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DOCTORAL THESIS

AIRPORTS AND TERRITORY: EMERGENCE OF A NEW STRATEGIC ACTOR IN THE AIR TRANSPORT SYSTEM

A thesis submitted by

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Declaration

“I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.”

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ABSTRACT

Airports and territory: Emergence of a new strategic actor in the air transport system

This thesis deals with the emergence of the airport as a new strategic actor in the air transport system which has undergone profound changes since its liberalisation and within which the airport turned out to be a major player. Considering the airport as an actor in the air transport system, even if it is affected by its environment in a large sense, this work proposes a contribution to current discussion about airport economics. This contribution refers to two levels: an analysis of the European airport business within which the airport emerges as a full player and an analysis of the link between airport strategy and the spatial and territorial context into which the airport is embedded.
Based on the differentiation of airport strategies according to the airports' commitment to certain market segments, the analysis of the spatial and territorial context into which the airports are embedded showed its influence on the development of airports but confirmed also that the latter is not automatic but subject to the dynamics arising from the interactions between the different actors. The emergence of the airport as a new strategic player in the air transport system places the emphasis on the complex relation between airport and territory which is reflected in a number of issues connected with the airport activity.

Keywords:

Airport, airport business, airport operator, airport strategies, airport taxonomy, infrastructure, liberalisation, nuisance, privatisation, restructuring process, spatial and territorial embeddedness.

Flughafen und Territorium: Zur Entstehung eines neuen strategischen Akteurs im Luftverkehrssystem

Diese Doktorarbeit beschäftigt sich mit dem Flughafen als einem neuen strategischen Akteur im Luftverkehrssystem, welches seit seiner Liberalisierung von weitreichenden Veränderungen erfasst wurde, und in dem der Flughafen sich zum wichtigen Teilnehmer entwickelt hat. Durch die Betrachtung des Flughafens als Akteur des Luftverkehrs, auch wenn er dem Einfluss seiner Umwelt im weitesten Sinne unterliegt, möchte diese Arbeit einen Beitrag zur gegenwärtigen Diskussion zum Thema Flughäfen in zweifacher Hinsicht leisten: Eine Analyse des europäischen Luftverkehrssystems, in dem der Flughafen als ganzheitlicher Partner deutlich wird sowie eine detaillierte Untersuchung der Verbindung zwischen Flughafenstrategien und der Verankerung des Flughafens in Raum und Territorium.
Ausgehend von der Differenzierung der Flughafenstrategien, die durch die Spezialisierung auf ein oder mehrere Marktsegmente ihren Ausdruck findet, lässt die Analyse des räumlichen und territorialen Kontexts, in dem der Flughafen verankert ist, dessen Einfluss auf die Entwicklung des Flughafens deutlich werden, aber bestätigt auch, dass letzere nicht ein automatisches Ergebnis ist, sondern von den Interaktionen der verschiedenen Akteure abhängt. Die Entstehung des Flughafens als neuer strategischer Akteur im Luftverkehrssystem betont die komplexen Beziehungen zwischen Flughafen und Territorium, die sich in einer Reihe von Aspekten widerspiegeln, die in dieser Arbeit diskutiert werden.

Stichworte:

Flughafen, Flughafenbetreiber, Flughafenmanagement, Flughafenstrategien, Flughafentypologie, Infrastruktur, Liberalisierung, Privatisierung, räumliche und territoriale Verankerung, Restrukturierung, Umweltbeeinträchtigung.

Aéroports et territoire : L’émergence d’un nouvel acteur stratégique dans le système de transport aérien

Cette thèse de doctorat porte sur l’émergence de l’aéroport comme nouvel acteur stratégique dans le système de transport aérien qui a connu de vastes changements depuis sa libéralisation et au sein duquel l’aéroport est devenu un acteur majeur. En considérant l’aéroport comme acteur du transport aérien, bien qu’il soit affecté par son environnement au sens large, ce travail propose une contribution à la discussion récente sur la question des aéroports. Cette contribution se réfère à deux niveaux : une analyse du système de transport aérien européen dans lequel l’aéroport émerge comme partenaire à part entière et une analyse détaillée du lien entre stratégies aéroportuaires et l’ancrage de l’aéroport dans l’espace et dans le territoire.

En partant de la différentiation des stratégies aéroportuaires avec des aéroports qui se spécialisent dans un certain ou plusieurs segments de marché, l’analyse du contexte spatial et territorial, dans lequel les aéroports sont ancrés, a révélé son influence sur le développement des aéroports mais a confirmé aussi que ce dernier n’est pas un résultat mécanique mais est soumis aux dynamiques résultant du jeu d’acteurs. L’émergence de l’aéroport comme nouvel acteur stratégique dans le système de transport aérien met en lumière les rapports complexes entre aéroports et territoire qui se reflètent dans un certain nombre d’aspects discutés dans ce travail.

Mots-clés :

Aéroport, ancrage spatial et territorial, industrie aéroportuaire, infrastructure, libéralisation, nuisance, opérateur d’aéroport, privatisation, restructuration, stratégies aéroportuaires, typologie d’aéroports.

SUMMARY

Airports and territory: Emergence of a new strategic actor in the air transport system

The contribution of this work

This thesis deals with the emergence of the airport as a new strategic actor in the air transport system which has undergone profound changes since its liberalisation and within which the airport turned out to be a major player. Considering the airport as an actor in the air transport system, even if it is affected by its environment in a large sense, this work proposes a contribution to current discussion about airport economics. This contribution refers to two levels:

Analysing the European airport business within which the airport emerges as a full player

The major contribution of this work is a comprehensive analysis of the European airport panorama and of the airport business placing emphasis on the emergence of airports as strategic actor in the air transport system: identifying different agents, their rationales and their relationships with a focus on airports that are subject to the dynamics arising from the interactions between the different parties involved but also to the spatial and territorial context into which they are embedded.

Exploring more in detail the link between airport strategy and the spatial and territorial context into which the airport is embedded

On the one hand, the general conditions, which may be more or less favourable, determine the possibilities of an airport to develop. On the other hand, the analysis shows that the only spatial and territorial context into which airports are embedded is not sufficient: Certain airports may take advantage of a good situation while other may not; certain airports manage to outweigh remoteness while others may not. The observations that some airports seem to perform better or worse with respect to constraints or opportunities resulting from the spatial and territorial context into which they are embedded confirms that development of an airport is not automatic but depends on to the dynamics arising from the interactions between the different actors, on strategies that are not defined in advance.

First considerations

The air transport has registered a spectacular growth since its liberalisation. However, the development of air traffic was not uniform – neither from a geographical point of view nor as regards market segments. Actually, the increase in air traffic has been accompanied by a geographical redistribution of traffic flows with the creation of hub airports reinforcing the spatial and temporal concentration of air traffic on some routes and nodes of which especially certain big international airports take advantage. At the same time, the air transport market has become increasingly fragmented. A clear segmentation has emerged between historic flag carriers, charter and low-cost airlines in the passenger transport and between postal services, general cargo and freight express carriers in the goods transport.

The increasing differentiation of air services is followed by a differentiation of airport strategies leading to aerodromes which may concentrate on certain market segments or on the contrary have established themselves as generalist airports. From existing research on the airport's capacity to attract air traffic, which underlines the link between the characteristics of the catchment area of an airport and its general traffic volume, another question arises: It refers to the link between the spatial and territorial context into which an airport is embedded and the airport's specialisation. Supposedly, a bidirectional link between territory and airport strategy exists: On the one hand, the territory which is affected by the airport depends on the different market segments served by the airport and thus on the airport's profile; on the other hand, the territory influences the airport's potential to develop certain traffics. Thus, the airport's catchment area, which is defined as the territory where the existing and potential traffic lies, cannot be considered to be fixed and unique but different catchment areas emerge from different market segments which by the way may overlap with the catchment areas of nearby airports.

Proceeding in two steps: an airport taxonomy emerging from the analysis of 100 airports and an analysis of the spatial and territorial context – a differentiation of airport strategies according to the airport's location and also to its positioning within the European airport panorama

In order to find clues as how the territorial context determines airport strategies, in a first step an airport taxonomy was developed; in a second step the territorial context examined. The analysis was mainly based on data from Eurostat and the Official Airline Guide (OAG) since they cover the European Union (including Switzerland and Norway) thus ensuring methodological coherence. The airport industry needs to be analysed at the European level. Airports are not only an integral part of the European and worldwide flow of passengers and freight; moreover, the airport activity goes beyond state borders. As Europe has become more and more integrated, politically, economically as well as regards transport networks, passengers and goods circulate without obstacles. Due to relative short distances and good transport infrastructure, airports enter intramodal as well as intermodal competition, even if both terms have to be nuanced and put in the right perspective. However, state borders lose their interest in this context.

The *airport taxonomy* was established on the basis of airport characteristics by using Eurostat air transport statistics which indicate for passengers and cargo e.g. the airport's overall traffic, route data and the proportion of non-scheduled traffic for 2006/2007 as well as OAG data. The latter refer only to scheduled passenger flights (excluding charter traffic) but indicate the names of the airlines which operate the air routes as well as the number of departing flights and of seats available on these flights for 2006. Additional information came from airport publications, in particular for determining the proportion of traffic operated by low-cost carriers as this information was only partly available from OAG data.

As regards the spatial and territorial context, the analysis was based on catchment areas. As Paris Charles de Gaulle, Amsterdam and Frankfurt airports are particularly well served by public transport, especially by high-speed train services, access times zones were used for identifying catchment areas according to different market segments. On the basis of the access times accepted by passengers according to literature and surveys, catchment areas could be drawn depending on the traffic type operated by the airport. However, this approach could not be applied to all airports as it was very time-consuming. Therefore, other airports' catchment areas had to be based on kilometric distances which were assigned to the access times accepted by passengers and freight forwarders in order to reach the airport, knowing full well that the determination of catchment areas was only approximate. The relevance of the different access times zones (whether indicated by travel times or kilometric distances) for an airport could be assessed thanks to the detailed analysis of its flight offer (which had already been done in order to establish the airport taxonomy); of course, zones which are closer to the airport tend to be of greater importance than more distant zones. Finally, the catchment areas were characterised by using statistical information from the Urban Audit on the demography, economic activity and attractiveness for tourism of 365 European cities. It was completed by data on meetings for 2003, 2005 and 2007 provided by the Union of International Associations. The separate analysis of the different variables was not adapted for comparisons and for examining airport strategies as information was to rich. For this reason, data were aggregated. Finally, hierarchical clustering allowed to classify cities according to its population, its economic and touristic importance. The "average linkage within groups" method was applied in order to create clusters that are as homogenous as possible inside.

Data were visualised by means of MapInfo®, software for mapping and geographic analysis. Vertical Mapper® for MapInfo® was used for representing access time zones and Arrow40.mbx for air routes.

Limits of the analysis of the spatial and territorial context into which airports are embedded

Despite the methodological coherence of the data used, the analysis of the territorial context has a limited degree of accuracy and figures indicate only orders of magnitude for two reasons mainly: The data from urban statistics refer to the period 2003-2006 and were restricted to 365 cities; the delimitation of catchment areas is a rather rough estimate due to the wish to include a large number of European airports into the analysis. In return, the analysis of 100 airports reveals the extent of the emergence of airport specialisations thus giving reasons for studying the territorial context into which these airports are embedded. The scope of this phenomenon would not have become apparent when the analysis had been restricted to a certain geographical area a small number of airports for the benefit of using "better" urban data. This also applies to the analysis of the territorial context into which the airports are embedded: Certain structures and tendencies would not have become apparent when the number of airports had been restricted for the benefit of the precise determination of catchment areas.

Structure of this work

This thesis is divided into three parts: The first part giving the reader a basic familiarity with airports, whereas the second part focuses on the new potentialities for developing the airport activity and the third part deals with the spatial and territorial embeddedness of airports.

First part: The airport within the air transport system

The first part, which is composed of four chapters, presents the airport within the air transport system. Whereas the **first chapter** underlines the specificities of freight and passenger transport by air, which influence airport strategies, as well as the role of the airport within the air transport system and its relations with the other parties involved, the **second chapter** concentrates on the relation between airport and territory since airports constitute the ground infrastructure of the transport network and are localised, tangible assets: On the one hand, they influence functional spaces and territories; on the other hand, they are embedded into several institutional territories. The **third chapter** goes deeper into four major issues connected with the spatial and territorial embeddedness of airports: their capacity to attract air traffic which is affected by the location of the airport in addition to the airport's supply-side policy; attention will also be paid to intra- and intermodal competition which depends on different factors, including once again the airport's location; then will be presented some publications on the geography of air transport and the strategic airport management. While the first two issues point out the relevance of the spatial and territorial context in addition to other factors, studies on the geography of air transport in general consider airports as simple infrastructure and the few publication on airport management neglect the spatial and territorial context into which airport are embedded. The first two chapters do not only give the reader a basic familiarity with the airport within the air transport system but also underline the emergence of the airport as a new strategic actor in an air transport system who is subject to the dynamics arising from the interactions between the different parties involved and the relevance of the spatial and territorial context into which the airport is embedded. Dealing with major issues to airports, the following literature review in the third chapter allowed to set the two objectives of this work. The **fourth** chapter explains the method applied for analysing airport strategies and the spatial and territorial context into which airports are embedded.

Second part: New potentialities for developing the airport activity

The **second part**, consisting in two chapters, concentrates on the new potentialities for developing the airport activity. They arise from the liberalisation of air transport which modified profoundly the political framework (**fifth chapter**) allowing airlines to choose the intra-European routes they want to operate and thus the airports to be served. Then, the **sixth chapter** provides an overview of the airport industry. To begin with, the economic characteristics of airports are presented. As regards capacity, airport operations exhibit significant economies of scale as a result of high fixed costs. Moreover, airports, in particular runways and to a lesser extent also terminals, are characterised by “indivisibilities” as investment in airport capacity has to be done in large discrete steps leading to fixed-step costs. One of the consequences is that the investment in airport infrastructure expansion has to be justified by a sufficiently important expected traffic growth. This implies a kind of threshold in the airport activity that has consequences on airport strategies. Another aspect of the airport industry is the growing importance of commercial activities which provide additional financial resources and thus contribute to expanding the airport’s room for manoeuvre. Finally, the sixth chapter also considers the large restructuring process which airports have been undergoing over the last years leading to the internationalisation of airport companies and the arrival of new investors. This is an important point as new investors may contribute to changing mentalities, which could be advantageous e.g. for promoting air-rail intermodality. At the same time, privatisation may have negative effects due to a focus on short-term profit seeking that may be disadvantageous for airport users and other parties involved in the airport business. This conflict of interest becomes apparent e.g. when discussing the organisation of transfers, the development of car parks and the increase in parking fees vs. the improvement of access by public transport although generating less profit but also when observing the number of strikes among sub-suppliers of airport services. However, privatisation is generally very partial with infrastructure remaining publicly financed and the private operator runs only the visible part of the system.

Third part: The spatial and territorial embeddedness of the airport

Finally, the **third part**, which is composed of three chapters, places emphasis on the spatial and territorial embeddedness of airports. To start with, the **seventh chapter** reminds the characteristics of the European territory as regards its demography, the distribution of economic activities and the attractiveness of certain destinations for tourism. It provides the basis for a detailed analysis of the spatial and territorial context into which the different airport types are embedded. The results of this analysis are presented in the **eighth chapter** which also draws an airport taxonomy by determining differing airport specialisations, the latter being associated to the airports’ locations. From this analysis emerges a picture of the landscape of European airports revealing a structure which is to a certain extent conditioned by a given territorial context, including the airport’s position with respect to other airports and their respective profiles. The **ninth chapter** gives an insight into the criteria for the choice of an airport by an airline, restrictions to the airport activity arising from a growing public interest in airports as well as the management of scarce capacity. These elements are integral parts of airport strategies. Airports that want to attract a certain type of airline have to take into consideration its behaviour. Besides, their way of handling environmental problems or scarce capacity may be determining for safeguarding future development.

The airport emerging as a new strategic actor

In the course of this work, it became apparent that current and in particular future development depends not only on airline behaviour but also, and to a large extent, on the airports’ capacity to respond to airline needs and to deal with various subjects related to their activity, including environmental problems, scarce capacity and the access by ground transport. It is through the airport's interest for and awareness of these aspects that airports emerge as full partners in the air transport system. In this respect, the development of non-aeronautical activities and the restructuring process, that a number of airports have undergone, have largely contributed to the broadening of the airport's room for manoeuvre. The different facets of the airport business show the latter's intention of being recognised as a full partner in the air transport system as they largely exceed the technical and management skills of an infrastructure provider in order to include the promotion of the air transport within the catchment area, the promotion of the catchment area to air transport and the promotion of the own facility to air carriers as well as to economic and political partners, the coordination between the different parties performing their activities at the airport (such as air carriers, ground handling companies, freight forwarders, public administrations, shops and restaurants) as well as the participation in consultations of and the dialogue with residents and neighbouring communities.

For this reason, airport strategies are not limited to the development of a particular specialisation but depend also on the airport's capacity to take into account and to cope with these different aspects which are crucial for safeguarding future development.

Importance of the multi-scale character of the link between airport and territory and the multimodal character of transport

The emergence of the airport as a new strategic actor in the air transport system places emphasis on the relation between airport and territory: The airport acts on but is also embedded into several territories. This multi-scale character of the link between airport and territory is reflected in the division of catchment areas according to different market segments but also in the relationship with the airport's surrounding areas. It is of a particular relevance for the better integration of the airport into local territories in order to ensure the social acceptability of the airport activity since there is a strong interdependency between the airport that gets necessary resources, such as labour, services and equipment from neighbouring territories and the latter benefitting from induced territorial dynamics but also suffering from nuisances. It is also reflected in the diverseness of landside access with the airport's integration in multimodal transport chains which include not only the flight but also urban public, road, railway, and high-speed railway transport referring to local, regional, national, international and even intercontinental levels thus covering territories of different scales.

Importance of the link between private and public aspects of the airport activity

Finally, the link between private and public aspects of the airport activity has to be underlined. It has come to the fore with the privatisation tendencies that could be observed in the airport industry with the introduction of the private sector justified by the pursuit of improved efficiency leading to higher service quality, passenger and airline market orientation and airport performance and the, at least partial, withdrawal of state funding. The necessity to generate substantial revenues providing for profitability to shareholders and financial resources for future investments may incite airport managers to focus on short-term profit seeking that may create tensions between the airport operator and other parties (e.g. airport users, service providers, airport employees and residents) which result from conflicts of interests. In this respect, residents and local authorities have come to the fore launching the discussion on nuisances, sustainable development and the distribution of benefits from air transport with a particular focus on the need for economic and environmental regulation. Besides, public authorities continue to finance infrastructure in most cases, so that the private operator deals actually only with a small part of the system.

Concluding remarks

Based on the differentiation of airport strategies according to the airports' commitment to certain market segments, the analysis of the spatial and territorial context into which the airports are embedded showed its influence on the development of airports but confirmed also that the latter is not automatic but subject to the dynamics arising from the interactions between the different actors. In this respect, the emergence of the airport as a new strategic player in the air transport system places the emphasis on the complex relation between airport and territory which is reflected in a number of issues connected with the airport activity. Finally, through the different aspects that were discussed in this work, airports raise the most complex and interesting questions, just as it is the case of other infrastructures and transport systems...

KURZFASSUNG

Flughafen und Territorium: Zur Entstehung eines neuen strategischen Akteurs im Luftverkehrssystem

Beitrag dieser Dissertation

Diese Doktorarbeit beschäftigt sich mit dem Flughafen als einem neuen strategischen Akteur im Luftverkehrssystem, welches seit seiner Liberalisierung von weitreichenden Veränderungen erfasst wurde, und in dem der Flughafen sich zum wichtigen Teilnehmer entwickelt hat. Durch die Betrachtung des Flughafens als Akteur des Luftverkehrs, auch wenn er dem Einfluss seiner Umwelt im weitesten Sinne unterliegt, möchte diese Arbeit einen Beitrag zur gegenwärtigen Diskussion zum Thema Flughäfen in zweifacher Hinsicht leisten:

Eine Analyse des europäischen Luftverkehrssystems, in dem der Flughafen als ganzheitlicher Partner deutlich wird.

Der wesentliche Beitrag dieser Arbeit ist eine umfassende Analyse des Luftverkehrssystems und der Flughafenlandschaft auf europäischer Ebene, wobei der Schwerpunkt auf dem Hervortreten des Flughafens als strategischer Akteur liegt. Dazu werden die verschiedenen Akteure mit ihren Handlungslogiken und ihren Beziehungen untereinander identifiziert. Im Mittelpunkt der Betrachtung steht der Flughafen, welcher jedoch auch den Dynamiken, welche aus den Interaktionen der verschiedenen Akteure resultieren, sowie dem räumlichen und territorialen Kontext, in dem er verankert ist, unterliegt.

Eine detaillierte Untersuchung der Verbindung zwischen Flughafenstrategien und Verankerung des Flughafens in Raum und Territorium.

Einerseits bestimmen die grundsätzlichen Bedingungen, die mehr oder wenig günstig sein können, die Entwicklungsmöglichkeiten des Flughafens. Andererseits zeigt die Untersuchung, dass die räumlichen und territorialen Gegebenheiten, in denen der Flughafen verankert ist, allein nicht ausreichend sind: Bestimmten Flughäfen gelingt es, aus einer günstigen Lage einen Vorteil zu ziehen, während dies bei anderen nicht der Fall ist; bestimmten Flughäfen gelingt es, eine abgeschiedene, ungünstige Lage zur überwinden, während andere es nicht schaffen. Die Variationen um diese Möglichkeiten (Erfolge und Fehlschläge) bestätigen, dass die Entwicklung von Flughäfen nicht ein automatisches Ergebnis ist, sondern von den Interaktionen der verschiedenen Akteure abhängt, und damit von nicht im Voraus definierten Strategien.

Ein paar einleitende Betrachtungen

Der Luftverkehr verzeichnete ein ausgesprochen starkes Wachstum seit dessen Liberalisierung. Allerdings war der Anstieg der Verkehre nicht einheitlich, weder aus geografischer Sicht, noch in Hinblick auf die Marktsegmente. Tatsächlich wurde die Zunahme des Luftverkehrs von einer Umverteilung der Verkehrsströme mit der Inbetriebnahme von Drehkreuzen (*Hub*-Flughäfen), die die Konzentration der Verkehre auf bestimmten Achsen und Knoten verstärkten und wovon insbesondere die großen internationalen Flughäfen profitierten, begleitet. Gleichzeitig erlebte der Luftverkehrsmarkt eine immer stärkere Fragmentierung durch die Herausbildung von einzelnen Marktsegmenten. Diese reichen von den Leistungen alteingesessenen Fluglinien (ehemalige *flag carriers*), über die der Billigflieger (*low-cost carriers)* und der Charterfluggesellschaften im Passagierverkehr bis hin zur Luftpost, dem allgemeinen Stückgutverkehr (*general cargo)* und der Expressfracht im Güterverkehr.

Dieser zunehmenden Differenzierung von Luftverkehrsdienstleistungen folgt dabei eine Differenzierung der Flughafenstrategien. Letztere zeichnet sich dadurch aus, dass sich bestimmte Flughäfen auf ein bestimmtes oder mehrere Marktsegmente konzentrieren, während im Gegensatz dazu sich andere Flughäfen als Generalisten etablieren. Ausgehend von der bestehenden Literatur zur Verkehrsanziehungskraft von Flughäfen, welche die Verbindung zwischen den Merkmalen des Flughafeneinzugsgebietes und seinem Verkehrsvolumen hervorhebt, stellt sich eine andere Frage, nämlich die nach der Verbindung zwischen räumlicher und territorialer Lage eines Flughafens und seinem Profil. Diese Verbindung ist vermutlich bidirektional: Einerseits wirkt der Flughafen über die verschiedenen Marktsegmente, welche er bedient, auf das Territorium; andererseits hat das Territorium einen Einfluss auf das Potential des Flughafens bestimmte Verkehre zu entwickeln. So kann das Flughafeneinzugsgebiet, welches als das Territorium definiert wird, wo der existierende und der potenzielle Verkehr seinen Ursprung oder seine Destination hat, weder als feststehend noch als einmalig betrachtet werden, denn mehrere Einzugsgebiete können entsprechend der vom Flughafen bedienten unterschiedlichen Marktsegmente abgegrenzt werden. Darüber hinaus können sich die Einzugsgebiete naheliegender Flughäfen überschneiden.

Vorgehensweise: Eine zweistufige Analyse mit dem Entwurf einer Flughafentypologie ausgehend von der Untersuchung von etwa 100 Flughäfen und einer Betrachtung der räumlichen und territorialen Gegebenheiten, in denen der Flughafen verankert ist – Differenzierung der Flughafenstrategien entsprechend der absoluten und relativen Lage des Flughafens

Um besser zu verstehen, wie die räumliche und territoriale Verankerung die Flughafenstrategien beeinflusst, wird in einem ersten Schritt eine Flughafentypologie entworfen. In einem zweiten Schritt wird die Lage des Flughafens untersucht. Die Analyse basiert auf den Statistiken von Eurostat und dem Official Airline Guide (OAG) denn diese decken ganz Europa (EU, Schweiz und Norwegen) ab und sichern so eine methodische Kohärenz. Dabei muss die Flughafenbranche auf europäischer Ebene betrachtet werden. Zum einen sind die Flughäfen Bestandteile der Passagier- und Güterströme auf europäischer und globaler Ebene. Darüber hinaus überschreitet die Flughafentätigkeit nationale Grenzen, da Passagiere und Güter heute fast barrierefrei zirkulieren können dank der zunehmenden

Integration Europas, welche sich nicht nur auf die politische und wirtschaftliche Ebene bezieht, sondern auch die Verkehrsnetze betrifft. Aufgrund relativ kurzer Entfernungen und guter Infrastruktur unterliegen Flughäfen teilweise länderübergreifendem intra- und intermodalen Wettbewerb, auch wenn dieser relativiert werden muss. In solch einem Zusammenhang verlieren Staatsgrenzen ihre Bedeutung.

Die Flughafentypologie wurde auf Grundlage der Eigenschaften der Flughäfen ausgehend von den Statistiken zum Passagier- und Luftfrachtverkehr für 2006/2007 (Gesamtverkehr, Flugverbindungen und Anteil des Charterverkehrs) von Eurostat sowie den OAG-Information erstellt. Letztere beziehen sich nur auf den Linienverkehr aber enthalten detaillierte Angaben zu den Fluggesellschaften, welche im Jahr 2006 alle von europäischen Flughäfen abgehenden Flüge durchführten (Name der Fluggesellschaft, Zahl der Flüge, Sitzplätze). Diese Informationen wurden um Angaben von den Flughäfen selbst ergänzt, insbesondere in Hinblick auf den Billigflugverkehr.

Die Analyse der räumlichen Lage basiert auf den Flughafeneinzugsgebieten. Für die Flughäfen Paris Charles de Gaulle, Amsterdam und Frankfurt, die sehr gut an das öffentliche Verkehrsnetz angebunden sind und insbesondere an den Hochgeschwindigkeitszugverkehr, wurde die Anfahrtszeit verwendet, um die Einzugsgebiete entsprechend der verschiedenen Marktsegmente abzugrenzen. Die Grundlage dafür ist die Anfahrtszeit, welche die Passagiere laut Literatur und Umfragen im Allgemeinen entsprechend den verschiedenen Marktsegmenten akzeptieren, um den Flughafen zu erreichen. Jedoch konnte dieser Ansatz nicht auf alle Flughäfen angewandt werden, weil seine Umsetzung sehr aufwendig ist. Aus diesem Grund wurden die Einzugsgebiete der anderen Flughäfen entsprechend der kilometrischen Distanzen abgegrenzt, welche den Anfahrtszeiten, die Passagiere sowie die Verlader/Intermediäre im Güterverkehr akzeptieren würden, zugeordnet wurden, wobei diese Abgrenzung der Flughafeneinzugsgebiete eine näherungsweise ist. Zur Erschließung der Bedeutung der verschiedenen Einzugsgebiete (ob in Anfahrtszeit oder kilometrischer Distanz gemessen) wurde auf die detaillierte Analyse des Verkehrsangebotes der Flughäfen, welche auch die Grundlage zur Erarbeitung der Flughafentypologie bildete, zurückgegriffen; natürlich sind zum Flughafen naheliegende Zonen innerhalb der Einzugsgebiete von größerer Bedeutung als weiter entfernt liegende. Schließlich wurden die Einzugsgebiete mit Hilfe von Daten aus der *Urban Audit*-Statistik zur Demografie, wirtschaftlichen Aktivität und touristischen Bedeutung von 365 Städten charakterisiert. Hinzugefügt wurden Informationen der *Union of International Associations* zu internationalen Kongressen, die in den Jahren 2003, 2005 und 2007 stattfanden. Die getrennte Analyse der verschiedenen Variablen war nicht günstig für einen Vergleich und die Untersuchung von Flughafenstrategien, da die Information zu reichhaltig war. Aus diesem Grund wurden die Daten aggregiert. Anschließend wurde eine hierarchische Clusteranalyse durchgeführt, um ähnliche Städte in Hinblick auf Bevölkerungsgröße sowie wirtschaftliche und touristische Bedeutung in entsprechende Cluster zusammenzufassen. Dafür wurde das *Linkage-within-groups*-Verfahren genutzt, um möglichst homogene Cluster zu bilden.

Die verschiedenen Daten wurden mit Hilfe der Software MapInfo visualisiert. Des Weiteren wurde Vertical Mapper für die Darstellung der Anfahrtszeiten und Arrow40.mbx für die der Flugverbindungen genutzt.

Die Grenzen der Analyse der räumlichen und territorialen Lage von Flughäfen

Trotz der methodischen Kohärenz der benutzen Daten ist der Genauigkeitsgrad der Analyse der territorialen Lage begrenzt und die Zahlen geben eher Größenordnungen an. Dafür gibt es zwei hauptsächliche Gründe: Die *Urban Audit*-Statistik beschränkt sich auf den Zeitraum 2003-2006 und 365 Städte in Europa; die Abgrenzung der Einzugsgebiete erfolgte nur näherungsweise aufgrund des Wunsches eine große Anzahl an Flughäfen in die Betrachtung einzubeziehen. Dafür macht die Untersuchung von etwa 100 Flughäfen das Ausmaß der zum Vorschein kommenden Spezialisierungen deutlich. Dies begründet ja gerade das Interesse für eine Analyse des Territoriums, in welches die Flughäfen verankert sind. Das Ausmaß dieses Phänomens hätte sich nicht aufgezeigt, wenn die Betrachtung auf eine geografisch kleinere Zone oder eine begrenzte Anzahl an Flughäfen beschränkt worden wäre zu Gunsten der Verwendung „besserer" Daten zu den Städten. Die gilt auch für die Analyse der Lage der Flughäfen, bei der bestimmte Strukturen und Tendenzen nicht deutlich geworden wären, wenn nur einige wenige Flughäfen betrachtet worden wären, um die Einzugsgebiete besser abgrenzen zu können.

Aufbau der Arbeit

Die Dissertation besteht aus drei Teilen: der erste erlaubt es dem Leser, sich in die Thematik der Flughäfen einzuarbeiten, während der zweite sich auf die neuen Möglichkeiten für die Entwicklung der Flughafentätigkeit konzentriert und der dritte sich mit der räumlichen und territorialen Lage der Flughäfen beschäftigt.

Erster Teil: Der Flughafen im Luftverkehrssystem

Der erste Teil enthält vier Kapitel und situiert den Flughafen im Luftverkehrssystem. Das **erste Kapitel** unterstreicht die Besonderheiten des Passagier- und Luftfrachtverkehr, welche auch einen Einfluss auf Flughafenstrategien haben, und betont die Rolle des Flughafens im Luftverkehr aber interessiert sich ebenfalls für die Beziehungen zu den anderen Akteuren. Demgegenüber konzentriert sich das **zweite Kapitel** auf die Beziehungen zwischen Flughafen und Territorium, da Flughäfen ja die räumlich gebundene, materielle Bodeninfrastruktur des Luftverkehrs darstellen: Einerseits hat der Flughafen einen Einfluss auf funktionale Räume und Territorien; andererseits ist er in verschiedene institutionelle Territorien eingebettet. Das **dritte Kapitel** vertieft vier Themen, die eng mit der Frage der räumlichen und territorialen Lage von Flughäfen verbunden sind: die Verkehrsanziehungskraft, welche, zusätzlich zu seiner Angebotspolitik, vom Standort des Flughafens abhängt; der intra- und intermodale Wettbewerb; darüber hinaus sollen auch Veröffentlichungen zur Luftverkehrsgeografie sowie zum strategischen Flughafenmanagement kurz erörtert werden. Während die ersten beiden Themen das Interesse für die räumliche und territoriale Lage der Flughäfen betonen, betrachten die Studien zur Geografie des Luftverkehrs in aller Regel den Flughafen als einfaches Infrastrukturobjekt und die zum Flughafenmanagement vernachlässigen die Frage des Standorts des Flughafens. So geben die ersten beiden Kapitel dem Leser einen Einblick in das Luftverkehrssystem, wobei sie jedoch die Entstehung des Flughafens als neuen strategischen Akteur, der den Dynamiken, welche aus den Interaktionen der Akteure resultieren, unterliegt und das Interesse für die Verankerung des Flughafens ins das Territorium hervorheben. Damit lassen sich aus der Literaturübersicht im dritten Kapitel die Ziel für diese Arbeit ableiten. Schließlich beschreibt das **vierte Kapitel** eingehend die Vorgehensweise für die Analyse der Flughafenstrategien sowie des räumlichen und territorialen Kontexts.

Zweiter Teil: Neue Möglichkeiten für die Entwicklung der Flughafentätigkeit

Der zweite Teil, bestehend aus zwei Kapiteln, beschäftigt sich mit den neuen Möglichkeiten für die Entwicklung der Flughafentätigkeit. Diese resultieren von der Liberalisierung des Luftverkehres, welche die politischen Rahmenbedingungen weitreichend veränderten (**fünftes Kapitel**), indem sie den Fluggesellschaften erlaubt, die Verbindungen innerhalb der Europäischen Union auszuwählen, welche sie befliegen wollen und damit auch die Flughäfen, welche sie bedienen wollen (vorausgesetzt, dass sie über die notwendigen Start- und Landerechte verfügen). Das **sechste** Kapitel gibt einen Überblick über die Flughafenindustrie, wobei es zuerst die ökonomischen Merkmale betrachtet. Flughäfen zeichnen sich durch erhebliche Größenvorteile aufgrund sehr hoher Fixkosten aus. Darüber hinaus sind Flughäfen von sogenannten Unteilbarkeiten geprägt, insbesondere in Bezug auf Lande-/Startbahnen aber in gewissem Masse auch auf Terminals, da diese Investitionen in großen Schritten gemacht werden müssen, was zu sprungfixen Kosten führt. Eine der Folgen davon besteht darin, dass Investitionen durch ein ausreichend starkes, erwartetes Verkehrswachstum gerechtfertigt sein müssen. Dies führt zu einer Art Schwelle, die überschritten werden muss, damit die Investition rentabel wird und die natürlich Auswirkungen auf Flughafenstrategien hat. Ein anderer Aspekt ist die Zunahme der kommerziellen Aktivitäten, die zusätzliches Einkommen generieren und so zu einer Erweiterung des Handlungsspielraums des Flughafens beitragen. Abschließend setzt sich das sechste Kapitel mit dem weitreichenden Restrukturierungsprozess auseinander, den viele Flughäfen in den letzten Jahren durchlaufen haben und der mit einer Tendenz hin zur Privatisierung und zur Internationalisierung der Flughafenbetreiber einherging sowie zum Erscheinen von neuen Akteuren beitrug. Dieser Punkt ist wichtig, weil neue Akteure zu einer Weiterentwicklung der Mentalitäten beitragen können, was insbesondere in Hinblick auf die weitere Umsetzung der Konzepte zur Intermodalität Schiene/Flug von Vorteil sein könnte. Gleichzeitig kann die Privatisierung negative Effekte aufgrund der Suche nach kurzfristigen Gewinnen haben, welche sich nachteilig z.B. auf die Nutzer des Flughafens, aber auch auf die externen Dienstleister, welche für den Flughafenbetreiber tätig sind, und ebenso auf die Anwohner auswirken können. Dieser Interessenkonflikt wird deutlich, wenn Themen diskutiert werden wie z.B. die Organisation der Umsteigevorgänge oder der Ausbau der Parkmöglichkeiten sowie die Höhe der Parkgebühren im Vergleich zu Investitionen in die Verbesserung der Anbindung an den öffentlichen Personenverkehr, obwohl dieser weniger rentabel ist. Darüber hinaus können des

Öfteren Streiks unter den externen Dienstleistern, die für den Flughafenbetreiber tätig sind, beobachtet werden. Dennoch bleibt die Privatisierung in aller Regel sehr partiell, da die Infrastrukturanlagen zumeist weiterhin mit öffentlichen Geldern finanziert werden, so dass der private Flughafenbetreiber sich nur um einen kleinen, sichtbaren Teil des Systems kümmert.

Dritter Teil : die räumliche und territoriale Verankerung des Flughafens

Der dritte Teil, der sich aus drei Kapiteln zusammensetzt, beschäftigt sich mit der räumlichen und territorialen Lage der Flughafen. Zunächst erinnert das **siebte Kapitel** an die Merkmale des europäischen Territoriums (Demografie, Verteilung der wirtschaftlichen Aktivitäten und touristische Bedeutung). Damit bildet es die Grundlage für die eingehende Betrachtung des räumlichen und territorialen Kontexts, in dem der Flughafen seine Tätigkeit ausübt. Die Ergebnisse werden im **achten Kapitel** diskutiert. Dazu wird die Flughafentypologie entsprechend der verschiedenen Spezialisierungen präsentiert und mit den Flughafenstandorten assoziiert. Daraus ergibt sich eine Übersicht zur europäischen Flughafenlandschaft, welche eine Struktur erkennen lässt, die in Teilen durch den räumlichen und territorialen Kontext bedingt ist, einschließlich der Lage des Flughafens in Bezug auf andere Flughäfen und deren jeweilige Profile. Das **neunte Kapitel** befasst sich mit den Kriterien, die für die Wahl eines Flughafens durch die verschiedenen Typen von Fluggesellschaften ausschlagegebend sind, aber auch mit Beschränkungen der Flughafentätigkeit, welche sich durch ein gestiegenes öffentliches Interesse für Flughäfen begründen und mit Fragen zum Management von knappen Kapazitäten am Flughafen. Diese Elemente sind feste Bestandteile von Flughafenstrategien: Flughäfen, die einen bestimmte von Fluggesellschaft anziehen wollen, müssen deren Verhalten berücksichtigen und die Art und Weise, wie mit Umweltproblemen oder Kapazitätsenpässen umgegangen wird, entscheidet darüber, ob es einem Flughafen gelingt, zukünftiges Wachstum abzusichern.

Zur Entstehung eines neuen strategischen Akteurs

Im Rahmen dieser Arbeit wurde deutlich, dass gegenwärtige und zukünftige Entwicklungen nicht nur vom Verhalten der Fluggesellschaften abhängen, sondern auch weitgehend von der Fähigkeit des Flughafen, auf die Anforderungen der Fluggesellschaften einzugehen und mit den verschiedenen Aspekten der Flughafentätigkeit umzugehen, wie z.B. mit Umweltproblemen, Kapazitätsmangel und der landseitigen Anbindung des Flughafens an das öffentlichen Verkehrsnetz. Über das Interesse und das Bewusstsein für diese Herausforderungen kommt der Flughafen als neuer strategischer Akteur zum Vorschein. In dieser Hinsicht haben die kommerziellen Aktivitäten und der Restrukturierungsprozess, den viele Flughäfen in der Vergangenheit durchlebt haben, zur Erweiterung deren Handlungsspielraums beigetragen. Die verschiedenen Aspekte der Aktivität verdeutlichen die Absicht des Flughafens, als vollständiger Partner im Luftverkehrssystem wahrgenommen zu werden, denn die Aktivität der Flughäfen geht bei weitem über die technischen und Managementfähigkeiten eines Infrastrukturbereitstellers hinaus. Sie bezieht auch die folgenden Punkte ein: die Förderung des Luftverkehrs gegenüber dem Einzugsgebiet, die

Förderung des Einzugsgebietes gegenüber dem Luftverkehr und die Förderung der eigenen Infrastruktur gegenüber den Fluggesellschaften sowie den politischen und wirtschaftlichen Partnern. Der Flughafen schaltet sich auch in die Koordination zwischen den verschiedenen Akteuren, die ihre Tätigkeit am Flughafen ausüben, ein (wie Fluggesellschaften, Bodenabfertigungsdienste, Verlader/Spediteure, Verwaltungen, Läden und Restaurants) und nimmt an Konsultationen und Absprachen mit den Anwohnern und angrenzenden Gemeinden teil.

Aus diesem Grund beschränken sich Flughafenstrategien nicht nur auf die Ausbildung bestimmter Spezialisierungen, sondern werden auch bestimmt von der Fähigkeit des Flughafens, mit bestimmten Aspekten umzugehen, die entscheidend sind für die Absicherung von zukünftigem Wachstum.

Die Bedeutung des mehrstufigen Charakters der Verknüpfung zwischen Flughafen und Territorium und des multimodalen Charakters des Verkehrs selbst

Das Hervortreten des Flughafens als neuer strategischer Akteur im Luftverkehrssystem rückt das Verhältnis zwischen Flughafen und Territorium in den Mittelpunkt: Der Flughafen wirkt auf den verschiedenen Ebenen des Territoriums aufgrund dessen, dass er darin verankert ist. Der mehrstufige Charakter der Verknüpfung zwischen Flughafen und Territorium äußert sich in der Abgrenzung der Einzugsgebiete den verschiedenen Marktsegmenten entsprechend aber auch in den Beziehungen zu seiner näheren Umgebung. Er ist auch von Bedeutung für eine bessere Integration des Flughafens in die lokalen Territorien, um dessen soziale Akzeptanz zu erhöhen, wobei ein starke Wechselbeziehung besteht zwischen dem Flughafen, der seine Ressourcen (Arbeitskraft, Dienstleistungen, Ausrüstung) aus dem näheren Umfeld bezieht und dem Umfeld, welches von den territorialen Dynamiken profitiert, die von der Flughafenaktivität ausgehen, aber auch dessen Umweltbeeinträchtigungen ertragen muss. Er spiegelt sich auch wider in der Vielfältigkeit des landseitigen Zugangs zum Flughafen und dessen Integration in multimodale Transportketten, welche über den Flug hinaus auch den öffentlichen Nahverkehr, den Straßen- und Eisenbahnverkehr und sogar den Hochgeschwindigkeitszugverkehr beinhalten und sich auf sehr unterschiedliche Ebenen erstrecken (von lokal und regional über national und international bis interkontinental).

Die Bedeutung der Verknüpfung zwischen privaten und öffentlichen Aspekten der Flughafentätigkeit

Schließlich muss die Verknüpfung zwischen privaten und öffentlichen Aspekten der Flughafentätigkeit hervorgehoben werden. Sie rückten in den Vordergrund im Rahmen der Privatisierungstendenzen, die in der Flughafenindustrie beobachtet werden konnten und mit der Suche nach Effizienzsteigerungen sowie dem Rückgang von öffentlichen Geldern begründet wurden. Die Notwendigkeit, substantielles Einkommen zu generieren, um Teilhabern eine gewisse Rentabilität zu sichern und um über finanzielle Ressourcen für zukünftige Investitionen zu verfügen, kann Flughafenbetreiber dazu anregen, sich auf die Suche nach kurzfristigen Gewinnen zu konzentrieren, wobei dies oft zu Spannungen mit den anderen Akteuren (Nutzer des Flughafens, externe Dienstleister, Anwohner, etc.) aufgrund von Interessenkonflikten führt. Diesbezüglich rücken Anwohner und lokale Behörden in den Vordergrund, um über Umweltbeeinträchtigungen, nachhaltige Entwicklung und die Verteilung des Nutzens vom Luftverkehr zu diskutieren, wobei eine besondere Aufmerksamkeit der Regulierung von wirtschaftlichen und Umweltaspekten zukommt. Darüber hinaus leistet die öffentliche Hand zumeist weiterhin einen Beitrag zur Finanzierung der Infrastruktur, so dass der private Flughafenbetreiber sich nur um einen kleinen, sichtbaren Teil des Systems kümmert.

Abschließende Bemerkungen...

Ausgehend von der Differenzierung der Flughafenstrategien, die durch die Spezialisierung auf ein oder mehrere Marktsegmente ihren Ausdruck findet, lässt die Analyse des räumlichen und territorialen Kontexts, in dem der Flughafen verankert ist, dessen Einfluss auf die Entwicklung des Flughafens deutlich werden, aber bestätigt auch, dass letzere nicht ein automatisches Ergebnis ist, sondern von den Interaktionen der verschiedenen Akteure abhängt, von nicht im Voraus definierten Strategien. In dieser Hinsicht macht die Entstehung eines neuen strategischen Akteurs im Luftverkehrssystem auf die komplexen Beziehungen zwischen Flughafen und Territorium aufmerksam, die sich in einer Reihe von Aspekten wiederspiegeln, die in dieser Arbeit diskutiert wurden und wodurch Flughäfen die komplexesten und interessantesten Fragen aufwerfen, wie man sie auch im Umgang mit anderer Infrastruktur und anderen Verkehrssystemen findet…

RESUME

Aéroports et territoire : L'émergence d'un nouvel acteur stratégique dans le système de transport aérien

La contribution de cette thèse de doctorat

Cette thèse de doctorat porte sur l'émergence de l'aéroport comme nouvel acteur stratégique dans le système de transport aérien qui a connu de vastes changements depuis sa libéralisation et au sein duquel l'aéroport est devenu un acteur majeur. En considérant l'aéroport comme acteur du transport aérien, bien qu'il soit affecté par son environnement au sens large, ce travail propose une contribution à la discussion récente sur la question des aéroports. Cette contribution se réfère à deux niveaux :

Une analyse du système de transport aérien européen dans lequel l'aéroport émerge comme partenaire à part entière
La contribution majeure de cette thèse est une analyse complète du système de transport aérien et du paysage aéroportuaire à l'échelle européenne tout en mettant l'accent sur l'émergence de l'aéroport comme acteur stratégique en identifiant les différents acteurs, leurs logiques et leurs relations, avec l'aéroport au centre et qui est toutefois soumis aux dynamiques résultant du jeu d'acteurs ainsi qu'au contexte spatial et territorial dans lequel l'aéroport est ancré.

Une analyse détaillée du lien entre stratégies aéroportuaires et l'ancrage de l'aéroport dans l'espace et dans le territoire
D'une part, les conditions générales, qui peuvent être plus ou moins favorables, déterminent les possibilités de développement de l'aéroport. D'autre part, l'analyse montre que le seul contexte spatial et territorial dans lequel l'aéroport est ancré n'est pas suffisant : certains aéroports réussissent à profiter d'une situation favorable tandis que d'autres n'y arrivent pas ; certains aéroports réussissent à surmonter l'isolement de leur plateforme tandis que d'autres n'y parviennent pas. Les variations autour de ces possibilités (succès et échecs) confirment que le développement des aéroports n'est pas un résultat mécanique mais dépend du jeu d'acteurs, de stratégies non définies à l'avance.

Quelques considérations au départ

Le transport aérien a enregistré une croissance spectaculaire depuis sa libéralisation. Toutefois l'évolution des trafics aériens n'a pas été uniforme que ce soit du point de vue géographique où à l'échelle des segments de marché. En effet, la croissance du transport aérien s'est accompagnée d'une redistribution des flux de trafic avec la création de plates-formes de correspondance (*hubs*) qui renforcent la concentration des trafics sur certains axes et nœuds dont profitent surtout les grands aéroports internationaux. En même temps, le marché aérien est devenu de plus en plus fragmenté. Une segmentation nette a émergé entre les opérateurs historiques (anciens *flag carriers*), les compagnies à bas coûts (*low-cost carriers*) et les compagnies charters dans le transport de passagers et entre la poste, le fret général (*general cargo*) et les opérateurs du fret express dans le transport de marchandises.

La différentiation croissante des services aériens est suivie d'une différentiation des stratégies aéroportuaires avec des plates-formes qui se concentrent sur un segment de marché spécifique ou au contraire se positionnent en tant qu'aéroports généralistes. En considérant la littérature existante sur la capacité des aéroports à attirer des trafics qui met en évidence le lien entre les caractéristiques de la zone de chalandise de l'aéroport et son volume de trafic, une autre question se pose, celle du lien entre le contexte spatial et territorial dans lequel l'aéroport est ancré et son profile. On peut supposer que le lien entre stratégie aéroportuaire et territoire est bidirectionnel : d'une part, le territoire est affecté par l'aéroport à travers les différents segments de marché desservis par l'aéroport et donc par le profile de l'aéroport ; d'autre part, le territoire influence le potentiel de l'aéroport de développer certains trafics. Ainsi, la zone de chalandise d'un aéroport, qui est définie comme le territoire où le trafic existant et potentiel a son origine ou sa destination, ne peut pas être considérée comme étant fixe et unique mais différentes zones de chalandises émergent des différents segments de marché desservis par l'aéroport ; des zones de chalandises qui peuvent se recouper avec celles d'un aéroport proche.

La démarche: une analyse en deux étapes avec d'abord l'établissement d'une typologie d'aéroports en partant de l'analyse d'une centaine d'aéroports et ensuite l'analyse du contexte spatial et territorial – différentiation des stratégies aéroports en fonction de l'emplacement de l'aéroport et de sa position relative dans le paysage aéroportuaire

Afin de mieux comprendre comment l'ancrage territorial détermine les stratégies aéroportuaires, dans une première étape une typologie d'aéroports a été établie ; dans une deuxième étape, le contexte territorial a été analysé. L'analyse est basée sur des statistiques qui proviennent d'Eurostat et d'*Official Airline Guide* (OAG) car elles permettent de couvrir l'ensemble du territoire européen (Union Européenne, Suisse et Norvège) est garantissent ainsi une cohérence méthodologique. L'échelle européenne est l'échelle pertinente pour analyser l'industrie aéroportuaire. Les aéroports ne sont pas seulement une partie intégrante dans les flux de passages et de fret à l'échelle européenne et mondiale. En plus, l'activité aéroportuaire dépasse les frontières nationales. Les passagers et les biens circulent presque sans obstacles grâce aux avancés au niveau de l'intégration européenne qui concerne non seulement l'échelle politique et économique mais aussi les réseaux de transport. En raison des distances relativement courtes et de bonnes infrastructures, les aéroports entrent en concurrence intra- et intermodale, même si celle-ci doit être relativisée. Toutefois, les frontières nationales perdent leur intérêt dans ce contexte.

La typologie d'aéroports a été établie sur la base des caractéristiques des aéroports en utilisant les données sur le trafic aérien de passagers et fret publiées par Eurostat pour 2006/2007 qui se réfèrent au trafic total, le trafic par liaison aérienne et la part du trafic charter et des données OAG. Ces dernières portent uniquement sur le trafic régulier mais indiquent les noms des compagnies aériennes pour l'ensemble des liaisons à partir des aéroports européens ainsi que le nombre de vols au départ et de sièges disponibles pour 2006. Ces informations ont été complétées par des données publiées par les aéroports eux-mêmes, en particulier par rapport au trafic *low cost.*

L'analyse du contexte territorial est basée sur les zones de chalandises. Pour les aéroports Paris Charles de Gaulle, Amsterdam et Francfort qui sont particulièrement bien desservis par les transports publics et surtout par le train à grande vitesse, les zones résultant du temps d'accès ont été utilisées pour identifier les zones de chalandises en fonction des différents segments de marché. Sur la base des temps d'accès acceptés par les passagers selon la littérature et les enquêtes réalisées à ce sujet, les zones de chalandise ont été délimitées en fonction du type de trafic opéré par l'aéroport. Toutefois, cette approche n'a pas pu être appliquée à l'ensemble des aéroports car sa mise en place est complexe et prend trop de temps. Pour cette raison, les zones de chalandises des autres aéroports se basent sur des distances kilométriques qui ont été attribuées aux temps d'accès acceptés par les passagers ou les intermédiaires dans le transport de fret pour rejoindre l'aéroport, sachant que les zones de chalandise sont délimitées de façon approximative. La pertinence des différentes zones (qu'elles soient exprimées en temps de trajet ou en distance kilométrique) a été évaluée à l'aide de l'analyse détaillée de l'offre de transport des aéroports qui avait déjà servie comme base pour la typologie d'aéroports ; bien sûr, les zones plus proches ont une importance plus élevée que les zones plus éloignées. Enfin, les zones de chalandise ont été caractérisées en utilisant des données statistiques provenant de l'*Urban Audit* sur la démographie et l'attractivité économique et touristiques de 365 villes européennes ainsi que des données sur les conférences internationales organisées en 2003, 2005 et 2007 de la part de l'*Union of International Associations*. L'analyse séparée des différentes variables n'était pas adaptée à des comparaisons et à l'analyse des stratégies aéroportuaires car l'information était trop riche. Pour cette raison, les données ont été agrégées. Ensuite, la classification hiérarchique a permis de regrouper les villes en fonction de leur population et de leur importance économique et touristique. La distance moyenne dans les classes a été utilisée afin d'obtenir des classes (*clusters*) qui sont les plus homogènes possibles à l'intérieur.

Les données ont été visualisées en utilisant le logiciel MapInfo. Vertical Mapper a été utilisé pour la représentation des zones en fonction du temps d'accès et Arrow40.mbx pour celle des liaisons aériennes.

Les limites de l'analyse du contexte spatial et territorial dans lequel les aéroports sont ancrés

Malgré la cohérence méthodologique des données utilises, l'analyse du contexte territorial a un degré limité de précision et les chiffres indiquent plutôt des ordres de grandeur pour deux raisons principalement : les données issues d'*Urban Audit* se réfèrent à la période 2003-2006 et se limitent à 365 villes ; la délimitation des zones de chalandise est plutôt approximative ce qui est dû à la volonté d'inclure dans l'analyse un très grand nombre d'aéroports. En revanche, l'analyse de la centaine d'aéroports révèle l'ampleur des spécialisations qui ont émergé de la part des aéroports et qui justifient l'intérêt pour l'analyse de l'ancrage territorial des aéroports. On ne se serait pas aperçu de l'ampleur de ce phénomène si l'analyse avait été restreinte à une zone géographique plus petite ou à un nombre limité d'aéroports au profit de données « meilleures » sur les villes. Cela s'applique aussi à l'analyse du contexte territorial dans lequel les aéroports sont ancrés : on ne se serait pas aperçu de certaines structures et tendances si le nombre d'aéroports avait été limité au profit d'une délimitation plus précise des zones de chalandise.

Le plan

Cette thèse se compose de trois parties : la première permettra au lecteur de se familiariser avec les aéroports tandis que la deuxième se concentre sur les nouvelles potentialités pour développer l'activité aéroportuaire et la troisième porte sur l'ancrage spatial et territorial des aéroports.

Première partie: L'aéroport dans le système de transport aérien

La première partie, qui consiste en quatre chapitres, présente l'aéroport dans le système de transport aérien. Tandis que le **premier chapitre** souligne les spécificités du transport de fret et de passagers par air, qui aussi influencent les stratégies aéroportuaires, et le rôle de l'aéroport dans le système de transport aérien mais s'intéresse également à ses relations avec les autres acteurs, le **deuxième chapitre** se concentre sur les rapports entre aéroports et territoire puisque les aéroports constituent les infrastructures sur le sol, localisées et matérielles du réseaux de transport : d'une part, ils influencent les espaces et territoires fonctionnels ; d'autre part, ils sont ancrés dans différents territoires institutionnels. Le **troisième chapitre** approfondit quatre sujets qui sont étroitement lies à la question de l'ancrage spatial et territorial des aéroports: leur capacité d'attirer des trafics qui dépend de l'emplacement de l'aéroport en plus de facteurs liés à sa politique de l'offre de transport ; la concurrence intra- et intermodale ; mais on s'intéressera aussi à quelques publications qui relèvent de la géographie des transports et du management stratégique des aéroports. Tandis que les deux premiers sujets mettent l'accent sur l'intérêt du contexte spatial et territorial pour l'analyse (en plus d'autres facteurs), les études sur la géographie du transport aérien en général considèrent l'aéroport comme une simple infrastructure et les quelques publications sur le management des aéroports négligent l'ancrage dans le territoire de l'aéroport. Ainsi, les deux premiers chapitres permettent au lecteur de se familiariser avec les aéroports dans le système de transport aérien tout en soulignant l'émergence de l'aéroport comme nouvel acteur stratégique qui est affecté par les dynamiques résultant des interactions des différents acteurs ainsi que l'importance de l'intérêt pour l'ancrage dans le territoire de l'aéroport. La revue de littérature dans le troisième chapitre a permis de définir les objectives du travail. Ensuite, le **quatrième chapitre** explique la méthode appliquée pour analyser les stratégies aéroportuaires et le contexte spatial et territorial dans lequel l'aéroport exerce son activité.

Deuxième partie: Nouvelles potentialités pour le développement de l'activité aéroportuaire

La deuxième partie, qui se compose de deux chapitres, se concentre sur les nouvelles possibilités pour développer l'activité aéroportuaire. Elles résultent de la libéralisation du transport aérien qui a modifié profondément le cadre politique (**cinquième chapitre**) en permettant aux compagnies aériennes de choisir les liaisons intra-européennes qu'elles souhaitent exploiter et les aéroports à desservir (à conditions de disposer des droits de décollage/d'atterrissage nécessaires). Le **sixième chapitre** donne une vue d'ensemble de l'industrie aéroportuaire, à commencer par les caractéristiques économiques des aéroports. En ce qui concerne la capacité, les opérations aéroportuaires affichent des économies d'échelle importantes en raison de coûts fixes élevés. En plus, les aéroports, en particulier les pistes et dans une certaine mesures les aérogares, sont caractérisés par des « indivisibilités » étant donné que l'investissement dans la capacité de l'aéroport doit se faire en intervalles. Une des conséquences est que l'investissement nécessaire à l'élargissement d'une infrastructure aéroportuaire doit être justifié par une croissance attendue du trafic suffisamment importante. Cela conduit à une sorte de seuil à atteindre voire à dépasser dans la croissance du trafic au-delà duquel l'investissement devient rentable ce qui a des répercussions sur les stratégies aéroportuaires. Un autre aspect de l'industrie aéroportuaire est l'importance croissante des activités commerciales qui génèrent des revenues supplémentaires et ainsi contribuent à l'élargissement de la marge de manœuvre de l'aéroport. Enfin, le sixième chapitre s'intéresse aussi aux processus de restructuration dont faisaient l'objet les aéroports ces dernières années avec une tendance à la privatisation et à l'internalisation des opérateurs d'aéroport et l'arrivée de nouveaux acteurs. Ce point est important car de nouveaux acteurs peuvent contribuer à l'évolution des mentalités ce qui pourrait être bénéfique par exemple pour la promotion de l'intermodalité rail-air. En même temps, la privatisation peut avoir des effets négatifs dus à la recherche de profit à court terme qui peut être désavantageuse pour les utilisateurs des aéroports mais aussi pour d'autres acteurs impliqués dans l'activité aéroportuaire. Ce conflit d'intérêts devient apparent par exemple lors des discussions sur l'organisation des correspondances, le développement des parkings et la fixation des tarifs de stationnement par rapport à des investissements dans un meilleur accès en transports collectifs bien que ces derniers soient moins rentables ou lorsque l'on observe les grèves fréquentes de sous-traitants de l'opérateur d'aéroport. Toutefois, la privatisation est en général très partielle avec les infrastructures qui continuent à être financées par les autorités publiques et l'opérateur privé qui exploite seulement la partie émergée du système.

Troisième partie: l'ancrage spatial et territorial de l'aéroport

Enfin, la troisième partie, qui consiste en trois chapitres, met l'accent sur l'ancrage spatial et territorial des aéroports. D'abord, le **septième chapitre** rappelle les caractéristiques du territoire européen (démographie, répartition des activités économiques et attractivité touristique). Il représente la base pour une analyse détaillé du contexte spatial et territorial dans lequel les différents types d'aéroports exercent leur activité. Les résultats de cette analyse sont discutés dans le **huitième chapitre** qui présente aussi la typologie d'aéroports en fonction de différentes spécialisations, ces dernières étant associées à l'emplacement des plates-formes. Il en émerge une vue d'ensemble du paysage aéroportuaire européen qui révèle une structure qui est en partie conditionnée par le contexte territorial donné, y compris par le positionnement de l'aéroport par rapport à d'autres plates-formes et leurs profiles respectifs. Le **neuvième chapitre** se concentre sur les critères selon lesquelles les compagnies aériennes choisissent un aéroport et les restrictions de l'activité aéroportuaire qui sont dues à l'intérêt croissant du publique pour les aéroports ainsi que à la gestion d'une capacité qui peut être rare. Ces éléments constituent une partie intégrante des stratégies aéroportuaires : des aéroports qui souhaitent attirer un certain type de compagnie aérienne doivent considérer son comportement ; la façon de gérer les problèmes environnementaux et de capacité peut être déterminante pour s'assurer d'un développement futur.

L'émergence de l'aéroport comme nouvel acteur stratégique

Dans le cadre de ce travail, il est devenu clair que des évolutions actuelles et futures ne dépendent pas seulement du comportement des compagnies aériennes mais dans une large mesure de la capacité de l'aéroport de répondre aux besoins des compagnies aériennes et de gérer les différentes questions liées à leur activité, y compris les problèmes environnementaux, le manque de capacité et l'accès terrestre à l'aéroport. C'est à travers l'intérêt de l'aéroport et sa conscience pour ces enjeux que l'aéroport émerge comme nouvel acteur stratégique dans le système de transport aérien. A cet égard, le développement des activités commerciales et le processus de restructuration, par lequel sont passés beaucoup d'aéroports, ont contribué à élargir la marge de manœuvre des aéroports. Les différents aspects de son activité montrent son intention d'être reconnu comme partenaire à part entière dans le système de transport aérien car cette activité dépasse largement les capacités techniques et de management d'un fournisseur d'infrastructure et intègre aussi la promotion du transport aérien au sein de la zone de chalandise, la promotion de la zone de chalandise au sein du transport aérien et la promotion des sa propre infrastructure auprès des compagnies aériennes mais aussi des partenaires économiques et politiques. L'aéroport intervient aussi dans la coordination entre les différents acteurs qui exercent leur activité sur la plate-forme (comme compagnies aériennes, compagnies de *handling*, transitaires/commissionnaires de transport, administrations publiques, boutiques et restaurants) et participe dans les consultations et la concertation avec les riverains et les municipalités voisines.

Pour cette raison, les stratégies aéroportuaires ne se limitent pas au développement d'une certain spécialisation mais dépendent aussi de la capacité de l'aéroport de tenir compte de ces différents aspects et de les gérer car ils sont crucial pour s'assurer d'un développement futur.

L'importance du caractère multiscalaire du lien entre aéroports and territoire ainsi que du caractère multimodal du transport lui-même

L'émergence de l'aéroport comme nouvel acteur stratégique dans le système aéroportuaire met l'accent sur les rapports entre aéroports et territoire: l'aéroport agit sur les différentes échelles du territoire tout en y étant ancré. Le caractère multiscalaire du lien entre aéroports et territoire se reflète dans le découpage des zones de chalandise en fonction des différents segments de marché mais aussi dans les relations avec l'environnement proche. Il est d'une pertinence particulier pour une meilleure insertion de l'aéroport dans les territoires locaux afin d'assurer l'acceptabilité sociale de l'activité en raison de l'interdépendance forte entre l'aéroport qui trouve ses ressources (main d'œuvre, services, équipements) dans les territoires autour tandis que ces derniers bénéficient des dynamiques territoriales engendrées par l'activité mais aussi subissent ses nuisances. Il se reflète aussi dans la diversité de l'accès terrestre avec l'intégration de l'aéroport dans les chaines de transports multimodales qui couvrent des échelles très différentes (locale, régionale, nationale, internationale voire intercontinentale) en incluant non seulement le vol mais aussi les transports urbains collectifs, le transport routier, ferroviaire et même ferroviaire de grande vitesse.

L'importance du lien entre des aspects privés et publics de l'activité aéroportuaire

Enfin, le lien entre aspects privés et publics de l'activité aéroportuaire doit être souligné. Il est arrivé sur l'avant-plan avec les tendances de privatisation qui pouvaient être observées dans l'industrie aéroportuaire avec l'introduction du secteur privé justifié par la recherche d'une meilleure efficience et le retrait, au moins partiel, des financements publics. La nécessité de générer des revenues substantielles afin d'assurer la profitabilité aux actionnaires et de disposer de ressources financières pour des investissements futures peut inciter les opérateurs d'aéroport à se focaliser sur la recherche de profit à court-terme ce qui crée souvent des tensions entre l'opérateur et les autres acteurs (utilisateurs de l'aéroport, les sous-traitants, résidents, etc.) résultant d'un conflit d'intérêts. A cet égard, les résidents et les autorités locales se mettent en avant pour discuter sur les nuisances, le développement durable et la répartition des bénéfices du transport aérien avec une attention particulière pour les besoins d'une régulation économique et environnementale. En plus, les autorités publiques continuent souvent à financer les infrastructures et l'opérateur d'aéroport n'exploite que la partie émergée du système.

Pour conclure...

En partant de la différentiation des stratégies aéroportuaires avec des aéroports qui se spécialisent dans un certain ou plusieurs segments de marché, l'analyse du contexte spatial et territorial, dans lequel les aéroports sont ancrés, a révélé son influence sur le développement des aéroports mais a confirmé aussi que ce dernier n'est pas un résultat mécanique mais est soumis aux dynamiques résultant du jeu d'acteurs, de stratégies non définies à l'avance. A cet égard, l'émergence de l'aéroport comme nouvel acteur stratégique dans le système de transport aérien met en lumière les rapports complexes entre aéroports et territoire qui se reflètent dans un certain nombre d'aspects discutés dans ce travail, par quoi, les aéroports posent les questions les plus intéressantes et les plus complexes que l'on retrouve aussi pour d'autres infrastructures et systèmes de transport…

ABBREVIATIONS

ACI	Airports Council International
ADP	Aéroports de Paris
ADR	Aeroporti di Roma
AEA	Association of European Airlines
AENA	Aeropuertos Españoles y Navegación Aérea
AIS	Aeronautical Information Services
ARI	Aer Rianta International
BAA	British Airport Authority
BAC	Brussels Airport Company
BIAC	Brussels International Airport Company
BBO	Buy-Build-Operate
BOO	Build-Own-Operate
BOOT	Build-Own-Operate-Transfer
BOT	Build-Operate-Transfer
CAB	Civil Aeronautics Board
CCI	Chamber of Commerce and Industry
CNS/ATM	Communications, Navigation and Surveillance for Air Traffic Management
CO_2	Carbon dioxide
Cpt.	Corporation
CRS	Computer Reservation System
DAA	Dublin Airport Authority plc
EEA	European Economic Area
e.g.	for example (“exempli gratia” in Latin)
EPNdB	Effective Perceived Noise in decibels
EPNL	Effective Perceived Noise Level
et al.	and others (“et alii” in Latin)
etc.	and so on; and the rest (“et cetera” in Latin)
ETS	emissions trading scheme
ECAC	European Civil Aviation Conference
EU	European Union
EUR	euro (currency)
FIATA	Fédération Internationale des Associations De Transitaires et Assimilés (International Federation of Freight Forwarding Agents Associations)
ff	and following pages (“foliis” in Latin)
ft	Foot (pl. feet) is a unit of length (1 foot = 30.48 cm).
GDP	Gross Domestic Product
GISCO	Geographic Information System of the European Commission
HSR	High-speed railway
HST	High-speed train
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation

ICE	Inter-City Express (the German HST)
IATA	International Air Transport Association
i.a.	among other things (“inter alia” in Latin)
i.e.	that is (“id est” in Latin)
incl.	including
kph	kilometres per hour
LDO	Lease-Develop-Operate
LRAC	Long-run average costs
MAG	Manchester Airports Group
MET	Meteorological services
NB	note well (“nota bene” in Latin)
NDI	Noise Depreciation Index
OAG	Official Airline Guide
OECD	Organisation for Economic Co-operation and Development
OSL	Oslo Lufthavn AS
p.a.	per year (“per annum” in Latin)
PEB	Plan d’Exposition au Bruit (the French noise exposition plan)
Plc	Public limited company
s.a.	without year (“sine anno” in Latin)
SAR	Search And Rescue services
SRC	Short-run average costs
TGV	Train à Grande Vitesse (the French High-speed train)
USA	United States of America
UK	United Kingdom
WLU	Work Load Unit (the equivalent of one passenger or 100 kg freight)

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GENERAL INTRODUCTION

This thesis deals with the emergence of the airport as a new strategic actor in the air transport system which has undergone profound changes since its liberalisation and within which the airport turned out to be a major player. The main contribution is an analysis of the air transport system identifying different agents, their rationales and their relationships with a focus on airports that have become major actors and are subject to the dynamics arising from the interactions between the different parties involved and to the relevance of the spatial and territorial context into which they are embedded. In this respect, the European airport panorama shows a much nuanced scenery, not only as regards the size of the airports but also in respect of their functions, their markets and customers, with generalist aerodromes and more specialised ones, all embarking on their own strategies. The scope of this development emerges when leaving the national level for the benefit of the European one, beyond national boundaries.

As this work focuses on airports and their emergence in the air transport system, it differs from most publications on air transport. All parties involved in air transport have been affected by the far-reaching consequences resulting from the liberalisation of the air transport within the EU; however, airports are mostly considered when a particular, specific aspect is treated (such as the optimal allocation of airport slots).

Airports being pushed in a competitive context due to the liberalisation of air transport within the EU

First and foremost, the liberalisation of air transport within the EU, realised in three steps of which the last one came in force on 1 January 1993 and was completed from 1 April 1997 by the right of providing cabotage, referred to airlines that got the freedom to choose the EU-airports they want to serve and to operate any intra-EU air service, provided that they dispose of the necessary slots. This signifies the abolition of all bi- and multilateral air service agreements that had previously existed between EU member states and had determined the airlines which were allowed to operate a certain route but also ticket prices as well as the allocation of capacity between these airlines. For this reason, prior to the liberalisation, the role of airports within the air transport system was minimised: Airports were considered to be simple infrastructure although being indispensable for the supply of a service of public utility; airport operators were not regarded as actors or decision makers but as public service entities just adapting to demand changes and to be interacting with other parties involved in air transport only to a very limited extent. Actually, there was little need for interaction since air service agreements determined the routes and frequencies that could be operated by each airline from the airport. With the liberalisation of air transport, airports had been pushed in a market economy like context where they have to attract traffic and are competing in particular with other airports for airlines, air services as well as for passengers and freight. This tendency has even been reinforced by the spectacular growth that air transport has registered since its liberalisation with the emergence of new airlines, the launching of new air services and the tendency towards concluding an increasing number of open skies agreements with third countries.

However, the development of air traffic was not uniform – neither from a geographical point of view nor as regards market segments. Actually, the increase in air traffic has been accompanied by a geographical redistribution of traffic flows. The restructuring of the air transport network has been characterised by the creation of hub airports reinforcing the spatial and temporal concentration of air traffic on some routes and nodes of which especially certain big international airports take advantage. At the same time, the air transport market has become increasingly fragmented. A clear segmentation has emerged between historic flag carriers, charter and low-cost airlines in the passenger transport and between general cargo and freight express carriers in the goods transport.

The airport emerging as a strategic actor despite the considerable role of public authorities

The increasing differentiation of air services is followed by a differentiation of airport strategies leading to aerodromes which may concentrate on certain market segments or on the contrary have established themselves as generalist airports. Thus, the big hub airports struggle for reinforcing their hegemony whereas other airports embark on more targeted strategies, whether they aim at a certain type of traffic or on a geographic zone. Cooperation and competition are two important aspects at stake in the European airport system, not only between airports but between the different parties involved.

In parallel, the airport industry itself has undergone fundamental changes since the liberalisation of air transport. Formerly, most airports had been under public ownership. Since the 1980s, more and more governments have sought to introduce commercial practices and the private sector into the airport activity. Thus, different privatisation approaches have emerged ranging from management contracts and concessions to corporatisation with the partial or total sale of the airport’s capital. In this context, airports have acquired a certain strategic and tactical autonomy that was not at their disposal before. In order not to be subjected to the consequences of the liberalisation of air transport, airports had to respond by means of their own appropriate development strategies. The observation of the airport industry suggests that airports react to changes in their environment, try to think ahead and look for strategies in order to respond to developments and even to influence changes.

In view of the continuous growth of the air transport, airports have become important poles of economic activity. Airports do not only put infrastructure and superstructure at the airlines’ disposal, they also play a role as coordinator of a number of economic and public activities which contribute to the functioning of the airport as a whole. Moreover, they invest into the promotion of their location and the development of air links. They also communicate with pressure groups, the media, trade unions, elected representatives, residents' associations, passengers, and the whole public. The development of non-aeronautical activities and the restructuring process, that a number of airports have undergone, have largely contributed to the broadening of the airport’s room for manoeuvre.

Nevertheless, public authorities at local, national and Community level still play a considerable role with respect to the ownership of infrastructure and its development, the control of rules of competition, the provision of services of general interest, such as air traffic control, as well as the handling of environmental problems. Airport strategies are also influenced by airline policies as the latter decide after all on their route network, frequencies and air fares. Finally, airports also consider the operators of other transport modes and public authorities for improving the airport's integration into a multimodal network at local as well as at regional and national level (places to be served, fares and frequencies). At local level a good access to and from the neighbouring area represents a clear advantage, whereas at regional and national (or even international) level a better accessibility represents also an advantage but especially high-speed trains may not only be perceived as being complementary to air transport but may also act as substitute for air transport. This ambiguity may explain why rail-air intermodality is considered with reserve by a number of airports while it is promoted by airports that have to deal with capacity shortage, such as Frankfurt airport, since the transfer of passengers from air to rail allows them to replace some short-haul flights by long-haul and in particular intercontinental flights for which there is no alternative (if it is not maritime transport).

Thus, the interaction with airlines, the management of scarce capacity and ground transport services to the airport constitute important elements of airport strategies. The consideration of protest from residents and the airport's role in discussions about e.g. bans on night flights are also integral parts of airport strategies. The example of Brussels airport illustrates to which extent noise nuisance and the relations with residents are a sensitive subject: The opposition of residents from the neighbouring communities to noise nuisance due to night flights forced DHL to leave Brussels airport for Leipzig/Halle airport where started operations of its new hub in October 2007. Brussels is not the only airport concerned by local protests and oppositions which can be observed in a number of countries and represent currently one of the major constraints for airport development.

Moreover, the strategies pursued by airports are determined by the spatial and territorial context into which they are embedded. In this respect, the airports' catchment areas, their economic structure, their density and the socio-economic structure of the population living there, the offer of ground transport but also the location of the airports within the catchment areas are particularly important. The spatial and territorial context into which airports are embedded is analysed in more detailed manner – and this constitutes the second contribution of this work. There are two reasons explaining the interest for the spatial and territorial context into which airports are embedded: At first, airlines take it into consideration when deciding to serve an airport and in what terms. For this reason, the spatial and territorial context represents a constraint if it is unfavourable, just as it represents an opportunity if it is advantageous. Besides, the analysis of the spatial and territorial context gives an idea of the airports performing better or less well as one could expect from its location. This amounts to saying that the airport manages to deal more or less well with the different aspects which constitute the airport strategy.

The contribution of this work

Considering the airport as an actor in the air transport system, even if it is affected by its environment in a large sense, this work proposes a contribution to current discussion about airport economics. This contribution refers to two levels.

Analysing the European airport business within which the airport emerges as a full player.

The major contribution of this work is a comprehensive analysis of the European airport panorama and of the airport business placing emphasis on the emergence of airports as strategic actor in the air transport system: identifying different agents, their rationales and their relationships with a focus on airports that are subject to the dynamics arising from the interactions between the different parties involved. Moreover, the spatial and territorial context into which they are embedded is relevant. Thus, very diverse elements which all contribute to the airport strategy are discussed: First, those that create new potentialities for developing the airport activity; then those that may be restrictive but whose control may contribute to safeguard the airport's future development. The interest of this review arises from the observation that the large majority of literature related to airports is very specific, concentrating on one particular aspect of the airport business. By focusing on specific details, one can lose sight of the airport business as a whole. Leaving that level of "details" is just what this work proposes: putting together different elements of which emerges the airport as a new strategic actor.

Exploring more in detail the link between airport strategy and the spatial and territorial context into which the airport is embedded.

Existing research on the airport's capacity to attract air traffic (Wolf, 2003) underlines the importance of the airport's catchment area and its economic structure, its density and the socio-economic structure of the population living there, the offer of ground transport and the location of the airport within this zone in addition to factors related to the airport's supply-side policy. Since there is a link between the general traffic volume of an airport and particularly the socio-economic characteristics of its catchment area, another question arises: It refers to the link between the spatial and territorial context into which an airport is embedded and the airport's specialisation. Supposedly, a bidirectional link between territory and airport strategy exists: On the one hand, the territory which is affected by the airport depends on the different market segments served by the airport and thus on the airport's profile; on the other hand, the territory influences the airport's potential to develop certain traffics. Thus, the airport's catchment area, which is defined as the territory where the existing and potential traffic lies, cannot be considered to be fixed and unique but different catchment areas emerge from different market segments which by the way may overlap with the catchment areas of nearby airports. For this reason, the second contribution of this work is to explore this link between airport strategy and the spatial and territorial context into which the airport is embedded, a link that is missing, or at least not explicit, in recent research. By exploring this link, this work proposes a different view on airports. The territory constitutes an instrument for analysing airport strategies; it reveals the strategies that are implemented by the airports and are coherent with the interests and objectives of all other players that have a stake in the airport activity; the strategies are revealed through an analysis of the territory.

Proceeding in two steps: an airport taxonomy emerging from the analysis of 100 airports and an analysis of the spatial and territorial context

In order to find clues as how the territorial context determines airport strategies, in a first step an airport taxonomy was developed; in a second step the territorial context examined. The analysis was mainly based on data from the Eurostat transport and Urban Audit statistics as well as from the Official Airline Guide (OAG). They cover the European Union (including Switzerland and Norway) and thus ensure methodological coherence. The airport industry needs to be analysed at the European level. Airports are not only an integral part of the European and worldwide flow of passengers and freight; moreover, the airport activity goes beyond state borders. As Europe has become more and more integrated, politically, economically as well as regards transport networks, passengers and goods circulate without obstacles. Due to relative short distances and good transport infrastructure, airports enter intramodal as well as intermodal competition, even if both terms have to be nuanced and put in the right perspective. However, state borders lose their interest in this context.

The airport taxonomy was established on the basis of airport characteristics by using Eurostat air transport statistics which indicate for passengers and cargo e.g. the airport's overall traffic, route data and the proportion of non-scheduled traffic for 2006/2007. OAG data refer only to scheduled passenger flights (excluding charter traffic) but indicate the names of the airlines which operate the air routes as well as the number of departing flights and of seats available on these flights for 2006. Almost all "traditional" full service carriers and low-cost airlines transmit their flight data to OAG; only Ryanair is missing among the large airlines. For this reason, additional information came from airport publications (annual reports, websites), in particular for determining the proportion of traffic operated by low-cost carriers as this information is only partly available from OAG data. In contrast to Eurostat statistics, OAG data refer to flight plans. For this reason, there may be a discrepancy between the flights scheduled for a certain period and the effectively operated flights as some of them might be cancelled while others were added. Nevertheless, differences are relatively small (Dobruszkes, 2007, p. 46f).

As regards the spatial and territorial context, the analysis is based on catchment areas. As Paris CDG, Amsterdam and Frankfurt airports are particularly well served by public transport, especially by high-speed train services, access times zones were used for identifying catchment areas according to different market segments. Access times originate from the travel information system accessible on the Deutsche Bahn homepage. It covers public transport timetable (train and bus) for many destinations in Europe. For this analysis, destinations were chosen in order to cover evenly a large area around the airport. Thus, data on journey times were collected on 539 destinations from Frankfurt airport, on 485 destinations from Paris CDG airport and on 243 destinations from Amsterdam Schiphol airport for Thursday 15 March 2007 (no school holidays). The shortest overall travel time starting from the airport, and including waiting time due to stops or transfers was considered. Often, the shortest travel time referred to the journey that required no or a minimum of transfers but in some cases, the shortest journey obliged the passenger to change trains while another itinerary needing more time but fewer transfers existed. Hence, the alternative was more comfortable and so preferable. As the passenger's choice depends on the additional travel time for the alternative journey, the decision on access times was based on the following assumption: A passenger was supposed to prefer the shortest journey unless he found an alternative that avoided at least one transfer but took less than 25 minutes in addition to the shortest travel time; otherwise, the passenger was supposed to prefer still the first solution even if he or she had to make one more connection. This situation was quite rare: As regards Frankfurt airport only about forty destinations were concerned by this problem that was less than 10%. On the basis of the access times accepted by passengers according to literature and surveys, catchment areas could be drawn depending on the traffic type operated by the airport: 30 to 60 minutes maybe 1.5 hours access time for short-distance scheduled flights, 1.5 to 2 hours for medium-distance scheduled flights and 2 hours, even 2.5 to 3 hours for long-distance scheduled flights but also for charter and low-cost flights.

However, this approach could not be applied to all airports as it was very time-consuming. Therefore, other airports' catchment areas had to be based on kilometric distances which were assigned to the access times accepted by passengers and freight forwarders in order to reach the airport. Knowing full well that the determination of catchment areas was only approximate, in particular when using kilometric distances, the following values had been attributed to the different access times: an air-line distance of up to 50 km corresponds to 30 to 60 minutes (maybe 1.5 hours) access time by road, of up to 100 km to 1 to 1.5 hours (maybe 2 hours), of up to 150 km to 1.5 to 2 hours (maybe 2.5 hours) and of up to 200 km to 2 to 2.5 hours (maybe 3 hours). As regards cargo transport, a distance of up to 250 km had been assigned to half a day road haulage and up to 500 km to one day road haulage.

The relevance of the different access times zones (whether indicated by travel times or kilometric distances) for an airport could be assessed thanks to a detailed analysis of its flight offer. Nevertheless, it is evident that zones which are closer to the airport tend to be of greater importance than zones which are more distant.

Finally, the catchment areas were characterised by using statistical information from the Urban Audit on the demography, economic activity and attractiveness for tourism of 365 European cities. It was completed by data on meetings for 2003, 2005 and 2007 provided by the Union of International Associations. The separate analysis of the different variables was not adapted for comparisons and for examining airport strategies as information was to rich. For this reason, data were aggregated. Finally, hierarchical clustering allowed to classify cities according to its population, its economic and touristic importance. The "average linkage within groups" method was applied in order to create clusters that are as homogenous as possible inside. In addition, the maps in general also indicate the location of 7269 Pan European settlements available from the GISCO reference data base, bibliographically referred to as "European settlements". They allow to assess the density of settlements and thus of population as Urban Audit statistics include only a limited number of cities.

Data were visualised by means of MapInfo®, software for mapping and geographic analysis. Vertical Mapper® for MapInfo® was used for representing access time zones and Arrow40.mbx for air routes.

A differentiation of airport strategies according to the airport's location and also to its positioning within the European airport panorama

As regards the European airport panorama, one can observe a differentiation of the strategies on which airports embark in particular with respect to the airport's activity. Thus, airports have developed different profiles. Since the liberalisation of air transport, distinct market segments have emerged in air transport, namely charter, low-cost and traditional full-service flights in passenger transport as well as general cargo and freight express services in goods transport. The increasing differentiation of air services is followed by a differentiation of airport strategies leading to airports which may concentrate on certain market segments or on the contrary establish themselves as generalist airports. In parallel to the concentration of certain traffic flows on big generalist hub airports, secondary poles emerge pursuing a functional and/or regional specialisation. In the first case, airports specialise in a traffic type (like charter or low-cost vs. full-service, network carriers; general cargo vs. express freight) and thus according to their function in the air transport network while in the second case the specialisation refers to providing air service to a certain region or geographical area. This differentiation results in a kind of airport taxonomy which however is closely related to the airport's location which refers to the spatial and territorial context into which the airport is embedded and to its relative position with respect to other airports and their specialisations. Moreover, the other elements which contribute to the constitution of airport strategies (such as the way of dealing with environmental or capacity problems and the promotion of air-rail intermodality) are considered to different degrees.

Using the term "strategy" may evoke discussions. In order to guard against misunderstandings, it shall be underlined that the emphasis is on observed strategy, that can be deliberate, and thus correspond to a plan, but that can also be emergent, hence reflecting a pattern (Mintzberg, 1987) which is some kind of "*consistency* in behavior, *whether or not* intended" (Mintzberg & Quinn, 1991, p. 13) or include both deliberate and emergent elements**.** This concept of strategy is relatively comprehensive. However, it does not require official declaration or insider information. This is an important point in respect of the feasibility of this work as the airport industry has become less disposed to inform about their activity (apart from well controlled official communication) since undergoing a large restructuring process with widespread tendency towards privatisation.[1]

[1] This impression is based on personal experience with different airport authorities that were contacted during the realisation of this work. Therefore, the author is grateful to *Aéroports de Paris*, Strategy Department, Risk Analysis and Monitoring Division and in particular to Vincent Dellis and Christophe Lebre for having welcomed her to a 4-month internship.

Airport strategies in a context with multiple influences: Table of contents

This thesis is divided into three parts: The first part giving the reader a basic familiarity with airports, whereas the second part focuses on the new potentialities for developing the airport activity and the third part deals with the spatial and territorial embeddedness of airports.

First part: The airport within the air transport system

The first part, which is composed of four chapters, presents the airport within the air transport system. Whereas the **first chapter** underlines the specificities of freight and passenger transport by air, which influence airport strategies, as well as the role of the airport within the air transport system and its relations with the other parties involved, the **second chapter** concentrates on the relation between airport and territory since airports constitute the ground infrastructure of the transport network and are localised, tangible assets: On the one hand, they influence functional spaces and territories; on the other hand, they are embedded into several institutional territories. The **third chapter** goes deeper into four major issues connected with the spatial and territorial embeddedness of airports: their capacity to attract air traffic which is affected by the location of the airport (external or so-called “natural” factors) in addition to the airport’s supply-side policy; attention will also be paid to intra- and intermodal competition which depends on different factors, including once again the airport’s location; then will be presented some publications on the geography of air transport and the strategic airport management. While the first two issues point out the relevance of the spatial and territorial context in addition to other factors, studies on the geography of air transport in general consider airports as simple infrastructure and the few publication on airport management neglect the spatial and territorial context into which airport are embedded. The first two chapters do not only give the reader a basic familiarity with the airport within the air transport system but also underline the emergence of the airport as a new strategic actor in an air transport system who is subject to the dynamics arising from the interactions between the different parties involved and the relevance of the spatial and territorial context into which the airport is embedded. Dealing with major issues to airports, the following literature review in the third chapter allows to set the two objectives of this work. The **fourth** chapter explains the method applied for analysing airport strategies and the spatial and territorial context into which airports are embedded.

Second part: New potentialities for developing the airport activity

The **second part**, consisting in two chapters, concentrates on the new potentialities for developing the airport activity. They arise from the liberalisation of air transport which modified profoundly the political framework (**fifth chapter**) allowing airlines to choose the intra-European routes they want to operate and thus the airports to be served. Then, the **sixth chapter** provides an overview of the airport industry. To begin with, the economic characteristics of airports are presented. As regards capacity, airport operations exhibit significant economies of scale as a result of high fixed costs. Moreover, airports, in particular runways and to a lesser extent also terminals, are characterised by “indivisibilities” as investment in airport capacity has to be done in large discrete steps leading to fixed-step costs.

One of the consequences is that the investment in airport infrastructure expansion has to be justified by a sufficiently important expected traffic growth. This implies a kind of threshold in the airport activity that has consequences on airport strategies. Another aspect of the airport industry is the growing importance of commercial activities which provide additional financial resources and thus contribute to expanding the airport's room for manoeuvre. Finally, the sixth chapter also considers the large restructuring process which airports have been undergoing over the last years leading to the internationalisation of airport companies and the arrival of new investors. This is an important point as new investors may contribute to changing mentalities, which could be advantageous e.g. for promoting air-rail intermodality. At the same time, privatisation may have negative effects due to a focus on short-term profit seeking that may be disadvantageous for airport users and other parties involved in the airport business. This conflict of interest becomes apparent e.g. when discussing the organisation of transfers (quick transfers vs. large shopping halls in order to incite passengers to spend money), the development of car parks and the increase in parking fees vs. the improvement of access by public transport although generating less profit but also when observing the number of strikes among sub-suppliers of airport services. However, privatisation is generally very partial with infrastructure remaining publicly financed and the private operator runs only the visible part of the system.

Third part: The spatial and territorial embeddedness of the airport

Finally, the **third part**, which is composed of three chapters, places emphasis on the spatial and territorial embeddedness of airports in a large sense. To start with, the **seventh chapter** reminds the characteristics of the European territory as regards its demography, the distribution of economic activities and the attractiveness of certain destinations for tourism. It provides the basis for a detailed analysis of the spatial and territorial context into which the different airport types are embedded. The results of this analysis will be presented in the **eighth chapter** which also draws an airport taxonomy by determining differing airport profiles or airport strategies, the latter being associated to the airports' locations. From this analysis emerges a picture of the landscape of European airports revealing a structure which is not due to accident but is largely conditioned by a given territorial context, including the airport's position with respect to other airports and their respective profiles. The **ninth chapter** gives an insight into the criteria for the choice of an airport by an airline, restrictions to the airport activity arising from a growing public interest in airports as well as the management of scarce capacity. These elements are integral parts of airport strategies. Airports that want to attract a certain type of airline have to take into consideration its behaviour. Besides, their way of handling environmental problems or scarce capacity may be determining for safeguarding future development.

PART 1

THE AIRPORT WITHIN THE AIR TRANSPORT SYSTEM

Introduction

Consisting in four chapters, the first part is intended to give the reader a basic familiarity with the airport within the air transport system (chapters 1 and 2) but also presents a literature review and the objectives of this work resulting from (chapter 3) as well as the method applied (chapter 4).

The first chapter underlines the specificities of passenger and freight transport by air and describes the evolution of the airport business since 1960s when air transport started growing. It also presents a brief overview of the airport's relations with the other parties involved in air transport. Despite the abundance of publications on air transport, only few give a general review of the air transport system, its evolution and the different players while placing emphasis on the airport; most research works on airports address only specific problems, such as the allocation of airport slots or the calculation of the optimal amount of airport charges. The first chapter is designed for filling this gap.

By definition, there is a strong relation between transportation and territory: Transportation includes all movements of people and goods on a given territory. It also consumes time. Hence, transportation implies both a spatial and temporal aspect. If transport was instantaneous, free, had an unlimited capacity and was always available, it would render space obsolete but this is not the case (Merlin, 1992). It is just "the purpose of transportation ... to overcome space, which is shaped by a variety of human and physical constraints such as distance, administrative divisions and topography" (Rodrigue, Comtois, & Slack, 2006, p. 1). In other words, the objective of transportation is "to transform the geographical attributes of freight, people or information, from an origin to a destination, conferring them an added value in the process" (Rodrigue, Comtois, & Slack, 2006, pp. 1-2). At the same time, transportation contributes to the territorial development by improving its accessibility and by affecting territorial dynamics. For this reason, the second chapter concentrates on the relation between airport and territory. Since the territory is not heterogeneous, the relation between airport and territory is not the same in the different places. The airport's room for manoeuvre is affected by the territory into which it is embedded. Therefore, the European airport panorama shows a nuanced scenery with airports embarking on different strategies: Strategies are mapped out on the territory and are revealed by studying the latter.

The relevance of the spatial and territorial context, into which airports are embedded, for airport strategies is also reflected in the third chapter which gives a short literature review on four issues to airports: It concentrates on the airport's capacity to attract air traffic as well as on intra- and intermodal competition but deals also with literature on air transport geography and on strategic airport management. This allows to draw conclusions with respect to lacks in existing research from which emerge the two objectives of this work.

Finally, the fourth chapter focuses on the method applied for analysing airport strategies and the territorial context into which airports are embedded. Therefore, it introduces the concept of catchment area but also presents the statistical data that were used, its limits and how they were analysed.

1. The air transport system

For a long time, the role of airports within the air transport system was minimised as they were considered to be simple infrastructures, certainly indispensable for the supply of a service of public utility, but to be interacting with other parties involved in air transport only to a very limited extent.

In view of the continuous growth of the air transport, airports have become important poles of economic activity that accumulate different functions, supply several services and coordinate various economic and public activities. Being complex urban elements, they are an integral part of the regional economy. Airports play a major role in a market which is defined by Carré (2000a, p. 14) as that of serving an area by air transport. They supply the need for being connected to the outside world by quick and modern means of transportation and the need for grouping together the professionals of this mode of transport at one site.

But airports do not only put infrastructure and superstructure at the airlines' disposal, they also invest in the promotion of their location and the development of air links as well as they communicate with pressure groups, the media, trade unions, elected representatives, passengers, and the whole public. Resorting to marketing and looking for more financial autonomy, they define and implement their own strategies of development. It is just the liberalisation of air transport which brought airports to play a larger part – or gave them the possibility to do so. To start with, chapter 1.1 points out the specificities of the passenger and freight transport by air; they also influence airport strategies. Then, chapter 1.2 presents the airport business which has evolved strongly since the 1960s. Finally, chapter 1.3 concentrates on the different parties involved in air transport and their relation with the airport.

1.1. The specificities of passenger and freight transport by air

Freight transport has different requirements with respect to its handling at the airport than passenger transport. By the way, this may represent a possibility to attract freight traffic for airports that may meet these requirements. As regards the means of transportation, a substantial difference between passenger and freight traffic results from the type of capacity used. At the same time, a specific characteristic of air transportation consists in the strong link between passenger and freight traffic which is not the case for other modes of transport.

1.1.1. Strong link between passenger and freight traffic by air but also a substantial difference in the type of capacity used for the transport

Passenger traffic differs from freight traffic in the type of capacity used for transportation: Freight transport is much more heterogeneous as goods may be carried aboard freighter aircraft as well as in the baggage hold[2] of passenger aircraft. The latter represents about 50 % of worldwide air freight traffic! In contrast to other modes of transport[3], aircraft is systematically used for carrying simultaneously people and goods which results in a strong link between both passenger and freight transport.

Transport of goods by passenger aircraft…

Even though passengers always take priority over freight, carrying goods by passenger aircraft has the advantage of allowing air carriers and shippers to benefit from the high frequencies and the large number of destinations of passenger flights.

…or freighter aircraft?

In contrast, freighter aircraft provides a high capacity which is not in competition with passengers. Thus, freight benefits from priority handling, in particular at airports specialised in cargo flights. Moreover, cargo flights may be adapted to the customers' needs as regards departure time, frequency, markets, and routes. Another advantage is that cargo aircraft, in particular original freighters (e.g. Boeing 747-400F), are easier to load which allows to transport heavy and voluminous goods, too. Finally, certain goods that may not be carried on passenger aircraft for security reasons may be loaded onto cargo aircraft (such as chemical products, larger quantities of perfume). However, the operation costs of freighter aircraft are almost as high as for passenger aircraft whereas revenues are forced down by airlines offering only the baggage hold capacity and keeping prices down close to marginal cost level[4] (Allaz, 2006). Since aircraft has to be charged to full capacity, freighter flights are operated only to selected destinations generating a sufficient volume of cargo. Nevertheless, frequency of cargo flights is in general below the frequency of passenger flights. Therefore, resorting to the cargo hold of passenger aircraft is necessary for the carrier in order to propose a flight offer which is attractive as regards cost and frequency thus allowing to reduce delivery times.

1.1.2. Diversity of carriers according to their commitment to freight transport

According to their commitment to freight traffic, different types of airlines may be distinguished: belly carriers, mixed airlines, cargo airlines and integrators. Finally, contract carriers operate aircraft on contract basis for other airlines.

[2] The baggage hold of passenger aircraft has a residual capacity varying from about ten or a hundred kilogramme on regional aircraft to one to three tons on medium-range aircraft and 15 to 20 tons on long-haul aircraft (e.g. Boeing 747, Boeing 777, Airbus 340). While the majority of medium-range aircraft is loaded with bulk cargo, long-haul aircraft is adapted to the transport of palettes and/or containers (Allaz, 2006).

[3] There are some minor examples where passengers and freight are carried by the same means of transportation, such as letters carried by a post wagon which is coupled to a high-speed train by the French post office *La Poste* or tests in order to use taxis for delivering small parcels (e.g. by Amazon).

[4] This may also explain why the cargo fleet is composed of a large number of passenger aircraft that were converted into cargo aircraft after having been written off.

Belly carriers

So-called "belly carriers"[5], such as American Airlines, Canada Air, Finnair, but also a number of small and medium-sized airlines, focus on passenger transport and therefore consider air cargo services as a "by-product" (Grandjot, Roessler, & Roland, 2007, p. 138). For this reason, they do not operate freighters and carry goods only in the cargo hold of passenger aircraft. However, due to the capacity available, they realise about 14 % of worldwide freight traffic, measured in tons, in 2000 (Allaz, 2003). Since cargo transport is only an additional business contributing to profit, these airlines tend to keep prices down close to marginal cost levels.

Mixed airlines

Being engaged in both passenger and freight business, mixed airlines or combination airlines (like Air France-KLM, British Airways, Cathay Pacific, Iberia, Korean Air, Lufthansa, Royal Jordanian, Singapore Airlines) regard air cargo services as a "joint-product" (Grandjot, Roessler, & Roland, 2007, p. 138). Benefitting from the advantages of passenger and freighter aircraft (including convertible, quick-change and combi aircraft), they offer their customers the whole range of freight services granting them a market share of 58 % of worldwide freight traffic, measured in tons, in 2000 (Allaz, 2003). Many combination airlines have established their cargo activities under brand names, some of them have transferred cargo activities in independent companies, the latter having agreements with their respective parent companies to exclusively market the cargo hold capacity of the passenger aircraft fleet (DVB, 2001b).

Cargo airlines

Traditional cargo airlines handle only freight, whether operating charter or scheduled services (e.g. Air Hong Kong, Beta Cargo, Cargolux, MK Airlines). Not carrying passengers, they dispose of an aircraft fleet specialised in freight traffic consisting in cargo aircraft only. Scheduled carriers represent about 10 % of worldwide freight traffic, in tons in 2000, non-scheduled[6] ones only 2 % (Allaz, 2003).

Integrators

The so called integrators (or integrated carriers), which are mainly UPS, Federal Express, DHL and TNT, are specialised in international express freight. Their market share in

[5] "Belly carriers" operate only passenger aircraft. Therefore they carry aircraft exclusively in the cargo hold, i.e. the "belly". However, among these airlines are those that benefit from an exhaustive network which is an advantage for cargo shipments, in particular for their transfer at home base airports (e.g. American Airlines, Delta Airlines, Air Canada, Finnair), whereas other "belly carriers" devote even less attention to air cargo and usually limit their activity to point-to-point cargo transportation (e.g. Adria Airways, Cyprus Airways, Luxair, Malev, Olymic, TAP). For this reason, DVB (2001b, p. 11) distinguishes two types of airlines within this group: cargo-focused passenger airlines and non-cargo focused passenger airlines.

[6] Non-scheduled all freight carriers concentrate on two market segments: large-scale humanitarian traffic (e.g. airlift) and transport of non-standard size goods that cannot be carried by conventional freighter (Allaz, 2006).

worldwide air freight traffic amounts to 16 %, measured in tons, in 2000 (Allaz, 2003). Integration refers to three levels allowing them to offer fast, specific and customer-oriented solutions (such as next-day deliveries): the organisation of door-to-door transport, the information system and the distribution channel with direct selling to the final customer.

In order to reduce interfaces and to minimise delivery times, the integrators operate their own transport systems according to the hub and spoke model, by using own but also contracted aircraft and trucks. Thus, they have more possibilities of checking every single step within the transport chain and more influence on it. For this reason, they dispose not only of their own cargo aircraft fleet but also of their own fleet of trucks.[7] However, the aircraft fleet operates mainly at night and has a quite low average degree of utilisation per day. The share of air transport in the transport chain corresponds to only 30 %, the road transport being essential to door-to-door transport (Allaz, 2006). For facilitating their handling, the integrators have confined themselves to transporting only consignments with restricted measurements and weights, including envelopes containing documents, medical supplies, merchandise samples and spare parts for machinery (O'Connor W. E., 1995, p. 157).

Contract carriers

Finally, contract carriers (e.g. Atlas Air) rent aircraft, in particular cargo aircraft, on an ACMI (aircraft, crew, maintenance and insurance) contract[8] basis to other airlines. Thus, it is possible for a company to dispose of its own cargo network without possessing or operating any own aircraft. However, in most cases, the airlines continue to operate their own fleet but use chartered aircraft in the context of annual contracts in order to limit investment and to increase their operation flexibility, e.g. when demand is fluctuating. This concerns also airlines requiring extra capacity at short notice or even in the long term for the development of new routes, waiting for the delivery of aircraft or lacking in air crew. ACMI contracts may also be of advantage to new start up airlines that may already operate while local staff undergo training and gain sufficient experience (Grandjot, Roessler, & Roland, 2007, p. 173).

Only little statistical information is known about the contract carriers' activity as the latter is included in that of their customers. Grandjot, Roessler and Roland (2007, p. 173) estimate at 9 % the proportion of global air cargo traffic operated by contract carriers.

[7] E.g. UPS and Federal Express dispose each one of its own huge fleets: respectively 238 and 664 aircraft as well as 95 000 and more than 80 000 motorised vehicles in 2009/2010. (See www.pressroom.ups.com/Fact+Sheets/UPS+Fact+Sheet and http://about.fedex.designcdt.com/our_company/company_information/fedex_corporation, accessed on 30 June 2010).

[8] An ACMI contract is a type of lease that is related to hiring an aircraft with its complete crew and covers all maintenance and hull insurance of aircraft. It is even possible for the lessee to brand his/her logo on the aircraft fuselage. Payment is generally based on fixed charges by hour, but with a minimum number of hours per month guaranteed (Grandjot, Roessler, & Roland, 2007, p. 173).

1.1.3. Diversity of the transport offer

Despite the strong link between passenger and freight traffic, there are some differences in the transport offer emerging from differences in production principles.

Unit load vs. consolidated freight and general cargo vs. express freight vs. postal service

The air freight transport offer is quite divers although traffic on own account is rather unusual[9] and most freight is carried by scheduled transport. Only about 10 % of total freight is considered as charter traffic, of which 75 % are operated by scheduled carriers (Allaz, 2006).

As regards the shipment of goods of little or medium significance (valuable goods, live animals, diplomatic bags or human remains excluded), the client may choose for a number of destinations between unit load and consolidated shipment. Whereas in the first case a bill of lading is issued for each consignment and the shipping charges are based on this individual consignment, in the second case a number of consignments are grouped together in order to be presented to the airline and forwarded as one shipment. To a number of destinations (such as to Asia, North America and Africa), traffic is mainly composed of consolidated air freight. Consolidation involves trade-offs: the higher the number of grouped consignments, the lower the frequency of shipment, and the longer delivery times.

Besides, express freight has to be distinguished from general cargo and postal service. The latter refers to the transport of letters without market value and provided by post offices. As regards general cargo, delivery times are still short but longer than for express freight. In return, transportation costs are lower than for express freight and goods are not subject to restrictions of weight and size. Express freight is characterised by a fast door-to-door transport, a commitment to a delivery date with money back guarantee if delay in delivery, and tracking & tracing allowing to determine past and current locations of a shipment as well as the issuing of a proof of delivery. A limited number of companies operate express freight: some medium-sized firms proposing courier services, the two American integrators UPS and Federal Express, the big post offices which either acquired express services (such as the integrators DHL and TNT that were acquired respectively by the German and the Dutch post office) or concluded strategic agreements (such as the French and US Post Office with Federal Express) and finally some traditional airlines (like Air France or Lufthansa) which launched real express freight products and are offering even overnight solutions for small packages.

In order to withstand competitors, integrators further optimised their transport chain by shortening the already restricted maximum size for a shipment (Grandjot, Roessler, & Roland, 2007, p. 142) rendering the volume of cargo still more homogeneous. They also expanded door-to-door deliveries. More recently, and in particular under the pressure of the economic crises, they rather tended to diversify their activity by offering also lower priced services

[9] An example for air transport for own account is Airbus Industries carrying engine pieces itself. For a general distinction between transport on own account and transport for third account, see e.g. Savy (2007, pp. 50-51).

where delivery times are still faster than for general cargo but longer in comparison with their core product. Moreover, even though the weight of most consignments is below 30 kg, there is a tendency towards heavier shipments (up to 60 kg).[10] The integrators now propose a whole range of logistic products and do not longer hesitate to transport general cargo if capacity[11] is available whereas traditional carriers started operating express services; the frontier between general cargo and express freight has become blurred.

Passenger traffic: different market segments according to charter, low-cost and "traditional" full service airlines

While air transport for own account is as unusual for passengers as for freight, charter traffic plays an important role. *Charter airlines* existed already before the liberalisation of air transport. They could develop non scheduled flights thanks to a kind of lack in the regulation which focused on scheduled air services.[12] For this reason, they operate according to their own business model: Instead of selling seats directly to the passengers, charter airlines contract with tour operators who resell seats, mostly in a flight and hotel package (with maybe other services included) and thus assume a large part of the risk of having unsold seats. This contributes to reducing ticket prices. Charter airlines operate mainly air services to popular holiday destinations around the Mediterranean Sea as well as in the Caribbean and some Asian countries. When the air transport was liberalised, they represented about 60 % of the intra-European air transport market (Perry, 1994, p. 254).

Low-cost airlines (also called *no-frills airlines* or *low-fare airlines*) have entered the European market only since the liberalisation of air transport. In contrast to charter airlines, they operate scheduled air services. As both charter and low-cost airlines seek for reducing costs in order to offer low fares, their business models have some points in common: Like charter airlines, low-cost carriers operate primarily point-to-point traffic and choose routes that are characterised by high volumes of traffic, reduce space between seats and offer a unique class. At the same time, substantial differences exist since low-cost airlines sell directly to the customer and operate scheduled air services.

Since the liberalisation of air transport within the EU, the distinction between scheduled and non-scheduled transport has become less important. From a commercial point of view, charter and low-cost carriers have got much closer over the last years. Whereas charter carriers started selling also individual places to passengers, some low-cost carriers cooperate[13] with tour operators…

The *"traditional" full service airlines*, also called *network carriers*, have largely adopted the hub and spoke model for the reorganisation of their networks since the liberalisation of air

[10] Information from a visit of the Federal Express hub at Paris CDG airport on 11 February 2010.

[11] If capacity is not available or a destination is not served by the integrator, the latter may hand over these shipments to other airlines (e.g. Federal Express cooperating with Air France, Lufthansa and British Airways).

[12] Actually, charter airlines were also regulated but in a more liberal fashion than scheduled airlines. See Lobbenberg (1995) for more details on the regulation of charter airlines.

[13] This results e.g. from a study published by Monitor Group (2004).

transport. This allows them to provide a maximum number of connections for their passengers while preserving a high degree of productivity. Among these carriers figure the former flag carriers of the European countries (including the French Air France, the German Lufthansa, the Italian Alitalia, and the Spanish Iberia). Closely connected to the “traditional” full service airlines are regional carriers which partly operated already before the liberalisation of air transport. They often focus on business passengers. Moreover, today, a number of them cooperate with network carriers for providing feeder services.

1.2. Evolution of the airport business showing the latter’s intention of being recognised as a full partner within the air transport system

The airport is the ground infrastructure of the air transport network. Until the end of the 1950s the airport was considered rather as a geographical place which allowed aircraft to land and to take off. From the 1960s on and favoured by the growth of air transport, airport operators started exercising their business which has evolved since then in order to meet the requirements of modern air transport.

1.2.1. Seven main axes of the airport business: from the conception of the airport infrastructure to the consideration of environmental concerns

Carré (2000a, p. 15ff) identified seven main axes according to which the airport operator’s business may be defined and which have developed progressively following a more or less chronological perspective:

The conception and creation of the airport facility

In the beginning of air transport, the airport business referred to the conception and construction of the airport infrastructure thus making it available to the air transport industry. Even today, the extension of runways and terminals as well as their maintenance are in the heart of the airport business. This requires the knowledge of environmental planning, of the elaboration of land use plans, of the development of the territory, etc.

Passenger handling, services and commercial activities

The growth of air transport forced airports to develop techniques allowing them to handle the increasing number of passengers and aircraft. For this reason, in a second step, the airport business focused on the smooth operation of the airport facility from a purely technical point of view. This includes e.g. the management of stopover times of aircraft and the organisation of passenger handling on arrival, on departure and during stopover as well as of the different services and commercial activities, all being subject of research & development strategies.

Introduction of a modern management system, need for financial stability

While airports developed in the past under public ownership for strategic reasons mainly, today the private sector plays an increasing role in the management of the large European airports. The arrival of private shareholders has contributed to the evolution of the airport business with the development of extra-aeronautical activities, the emphasis on a marketing approach to air transport markets and the airport operator adopting a new attitude towards financial expectations. Airport managers take into account the need for profitability they have to provide for their shareholders. Realising profits allows the airport not only to meet its shareholders' expectations but also to deal with future developments, in particular in times of withdrawal of State financing. As the airport operators became aware of the need to break even financially and to manage airports like economic entities, the airport business was extended by introducing a modern management system.

Information, computerisation and organisation: communication with its environment

The fourth axis is related to the airport's communication: Airports recognised the need for transferring required information to the other parties involved in air transport, which allows also the airport to exercise its business. Two types of information may be distinguished: internal information for users and passengers as well as external information for economic partners (flight schedules, activity reports, and statistics or information letters). This was rendered possible by a more efficient data processing due to computerisation and organisational measures.

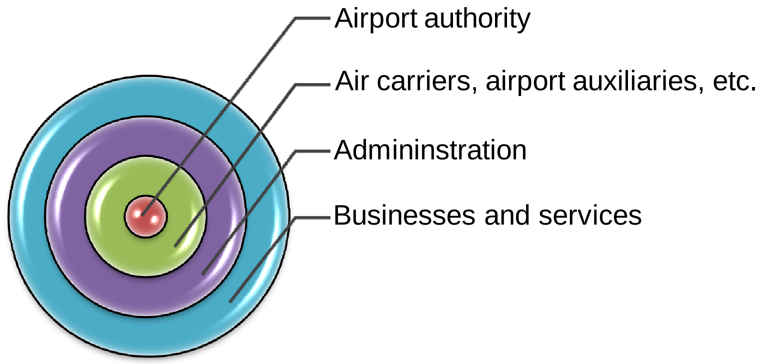
The airport promoting air transport within the catchment area, the catchment area to air transport and itself to air carriers and to economic and political partners

Since the 1980s, a fifth axis has emerged as airports invest in promotion at three levels: the promotion of air transport within the airport's catchment area, the promotion of the airport's catchment area to air transport and finally the promotion of the airport itself to air carriers as well as to economic and political partners of the airport region (e.g. by participating directly in negotiations for the improvement of the access to the airport).

Coordination between the different parties concerned: air carriers, auxiliaries, administration, businesses/services

The sixth step underlines the role that the airport plays as coordinator in the centre of different economic and public activities which contribute to the functioning of the airport as a whole. The following figure 1 illustrates this coordination function by means of circles.

Figure 1: The airport authority in the centre of different activities contributing to the functioning of the airport



Source: Carré (2000a, p. 18)

The airport authority being situated in the centre of decisions and arbitration has to solve arising conflicts of interests for the benefit of passengers and shippers. Next to the centre are situated air carriers and their auxiliaries, such as airport assistants (ground handling agents) and freight forwarders/forwarding agents who provide services connected to the mere transport of freight or passengers by air. Then comes the public administration, including customs service, health service, weather service, airport police, and frontier police. Finally, certain businesses and services are not essential but render the airport more comfortable and thus represent a competitive advantage.

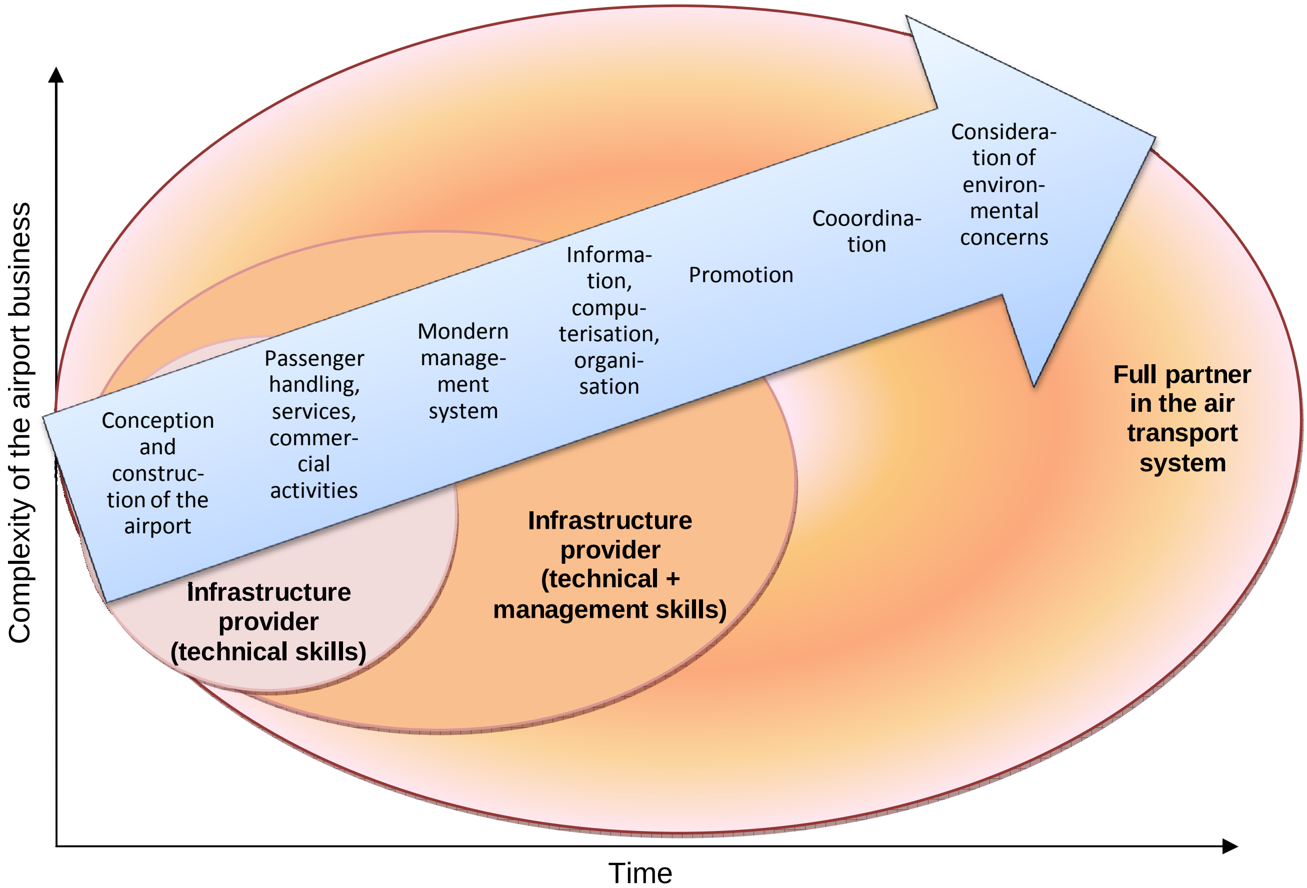
Relation with the environment: consideration of environmental concerns

The seventh and most recent step refers to the consideration of environmental concerns as part of the airport business which is not longer restricted to purely technical and economic matters connected to the functioning of the airport facility. Water and air quality, noise nuisance and various pollutions have to be taken into account when making decisions on the development of the airport activity, therefore necessitating consultation of and dialogue with residents and their respective associations as well as with elected representatives.

1.2.2. *The different facets of the airport business showing the latter's intention of being recognised as a full partner within the air transport system*

The role, the importance and the autonomy of airports have been minimised for a long time: Airports were not considered as real partners within the air transport system but just perceived as simple providers of an infrastructure which is indispensable for the supply of a public service. Contrary to this, the progressive development of the airport business reveals to which extent airport operators strived to play a part in air transport and to get involved with the good functioning of their site. Since the beginning of commercial air transport, airport operators have integrated new activities and considerations and accepted new responsibilities contributing to an increase in the complexity of the airport business as illustrated by figure 2.

Figure 2: The development of the airport business



Source: own figure, the seven main axes of the airport business according to Carré (2000a, p. 15ff).

By expanding their business, airport operators veered away from the simple infrastructure provider being characterised by technical skills in order to include also management skills and finally showed their intention of being recognised as a full partner in the air transport system. This evolution has been reinforced by new potentialities for the development of the airport activity (second part).

1.3. The airport vis-à-vis the other parties involved

The air transport system includes different parties with which the airport is in relationship, each one pursuing his/her own strategy in order to achieve own objectives. Among them figure air carriers, rival airports and the operators of other transport modes, the latter acting as complement or as substitute for which reason their relationship is sometimes difficult; freight forwarders, travel agents and tour operators who are intermediaries between air carriers and the final customer; airport service providers who are partners of the airport; airport staff; the air navigation system; final customers; the general public (others than final customers), residents/neighbouring communities and their associations; public authorities/regulation authority as well as owners/shareholders. They will be briefly presented as well as their relationship with the airport.

Figure 3: The airport in the centre of the air transport system

Source: according to Weimar and Jansen (2001, p. 52)

1.3.1. Air carriers: a new light on the relationship between airports and airlines

The liberalisation of air transport aimed at airlines but has through their behaviour profoundly modified the context within which airports exercise their business and put a new light on the relationship between airports and airports. Airports grant airlines, whether they operate passenger or freight traffic or both, access to the infrastructure on the ground. In return, the airline pays the airport.[14] Due to this relationship, airports were used to consider airlines as their "true" customers. By the way, the relationship between airports and airlines is characterised by a certain complementarity since passengers and shippers are customers of both airlines and airports.

Prior to the liberalisation, this relationship was very informal. The airport published its tariffs together with the conditions of use. By paying this tariff, the airline accepted the conditions of use. Certainly, the airport assumed the long-term traffic risk but this was not a problem since air services, including routes and frequencies, were strictly regulated. Airlines could not withdraw from a market or launch new services without official approval and as licensing

[14] As regards airport charges, fees paid to the State for air traffic control (on the way or for approaching the airport) have to be distinguished from charges paid to the airport for technical aid during the stopover, loading and unloading of the aircraft as well as for aircraft services (e.g. fuelling, cleaning, technical aid, catering) and from airport charges (such as charges and fees paid for landing, parking, hangar, passenger services) (ICAO, 2001; ACI Europe, 2003).

procedures were long and complicated, the environment was stable and little competitive. In a liberalised air transport market, airlines may choose routes and switch airports, thus creating an incentive for airports to establish with its downstream airline customers formal, specific, negotiated long-term contracts in order to achieve a better balance of risks.[15] These contracts may not only specify the charges to be paid by the airline but also the quality of service to be provided by the airport (e.g. turn-around times), including the amount of marketing-support the airline may receive as well as a commitment by the airport to future investment. In return, the airline may commit to basing a certain number of aircraft at the airport, to roll out, per schedule, a route network, and sometimes to guarantee a minimum level of traffic (Starkie, 2008). Starkie (2008) concludes from his research on UK airports that negotiated contracts in general allow airlines to pay charges, which are in average below published tariffs. Moreover, traffic risks may be shared e.g. by applying only per passenger charges.

In this new context, the bargaining power of certain airlines increased, especially that of low-cost airlines which have no specific interest in a particular geographic market. With respect to low-cost carriers but also to charter airlines, the airport's market power is often much smaller but it depends e.g. on the accessibility of alternative airports. Unlike network carriers, these airlines do not take into account network externalities. Because of a smaller price margin, they pay much attention to airport costs. Considering the characteristics of their passengers, these carriers may easier transfer their activity towards another airport without taking a high risk of losing customers. For this reason, the airport's market power is rather small; it started competing through prices for low-cost services. Despite the competitive pressure, this traffic may be very attractive to a number of secondary airports with spare capacity. Moreover, the market share of low-cost carriers is supposed to continue to increase over the next years (reaching 25 % in 2010).[16]

Network carriers operate according to the hub and spoke model. In this case, the hub airport's market power results from economies of agglomeration and network externalities which oblige the airline to commit to the airport. Consequently, it is much more difficult for other airports to attract these carriers. If the airport is dominated by one carrier and he can threaten credibly to transfer his traffics or even only a part to other airports, the airport's power could diminish. This risk depends not only on the availability of another airport but also on the airline's specific investments in the hub, which would be lost when leaving the airport (i.e. sunk costs).[17]

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[15] Starkie (2008, p. 8) reminded of the importance of long-term contracts between airports and airlines at airports in other parts of the world and in particular at Australian and US airports. The major difference arises from the subject matter of the contract: In contrast to Europe where contracts between airlines and airports are mostly related to airport charges, they usually refer to long-term leases on terminals at Australian airports as well as to gate leases and may contain "majority-in-interest" clauses granting airlines some control over capital expenditure at US airports.

[16] According to different studies, such as Mercer Management Consulting (Deraëd, 2002) and Horstmann (2003, p. 33).

[17] See also a report published by the Federal Aviation Authority (FAA, 1999) due to air carrier complaints in order to analyse the impact of certain business practices, the management procedures applied by the airport and of passenger charges on competition in the US air transport market.

1.3.2. Rival airports: air carriers choosing routes and switching airports leading to competition not only between spatially adjacent airports

In a liberalised market, air carriers may choose their routes and the airports they want to serve. This means that an airport may enter in competition with rival airports for attracting new air services but also for keeping the existing transit and origin/destination traffic. However, the effects from the air carriers' behaviour on the airport industry were not anticipated at the time of the liberalisation of air transport (Starkie, 2008).

If it is quite obvious that airports, that are located within the same metropolitan area, may compete for air services and passengers, it is less evident that competition does not only concern spatially adjacent airports but refers also to a relatively wide geographic market. This development is driven in particular by low-cost carriers willing to open new bases throughout Europe (Starkie, 2008). It is notably their influence on competition between airports that was not anticipated.

As regards the competition for transit traffic, it refers primarily the major hub airports (such as Amsterdam, London Heathrow, Paris CDG and Frankfurt airports). However, as the hub and spoke model has been adopted by a larger number of airlines, transit traffic has become an important issue for a certain number of airports which compete for developing this type of traffic in the context of a secondary hub.

Freight traffic is also concerned by competition, especially as in Europe large volumes of cargo are carried over long distances by road, often by the airlines themselves, before being loaded onto aircraft.[18] Due to its relatively high cost in comparison to road transport, air transport is used only if necessary in order to meet a delivery date. Otherwise, freight is mainly carried by road, even between airports[19]. Therefore, airlines use special trucks which carry freight under a flight number, also called air freight trucking or road feeder service[20]. As ground transport is used over long distances for bringing freight to an airport, the catchment areas of airports handling big volumes of cargo are particularly large and air cargo is concentrated on a rather limited number of airports. Competition is already tight. This shows e.g. the increasing number of special offers launched by the major airports together with consolidators and freight forwarders.

At the same time, airports may also be complementary, in particular within an airport system where each one performs a specific task. One can imagine that a generalist airport cooperates

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[18] The rivalry between Air France and Lufthansa Cargo illustrates well the increased competition in Europe: Whereas Lufthansa Cargo offers trucking connections to Frankfurt airport for onward transportation of air cargo that originates in France; Air France trucks air cargo shipments that originate in Germany to Paris CDG airport. Competition has even been intensified by the inauguration of a trucking terminal at Hahn airport by Air France which allows the airline to collect and consolidate shipments before trucking them to Paris for onward carriage (DVB, 2001b, p. 34).

[19] This may be illustrated by the example of Vienna airport where about one third of the 173 000 t of cargo handled in 2003 were carried by road between airports (according to a press release of Vienna airport of 15 January 2004).

[20] "*Vol camionné*" in French, "*Luftfrachtersatzverkehr*" in German. See Becker (1999) for history, characteristics and implications of air freight trucking as well as Button and Stough (2000, pp. 293-295).

with an airport that specialises in freight or low-cost traffic (as it is aimed for e.g. between Manchester airport and East Midlands airport) in order to set free capacity at the generalist airport. Moreover, local traffic restrictions may provide an incentive for cooperation. The success of this approach depends largely on specific circumstances. In particular, one has to keep in mind that more than the half of worldwide air freight (in tons) is shipped aboard conventional passenger aircraft.

Following the example of airlines, a trend towards concentration in the airport industry may be observed. However, the emergence of multiple airport companies, that are characterised by common ownership or at least a strategic minority holding, and of alliances in the airport industry is driven mainly by know-how transfer in ground handling, retailing and foreign investment, by the coordination in investment and operational issues and also by the wish to gain market power but not by network economies or in order to overcome market imperfection in vertical relationships (Forsyth, Niemeier, & Wolf, 2009). While the effects on competition are potentially negative, cost savings from horizontal integration are rather limited. For this reason, Forsyth, Niemeier and Wolf (2009, p. 25) consider that "most airport alliances are failures". An exception may be Aéroports de Paris and the Schiphol Group whose cooperation is in line with the dual-hub strategy of Air France-KLM[21].

1.3.3. Operators of other transport modes: competition vs. complementarity

Airports are the nodes of the physical air transport network to which they grant access. For this reason, the close relationship with air carriers, which operate aircraft allowing to link airports, is evident. Beyond, the cooperation with the operators of other transport modes is just as important since passengers and freight have to arrive at the airport in order to board an aircraft. This cooperation may take several forms and degrees and associate different partners, including the operators of other transport modes and public authorities but sometimes airlines too. It is also possible that an airport decides to operate itself e.g. a train service to the airport. This is the case BAA operating Heathrow Express, the railway line linking the City of London and Heathrow airport.

The airport's integration into the road and rail network and sometimes even its access to the river system and maritime shipping are considered to be a competitive advantage. This conception of the airport is quite different from the "traditional" vision of the "monomodal" airport according to which its activity is limited to that of a node in the air transport network and to serving the airlines (Jarach, 2001). This new approach underlines an easier and better interconnection between different means of transport for passengers and freight considering the airport as node of a multimodal network. Over the last years, airports have recognised the value of good accessibility thus attaching much importance to the subject.

This ambiguity may be one reason explaining why the implementation of this concept and in particular the introduction of high-speed services to airports, despite some good examples, proves to be difficult and requires overcoming a number of obstacles. In this respect, the

[21] See chapter 6.3.2. on the internalisation of airport operators.

heterogeneity of the partners involved in this type of project and its technical and business dimension, that both have to be addressed in order to offer commercially viable services, may pose a problem, e.g. for introducing an integrated air-rail ticket allowing the traveller to obtain a single ticket for the train journey to the airport and the flight, implying an integration at information level as regards schedules and prices but also at reservation level, i.e. access to the reservation system for checking available places and issuance of the ticket (Commission of the European Communities, 2008a).

1.3.4. Intermediaries in air transport: 90 % of air cargo handled by freight forwarders whereas in tourist travel direct selling gained in importance

Intermediaries in passenger and freight transport fulfil the same function, namely bringing together customers (shippers or passengers) and transport service providers (mainly air carriers but also providers of associated services). Nevertheless, they do not have the same impact which is due mainly to basic differences in the way a trip or shipment is organised in passenger and freight transport. Therefore, both professions will be presented, starting with intermediaries in air freight where classification is relatively difficult, in particular due to a quite diversified activity and differences in the regulatory framework. Then, the focus will be on intermediaries in passenger transport. Whereas their classification does not pose a problem, travel agents and tour operators have a far-reaching impact on the tourism decision process raising the question of their influence on individual trip decisions as well as on the level of demand for tourism operations, attractions and destinations.

Air freight: difficulties over clear classification of intermediaries

Most air freight is passing through traditional air cargo logistic chains (as represented in figure 4) in which intermediaries play an essential role as they bring together shippers and air carriers. Surface and air transport operations are clearly distinguished: Airlines are in charge of the airport-to-airport transport relying on forwarding agents for offering door-to-door transport. Air transport operations are backed up by the network of IATA[22] approved cargo agents. The traditional air cargo logistics chain is characterised by a close cooperation between freight forwarders, airlines and their respective cargo agents mainly within the IATA agency system. As airlines restrict their operations to the main haul by air, forwarding agents not only organise pre- and onward-carriage. In particular, they keep in touch with the shippers and despatch cargo shipments to IATA cargo agents. Moreover, a freight forwarder may act as air freight agent, whether or not appointed by IATA, and approach directly the airline.

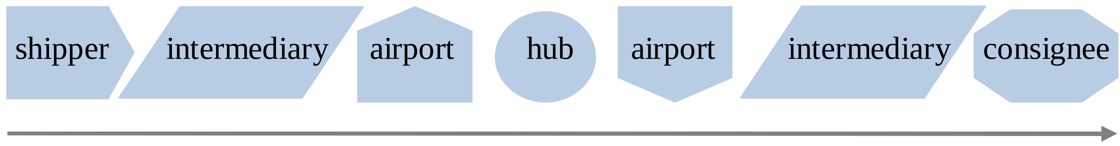
Altogether, about 90 % of all air freight shipments are coordinated by air freight forwarders (Allaz, 2006; Grandjot, Roessler, & Roland, 2007, p. 139)[23]. Only rarely airlines deal directly

[22] IATA represents about 230 member airlines from 120 countries. (See http://www.iata.org/membership/airlines.html, accessed on 21 January 2010).

[23] An older reference (Bauchet, 1998) estimates at 70 to 80 % the share of freight that intermediaries hand over to airlines.

with the shipper, except for the integrators who are the single operator of an integrated air cargo logistics chain and therefore have direct customer contact.

Figure 4: Traditional air cargo logistics chain



Source: according to Grandjot, Roessler and Roland (2007, p. 125).

Intermediaries cope with different tasks, such as providing services for surface collection and delivery, clearing the goods for import and exportation and offering their technical knowledge to the customer as supply and demand are brought together by performing and arranging additional services. The shipper has of course already decided on the final destination but much rarely on the carrier or the airport where the goods shall transit through when he turns to a freight forwarder. In particular if the latter acts as principal, he may contract with various carriers and select the precise itinerary when arranging for the carriage of his customers' goods.

From a legal point of view, freight forwarders may have different statuses depending on the legislation of the respective country. The freight forwarder may act as an agent on behalf of his principal, as the contracting carrier assuming carrier liability without performing the carriage himself or as the performing carrier (Ramberg, 1998). These three situations can be subsumed under two different concepts as defined in the "FIATA Model Rules for Freight Forwarding Services" in 1996 by the International Federation of Forwarding Agents Associations (FIATA).

The first concept refers to the freight forwarder acting as an agent on behalf of his principal, the customer or the performing carrier, and therefore benefits from a limited liability. This concerns e.g. the "*Spediteur*" in Germany or Austria, the "*transitaire*" in France, the "*Ekspeditör*" in the Scandinavian countries (Denmark, Sweden, Norway and Finland) and the "forwarding agent"/"freight forwarder"[24] in the United Kingdom.

However, a difference between the forwarding agent/freight forwarder in the UK and the German "*Spediteur*" has to be pointed out. Whereas the first one acts on behalf of his consignor and/or carriers by land, sea or air and therefore signs contracts of affreightment in the name of his principal, indicating this at least with the formulation 'on behalf of our principals', the second one is a freight forwarder contracting in his own name but on account of his principal. This status corresponds to the commission agent[25] under Anglo Saxon law,

[24] The terms "(freight) forwarding agent" and "freight forwarder" are used synonymously.

[25] The commission agent in UK law is treated under the concept of "undisclosed principal". As regards the liability of an agent for obligations incurred on behalf of a principal, this means that if the agent does not disclose the fact that he acts on behalf of another, and thus does not disclose the name of the principal, the agent may be held personally liable for his actions. If however, the agent revealed his agency and the name of the

representing a kind of intermediate stage between agent and principal (Ramberg, 1998). Under German law it is possible for the *"Spediteur"* to avoid carrier liability by assigning to his customer his rights under the contract which he concluded in his own name (the so-called *"Abtretungserklärung"*). This however is not possible where the freight forwarder would have qualified as a carrier subject to mandatory carrier liability. Freight forwarders have traditionally avoided carrier liability by declaring that they do not act as common carriers but as mere agents (Ramberg, 1998)[26]. Therefore, in the practice, the status of the *"Spediteur"* is comparable to the French *"transitaire"* being a commission agent who restricts his functions to services ancillary to the carriage, deals only with selected aspects of a transport organised by the principal and thus operates with limited liability. This also applies to Switzerland where the freight forwarder is regarded as a kind of commission agent.

According to the second concept, a freight forwarder can act as a principal, procuring or even performing carriage of goods in his name and on own account with his rights, duties and liability being the same as for a normal carrier by land, sea or air. If he performs the carriage of goods by his own means, he is usually called "performing carrier", otherwise he is considered as "contracting carrier", still assuming carrier liability despite another carrier is actually shipping the goods. The French *"commissionaire de transport"*[27], although contracting in his own name but on account of his principal thus being a commission agent, may be cited as an example as he is fully liable. Moreover, he may perform himself the carriage thus becoming the performing carrier. Other performing carriers are the *"Spediteur mit Selbsteintritt"* in Germany and Austria, the *"Speditör"* in the Scandinavian countries and the "forwarder as a principal" in the United Kingdom. In Germany, in addition to the *"Spediteur mit Selbsteintritt"*, as far as the carriage is concerned, the *"Fixkostenspediteur"*, who forwards at a fixed price, and the *"Sammelladungsspediteur"*, who acts as a cargo consolidator, have the rights and duties of a full liable carrier, too. This applies also to the Scandinavian *"Speditör"*, not only in his capacity as performing carrier, but also if he has expressly or impliedly accepted liability of a carrier by issuing a transport document in his name or quoting own prices for transport.

From a functional point of view[28], freight forwarders' core activity consist in despatching cargo by opting for the most suitable carrier and concluding the contract of carriage

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principal (disclosed principal), he will normally not be held liable for commitments undertaken within his authorised agency (Rawlings, 2007).

[26] The limitation of liability can be enforced by using General Terms and Conditions (such as ADSp, AÖSp, BIFA, NSAB). See e.g. Schramm (2010).

[27] In France, the term *"transitaire"* is often misleadingly used when referring to a *"commissionnaire de transport"* performing his activity on an international scale though, according to law, the *"transitaire"* is acting as a proxy for his principal. This causes confusion as regards his liability so often the court has to rule (Bernadet, 2006).

[28] This part is based on Schramm (2010) who compared the functions of the freight forwarder as explicitly defined by 25 authors during a time frame of over 80 years by distinguishing between core functions, ancillary services and other functions. Schramm (2010) underlined that basic functions seem to be unchanged, even though authors from the 1920s to the 1950s placed emphasis on the knowledge of trade practice and tariff issues and less on logistics as contemporary authors do. Moreover, due to legal restrictions, most of the considered Anglo-Saxon authors did not take into account that the freight forwarder could fulfil a transport function while German-speaking authors indicated this function at least to be ancillary. These 25 authors are (in chronological order): Metzger (1922), Schlichting (1931, pp. 11-58), Mayer (1933, pp. 12-14), Stern (1938, pp. 28-35), Ohling

(affreightment function), providing advice to customers in transportation matters (consultancy function), consolidating cargo for groupage services (consolidation function) and providing carriers' as well as forwarders' documents (fiduciary function). Ancillary functions of a freight forwarder include giving insurance coverage during transportation (insurance function), acting as a contracting or performing carrier (transport function) and caring for customs clearance (clearance function). In addition ("other functions"), freight forwarders may give advice to customers on packing problems (packaging function) and on warehousing and distribution (logistics function). Beyond consultancy on logistics, freight forwarders provide logistics services such as loading, unloading, reloading and temporary storage of cargo but also longer warehousing, including additional services such as quality inspections, sample drawing, cleaning, drying, pest-control of goods and even assembly of products on behalf of his customer. Furthermore, freight forwarders secure compliance with foreign trade regulations and Letter of Credit instructions (documentary function), supervise the movements of goods (supervision function) and credit freights, fees, duties payable at once and bill it later on or collecting and submit money on behalf of the consignor (quasi-banking function).

The legal status of the freight forwarder affects **the scope of activities** performed. As an *agent*, the freight forwarder arranges the carriage of goods and the associated formalities on behalf of the shipper or the receiver. Acting as their proxy and working for their account, he is forced to follow the instructions of his client. This means also that he cannot e.g. choose the airline. In return, his responsibility is limited to executing the order. In some cases, he may be the operator of the service used. In contrast, as a *principal* the freight forwarder acts under his own name and on his own responsibility. He arranges for the carriage of his customers' goods by contracting with various carriers. Moreover, he also gives advice on all documentation and customs requirements in the country of destination. Unlike the agent, he is bound only to the result which is the delivery of the shipment to the consignee, his task consisting in finding the means for moving the goods from the point of origin to the point of destination within the customers' time frame, at the most advantageous cost and in good condition (security/safety). Therefore, he conceives and organises the transport chain. Then, he confers the transport on a carrier who is working as subcontractors. For the latter, the freight forwarder is the principal and acts as "shipper" whereas the carrier needs not to know the client and in general does not have any relation with him. But the freight forwarder may also act as a carrier for part of a movement. Most freight forwarders organise door-to-door transport by land, sea and air. By choosing carriers and routes, they may constitute their own network without necessarily possessing or operating themselves any fleet. As a principal the freight forwarder has more freedom of action than as an agent but takes full responsibility. The International Federation of Freight Forwarders Associations refers to them as the real "Architects of Transport" underlining their strong commercial position relative to their clients.

(1950, pp. 216-218), Rosenthal (1950, pp. 116-121), Ullmann (1950, pp. 71-107), Kirchner (1950, pp. 11-45), Smith (1974, pp. 178-179), Mittendorf and Oelfke (1974, pp. 25-29), D'Amato and D'Amato (1977), Murr (1979, pp. 20-21, 293-297), Seiler (1981: 40-86), Matthäi (1985, pp. 24-26), Dehn (1987, pp. 22-23), Schumacher (1987, pp. 131-139), Thaler (1990, pp. 87-88), Sherwood and Burns (1992), Murphy and Daley (1995), Johnson and Wood (1996, pp. 410-412), Branch (2000, pp. 417-418), Lucke et al. (2001, pp. 265-267), Pfohl (2003, pp. 285-286), Lorenz (2005, pp. 61-63, 492-494) and Dischinger et al. (2005, pp. 23-24).

Finally, intermediaries may be classified according to their **main field of activity and specialisation**[29]. As this work focuses on air transport, only three shall be cited: the air freight forwarder/air freight agent, the consolidator (in air freight) and the customs clearance agent.

– The *air freight forwarder/air freight agent,* whether or not being an IATA appointed agent, presents the shipments to an airline "ready for carriage". He offers also services like advice on routing and shipping, insurance, customs documentation and clearance through customs, documentary credits and other matter relating to international trade. He acts for the account of one or more airlines. "IATA agents" are appointed by IATA in order standardise handling and working procedures. Therefore, they have to accomplish specific requirements and respect certain commitments.[30] Representing the IATA airlines sales and services unit, they receive a commission from the IATA carriers for airfreight shipments.
– The *consolidator (air freight)* is a freight forwarder specialist in the grouping together of a number of consignments in order to present them to the airline and to forward them as one shipment. This has the advantage of bringing down costs due to the declining rate structure which favours heavier shipments. The consolidation is consigned to a forwarder at the destination airport who has to distribute the individual consignment, therefore also called "break-bulk" agent.
– Finally, the *customs clearance agent* (or customs broker since the creation of a Single European Market and the free circulation of goods within the EU) is specialised in customs clearance. His task is to attend to on behalf of the importer or exporter, as the case may be, all customs formalities for shipments coming into or leaving the EU. He acts for the shipper's or receiver's account.

In practice, a freight forwarder may perform diverse activities and in particular may act as an agent when doing business with one client and as a principal when doing business with another thus blurring the frontier between the different professions and making a clear classification difficult (Bernadet, 2006). For this reason, the intermediary's legal status depends often on the precise situation. If the client determines the shipping details, the intermediary acts as forwarding agent, otherwise as freight forwarder.

To offer forwarding services on a worldwide basis, global networks have to be established, either by cooperating with reliable partners or by establishing further branches. As regards their **geographical market**, Allaz (2006) distinguishes between the big *multinational firms* having foreign bases on all five continents (e.g. Panalpina, Schenker, Nippon Express, Bax Global), the big second-rank *national and international firms* whose structure is for some of them comparable to the first group with a large number of international subsidiaries (e.g. SDV, Hellmann, Geologistics), *national firms* with an important activity but focusing on the national market, *firms specialising in a certain product category* (e.g. transport of horses, press, works of art, perishables) thus offering more adapted services of high quality and

[29] See Schramm (2010) for a comprehensive classification of freight forwarders according to their fields of activity which are subject to some specialisation according to the predominant mode of transport, type and scope of forwarding operations, their location, the direction of cargo movements, the geographical scope of operations and/or the cargo type and/or shipping industry served.

[30] See Grandjot, Roessler and Roland (2007, pp. 139-140) for more details.

integrated freight forwarders which made the choice to take charge of the production of a part of their transport capacity. An interesting example is Panalpina, a freight forwarder which charters aircraft for its exclusive use on an annual (or even more) base, thus having at its disposal a worldwide cargo network. Finally, thousands of *small freight intermediaries* entered the market since IATA has liberalised the conditions for access to the profession.

Freight forwarders often settle next to important junctions, such as **airports** but also train stations and seaports or inland ports. For the airport, it is important to attract freight forwarders since they conceive and organise the transport chain and therefore choose the airport by which cargo transits. Certain airports attract numerous intermediaries of freight transport locating in the airport's freight zone or in its neighbourhood.[31] In general, the number of freight forwarders increases in proportion to the airport's freight traffic. The effects are reciprocal: freight forwarders are attracted by large airports; then, freight forwarders bring about more cargo traffic to this airport. Moreover, the freight forwarders' choice of location is also affected by passenger flights operated at the airport as a large volume of passenger traffic represents an advantage over freight airports with respect to the number and frequency of flights from which freight forwarders may choose (Wang, 1999).[32]

As Grandjot, Roessler and Roland (2007, pp. 138-139) indicate "most freight forwarders have freight allotments with several airlines. Usually they book a shipment with several contracting airlines to make sure that the shipment is transported 'as booked'..." In order to avoid overbooking due to this practice, the **airlines** try to actively influence the booking behaviour of forwarders by granting preferential rates and available capacity to regular customers based on their proactive support. Some airlines strive after more influence by bypassing the forwarders and contacting big shippers directly at the risk of losing their biggest customers, the forwarders who have various small and middle-sized shippers in their account.

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[31] Wang (1999) analysed the choice of location of freight forwarders, by comparing the main airports in Belgium, Germany, France, the Netherlands, Switzerland and the United Kingdom (but Basel, Zurich, Düsseldorf and Birmingham were considered as data was not available).

[32] According to Wang (1999), among German airports Frankfurt has the largest freight traffic and most freight forwarders (about 300) are located at this airport. Munich and Stuttgart attract more freight forwarders than one could expect from the airports' freight traffic volume whereas the number of freight forwarders at Cologne/Bonn airport does not reflect its 2nd place among German airports in freight traffic. Why freight forwarders locate more frequently at Munich and less often at Cologne airport may be explained by the strong link between freight and passenger traffic (see also chapter 1.1.1), the latter being relatively high at Munich and Stuttgart airports but relatively small at Cologne (7th airport in passenger traffic after Frankfurt, Munich, Dusseldorf, Hamburg, Berlin and Stuttgart in 1998). In France, freight forwarders concentrate at Paris CDG and Orly airports, but also at Lyon airport (6th airport in freight traffic) which attracts as many freight forwarders as Orly airport and many more than airports of similar size. In the UK, London Heathrow airport dominates the choice of location of freight forwarders, especially in the London metropolitan area where Gatwick and Stansted airports attract relatively little freight forwarders. Manchester and Glasgow airports attract also many intermediaries, more than one could expect from their freight traffic volume whereas relatively little freight forwarders locate at East Midlands airport next to Manchester. In the Netherlands and Belgium, freight forwarders are mainly located in the two most important airports Amsterdam and Brussels but only some choose the second biggest airports of Maastricht and Liege.

Intermediaries in passenger transport also bring together customers and transport service providers. Even though the function of tour operators and travel agents often blur and overlap (Honey, 1999, p. 53), they may be well distinguished. Contrary to freight forwarders, they may strongly influence the tourism decision process. However, their importance decreased in the recent past due to the use of on-line Internet booking systems which enable travellers to obtain more easily information and to organise directly their journeys.

This concerns in particular *travel agents*[33] whose activity consists in selling travel offers (tickets, package holidays etc.) to their clients, for which reason they are classified as retailers (Honey, 2008, p. 53). They provide advice, book reservations and procure tickets/vouchers. Acting as a broker, they bring together the clients and the different service providers in the tourism market, such as tour operators, airlines, hoteliers and car rental agencies. Moreover, travel agents may influence tourism planning decisions and outcomes as underlined by Klenosky and Gitelson (1998) by their recommendations of potential destinations, side trips, attractions, transportation, lodging, dining, and entertainment options. For this reason, travel agents may have an impact on the satisfaction that a particular consumer derives from a particular leisure or business trip but also on the level of demand for tourism operations, attractions and destinations and thus on their success. Previous studies already stated that consumers potentially consider recommendations as being important during the decision-making process (Howard, 1963; Peter & Olson, 1993). Therefore, travel agents always have been considered to be a key interface in tourism marketing (Bitner & Booms, 1982).

Nevertheless, Sterzenbach, Conrady and Fichert (2009, p. 430) underline that the possibilities for travel agents to guide clients towards particular airlines are presumed to be very limited since the clients are already predisposed to fly with a particular airline due to the impact of the airlines' frequent flyer programs, pricing policy and flight schedules to which travel agents may have difficulties to stand up. In contrast, other surveys point out that travel agents may play a crucial role in determining consumer airport choice and in certain cases contribute to the suppression of demand for services from regional airports[34] (Humphreys, 1994).

Traditionally, travel agents receive a commission on sold services. As regards the revenues of travel agencies, the commissions paid by the airlines had an important share in. The relationship between travel agencies and airlines has changed since the 1990s as airlines were seeking for more direct contact with their clients and for reducing costs.[35] For this reason,

[33] Different types of travel agents may be distinguished according to Sterzenbach, Conrady and Fichert (2009, pp. 438-440), including IATA agents, non IATA agents, consolidators, General Sales Agents, and travel management companies being specialised in business travel.

[34] Humpherys (1994) found out in a 1992 survey that travel agents were more likely to send via London Heathrow airport a random travel enquiry suited to a regional air service if the route from the regional airport was new and operated by an independent airline, contrary to a service from the regional airport that had been established for a number of years and was operated by a major airline. For likely explanations and possible solutions see Humpheys (1994). See Dumazel and Humphreys (1999) for an update of the 1992 survey.

[35] Airlines may use different direct and indirect distribution channels for selling their flight tickets. Direct ones include their sales offices, call centres, own website and selling to corporate customers. Indirect ones refer to

airlines not only lowered commissions paid to travel agents but also developed direct selling.[36] In fact, as much as 75 %[37] of airline tickets were sold through conventional travel agents, these commissions involved a great expense for airlines. Distribution costs, including commissions to travel agents but also ticketing, credit card fees, and fees for using a computer reservation system (CRS), represented more than 17 % of the total airline operating costs in 1999, even though this already corresponded to a decrease in comparison with 20 % in 1989 (Alamdari, 2002).

Having emerged with the development of commercial aviation and the growth of mass tourism, traditional travel agencies suffer today from the competition of distribution channels such as Internet. For this reason, most travel agencies suit to changes in booking behaviour offering their whole range of services on the Internet. Beyond, online travel agencies just exist thanks to this new distribution channel as they are available only on the Internet (e.g. Expedia, Travelocity, Orbitz)[38].

In 2007, more than 35 % of worldwide flights were booked online, in comparison with only 10 % in 2000. Online bookings depend on regions and carriers. They represent 63.6 % in North America, 29.5 % in Latin America and 29.1 % in Europe but only 14.0 % in the Asia-Pacific region and 7.5 % in Africa/Middle East[39]. The low-cost carriers are the leaders (e.g. 99 % of bookings for Ryanair, 75 % for Southwest, 72 % for Air Lingus and 80 % for JetBlue)[40] whereas online sales are less important for network carriers even though they are growing. About two thirds of Internet-generated bookings are made via the airlines' websites (Sterzenbach, Conrady, & Fichert, 2009, pp. 491-492). While the majority of low-cost carriers sell tickets exclusively through their own website, network carriers use their own website but also online travel agents (Alamdari, 2002).

As regards traditional travel agents, they see their role change from bookings to the provision of advice and consultancy for leisure and corporate clients, with the need for charging management or transaction fees for their services (Alamdari, 2002).

In contrast, *tour operators* organise package tours, also called inclusive tours.[41] Therefore, they buy tourism services in bulk from a direct provider, such as a hotel or an airline, and

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traditional travel agents, online travel agents, multi-airline online travel portals (e.g. Opodo in Europe which was created in 2001 by Air France, Lufthansa, British Airways, KLM, Iberia, Alitalia, Austrian Airlines, Aer Lingus, and Finnair and now is owned by Air Lingus and a GDS and travel technology provider, Amadeus, the latter holding a majority stake since 2004), tour operators and consolidators, all having access to a Global Distribution System (Alamdari, 2002).

[36] Alamdari (2002) points out that US airlines were more aggressively trying to bypass travel agents while European, and in particular Asian carriers, have been more conservative in this respect.

[37] Figure refers to the tickets sold by major European airlines at the end of the 1990, published by Air Transport World in January 2000 and cited by Alamdari (2002).

[38] Large online agencies are increasingly gaining power in attracting the corporate travel market (Alamdari & Mason, 2006).

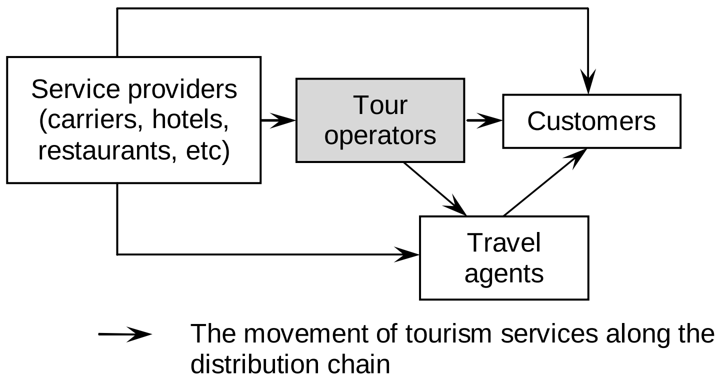
[39] Sterzenbach, Conrady and Fichert (2009) refer to figures cited by Jenner (2008, p. 51) and Sobie (2008, p. 48) that were taken from the Airline Business/SITA IT Trends Survey 2008.

[40] Figures cited by Sterzenbach, Conrady and Fichert (2009, p. 491) were taken from Sobie (2008, p. 46ff).

[41] In addition to all-inclusive package tours, tour operators may also offer modular products as well as dynamic bundling and dynamic packaging products. See Sterzenbach, Conrady and Fichert (2009, p. 436) for more details.

assemble them in attractive holiday packages. Then, these packages are offered to the public at a comprehensive published price including transport (by air and surface transport), accommodation for the duration of the trip and maybe other amenities (such as a touristic programme or catering). Tour operators are classified as wholesalers even though they not only sell to travel agencies but also directly to the customer (Honey, 2008, p. 55) as illustrated by figure 5. Travel businesses such as Thomas Cook, Marmara and TUI perform both activities, distribution of travel offers (including flights only) as well as tour operating. According to estimations, about 80 % of 663 million international travellers used the services of a tour operator in 1999[42].

Figure 5: The place of the tour operator in the tourism system



Source: Budeanu (2005), p. 93, adapted after Holloway (1998).

Two types of tour operators can be distinguished. Following the growing fragmentation of the tourism market, mass market tour operators and specialised operators coexist. The first ones work with relatively small margins but hold the majority of the tourism market and offer, at least at the cheaper end of the range, a largely undifferentiated product for tourists looking for sun, sea and sand whether travelling to Greece, Spain, Turkey or any other popular destination despite some differences in language and/or culture[43]; the second ones are small to medium-sized independent companies[44] specialising in particular geographic areas or types of holiday leading to a stronger differentiation of the product (Carey, Gountas, & Gilbert, 1997; Curtin & Busby, 1999).

Despite the diffusion of online booking systems allowing the customers to contact the producers directly, tour operators have not been put out of business. This may be explained by

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[42] Figures were taken from Tourism Concern Statistics, cited by Budeanu (2005).

[43] Knowles and Curtis (1999) distinguish three generations of tourist destinations, following the Tourist Area Life-cycle after Butler (1980).

[44] In the following we will concentrate on mass market tour operators since they operate the main part of tourism. All those that cannot be considered as mass market tour operators are summed up in the second group of small to medium-sized independent tour operators, even though this term is not accurately defined. [See Evans (2001).] Note that the latter may operate in a more flexible way and be more responsive to consumer demands. At the same time, especially smaller tour operators may have to deal with three problems: the degree of dependence upon distribution channels as a number of travel agents are owned by the large firms, the degree of dependence on charter flight capacity brokered by the large firms; the degree of difficulty encountered in negotiating competitive accommodation due to a lack of buying power (Evans, 2001).

their contribution to the good performance of the tourism industry through reducing risks and costs for tourism producers. Since services in general cannot be produced in advance and stocked while waiting for the customer, producers have to provide for capacities regardless of the actual demand. Therefore, only a high occupancy rate allows the producers to keep prices down, but this may be difficult for them to ensure on their own. By buying in bulk, tour operators accept to resell the products and assume the risk of having unsold products (Budeanu, 2005). This is particularly important as tourism, just as other services, is a perishable product (Bastakis, Buhalis, & Butler, 2004). In this situation, tour operators manage to reduce losses and to attract a low budget clientele thanks to their large distribution networks and the marketing of last minute offers. As intermediaries, tour operators reduce transaction costs. Customers may save time but also money when buying package tours as tour operators get better prices from producers than individual travellers allowing them to offer lower prices for the entire package (Budeanu, 2005).

But tour operators do not only act as sales offices of individual tourism service suppliers (Van Wijk & Persoon, 2006). As intermediaries, they can influence the consumer’s choice of destination and accommodation (Bastakis, Buhalis, & Butler, 2004) as well as the perceived image and experience of the destination (Carey, Gountas, & Gilbert, 1997). They play a crucial role in promoting, distributing products and facilitating information sharing in the tourism supply chain (Sigala, 2008). As underlined by Curtin and Busby (1999), tour operators are the main information channel through which the customers’ preferences reach the producers and services reach the markets. Thanks to their position between producers and customers, tour operators are able to know the levels and trends of supply and demand for leisure products and can have a significant influence on the equilibrium and on the way markets evolve.

Several authors underline the strong influence of tour operators on tourism development at destination level. They deliver tourists from international markets thanks to their promotional activities at home. Moreover, through their local presence at the destination, they bring convenience and familiarity (Van Wijk & Persoon, 2006). Some authors even consider that tour operators exercise “control over the whole tourism experience due to their volume planning, image creation, destination contracting, the type of excursions offered, nationality of overseas staff and pricing policy put[ting] them firmly in control of the demand” (Carey, Gountas, & Gilbert, 1997, p. 430). Consequently, it is important for a destination to be included into the tour operators’ programmes (Cavlek, 2002). However, the latter are anxious to establish their own brand identities (Carey, Gountas, & Gilbert, 1997, p. 430), the long-term sustainability of a particular destination being rather secondary to their business objectives. For certain destinations, this may lead to a one-sided image linked to a specific product category (such as “summer sun” or “tropical shores”) for which reason one destination may easily be replaced with another, trendier or lower cost one. By providing incentives for the construction of hotels and apartment blocks, the tour operators create overcapacity which leads to falling prices, lower standards and a deteriorating image. Thus, the tour operators make themselves indispensable as their powerful distribution network is needed for attracting a large number of hotel guests. Finally, the tourism activity is not always a secure source for local income (Klemm & Parkinson, 2001) mainly owing to the way large hotel complexes work: due to all-inclusive offers quite little money is spent outside.

Major tour operators may exert such a strong influence that hoteliers and other tourism suppliers in the destination develop a dependency relationship with them (Poon 1993, Shaw and Williams 1994)[45]. This concerns in particular small enterprises or isolated communities that have at their disposal only limited or inadequate distribution networks and thus can easily become reliant on tour operators for attracting tourists. Cyprus and Gambia are indicative of some small islands or developing countries which are highly or almost totally dependent on tour operators (Budeanu, 2005).

As regards the British market, Klemm and Parkinson (2001) observed that tour operators aim at improving their long-term profitability by vertical integration, improved market segmentation and targeting as well as building brand loyalty. Thanks to the vertical integration of their business, travel agencies and charter airlines, they manage to exercise more control not only over the distribution channel but also over the production of holidays and thus an improvement of margin through airline fleet integration and combined ground handling. The resulting consolidation process with the major companies taking over medium sized and smaller ones allowed certain tour operators to increase their market share and to develop their brand by offering a wider product range through their integrated distribution system. In this respect, Evans (2001) underlines that expansion through integration does not only apply to the UK but the 'travel industry is also experiencing rapid internationalisation of ownership' (Holloway 1998, p. 77), notably for the purpose of increasing the buying power abroad.[46] "The tourism industry is dominated by transnational corporations that are, on the one hand, becoming increasingly interlinked and consolidated and, on the other, spreading around the world and penetrating new markets." (Honey, 2008, p. 38)

Intermediaries in freight and passenger transport... summing up

At first sight, intermediaries in passenger and freight transport are fulfilling the same function, namely bringing together customers (shippers or passengers) and transport service providers (mainly airlines but also other providers of associated services). Nevertheless, there are some differences as regards their influence. Freight forwarders may have an effect on the organisation of the transport chain, including the choice of a particular carrier as well as of the departure and destination airport, whereas the final destination is determined by the shipper. Thus, they may influence e.g. the level of demand for a certain airport. Travel agents and in particular tour operators may affect the tourism decision making process much earlier and thus have a large influence already on the destination choice, in particular as regards the market segment for holiday trips. In return, passengers may have a stronger preference for a particular airline than a shipper who entrusts a freight forwarder with the organisation of the carriage of his goods and shows less emotions in this respect than a passenger travelling in

[45] Cited by Klemm and Parkinson (2001).

[46] Indicative is the takeover of Thomson Travel by the German Preussag in 2000 (Evans 2001), renamed TUI in 2002.

person. For this reason, tour operators may strongly influence the satisfaction of a particular traveller but also the level of demand for tourism destinations, attractions and operations. However, their importance has decreased due to the use of on-line Internet booking systems which enable travellers to obtain more easily information and to organise directly their journeys. As regards freight transport, Internet provides new opportunities for customers such as tracking and tracing, the management of their customer account but may not replace the knowledge and organisation ability of a freight forwarder.

1.3.5. Airport service providers: partners of the airport operator who coordinates concessionaries, airport assistants, administration…

There are a large number of service providers who perform their activities within the airport, such as concessionaries (shops, services), airport assistants (such as handling agents), and administration (like customs, health, weather services, police). They all contribute to the good functioning of the airport as a whole and are thus partners of the airport authority. But expectations may diverge and thus create a potential for conflicts of interests, for which reason the airport has also to acts as coordinator in order to reconcile the different activities.

For instance, the relations between the airport authority and concessionaries have changed over the last years since revenues from commercial activities have got an important source of income for most airports and are in general depending on store revenues. Accordingly, commercial activities have to be taken into account e.g. when configuring or redesigning the layout of airport facilities but this may lead to a conflict with other objectives, such as a high passenger processing level in order to reduce transfer times.

Ground handling refers to cargo and aircraft related services, such as the acceptance, documentation, physical handling and storage of import and export cargo but also the aircraft departure coordination (ramp handling), pre-calculation and planning of load distribution, routine spot checks etc. As these services are increasingly outsourced, a clear separation of activities between parties offering cargo handling and parties offering aircraft handling is not always easy. On behalf of the airline, their task is to assure that aircraft and cargo handling comply with valid regulations and instructions (Grandjot, Roessler, & Roland, 2007, p. 143). Prior to their liberalisation, ground handling services were performed by a limited number of service suppliers who were mainly the airport authority or the national carrier. Effectively, they had a monopoly since access for third party service suppliers was very restricted. With the liberalisation of ground handling, these services were largely opened to third party recognising the right of airlines to self-handling and guaranteeing at least some choice for airlines in the provision of ground handling services (Grandjot, Roessler, & Roland, 2007, p. 143). Thus, the airline appoints these service providers. Airports still have the right to provide ground handling services but they must be separated from their main role as airport operator.[47] Encouraged by the liberalisation, alliances, mergers and takeovers characterise this

[47] See e.g. SH&E Ltd. (2002) for an evalutation of the quality and efficiency of ground handling services at EU airports as a result of the implementation of Council Directicve 96/67/EC on the access to the ground handling market.

sector, too (Graham A., 2003, p. 128). Offering all-in-one solutions, most handling agents are providing the whole range of ground handling services and not only for just one airport. A number of airports have been actively expanding their handling activities at other airports in order to offset the reduced involvement at their home airports.

In terms of administration, e.g. customs authorities are assigned by each government to execute the specific customs law as well as to collect duties and taxes on imported/exported and transit goods. They represent an important element within the air cargo supply chain as they decide whether to release a foreign shipment, to look at it or to reject it. This process may require up to several days in certain countries. However, the introduction of on-line Internet-based systems allows to clear all documents electronically and to save time (Grandjot, Roessler, & Roland, 2007, p. 145).

1.3.6. *Airport employees: the importance of the airport authority as employer depends on its involvement in operating activities; many on-site jobs created by service providers*

Airports generate various activities and jobs which are directly and indirectly linked to and may be located on-site but also off-site. On-site employment includes a number of persons who do not necessarily belong to the airport authority. This depends to the degree to which the airport authority is involved in operating activities (such as the provision of ground handling services). Airport authorities in general account for 5 % to 10 % of airport site employees (IAURIF; ADP, 2001). Many jobs are generated by air traffic control, administration (like customs, health, weather services, and police), airlines, handling agencies, aircraft maintenance, in-flight catering, restaurants, bars, and retailing activities at the airport but also logistics services and warehousing. Whether being employed by the airport authority itself or by another service provider, they all may be concerned in the same way by problems due to the accessibility of the airport, in particularly by night and when coming from surrounding areas which sometimes are less well served than the city. However, the airport authority may lack precise information about their presence as they are employed by third party.

As regards on-site employment, the airport activity necessitates both highly qualified but also unskilled labour. In particular, logistics employment is considered by local communities in a negative manner as being largely without qualification and polluting. For this reason, it is important to underline that the notion “logistics” covers different types of activities requiring economic strategies and qualifications of varying scale (Collin, 2000).

1.3.7. *Final customers: airports paying more attention to passengers but having little information about them*

Passengers and shippers, the final customers in air transport, are at the bottom of the airport’s activity. However, they do not have a contractual relationship with the airport and this despite their physical presence at least in the case of travellers while cargo is being in general delivered from freight forwarders, who are often located at the airport and thus rent offices and logistics areas, and rather seldom from the shipper.

In the absence of a contractual relationship, airport managers have for a long time underestimated their role, and in particular that of travellers. Even today, airports in general know their passengers only casually. Whereas airlines dispose of relatively precise information about passengers from booking and frequent flyer programmes (including address, age, travelling behaviour, maybe even profession etc.), airports have to carry out surveys of representative samples of travellers or collect e.g. information on registration numbers of cars on the parking area.[48] This is time-consuming and cost-intensive.

Due to the introduction of competition and the growing importance of non aeronautical revenues, airports became aware of the final customers' role. However, the latter's presence depends on many factors, including the airlines' flight offer as passengers may often choose between different departure, destination and/or stopover airports thus creating a certain competitive pressure between the concerned airports. In this case, the passenger's decision depends not only on his/her socio-professional category, the motive for travelling and its duration but also on flight (e.g. ticket price and frequency) and airport characteristics (e.g. airport charges, accessibility). For this reason, the airport has to meet the requirements of both airlines and passengers.

1.3.8. The general public

The general public includes persons that might be in contact with the airport but are not passengers, nor working in the air transport industry. They usually largely recognise the positive effects of the airport activity on the economic activity and regional development but their ecological awareness is growing.

Over the last years, airports started considering the general public which had been neglected by the airport in the past. This results from a change in the airport's self-perception: It considers itself not longer as simple auxiliary of air transport (only providing access to the services of airlines for passengers or shippers) but as a real business. For this reason, airports seek to attract more customers who do not only go to the airport as passenger but also for the airport itself and its shops, cultural events, clubs, cinema, etc. Since the turnover from non aeronautical activities has considerably increased over the last years, the general public represents an important source of revenues.

[48] Collecting information on the registration numbers of cars on the parking area gives only a rough idea on the origin of passengers as those coming to the airport by taxi or public transport are not considered. In return, this survey is less cost-intensive than questioning passengers. As regards France, this is not possible anymore as of October 2009 all vehicle registration plates (already since April 2009 in effect for new cars) are issued using a new format without the local *"department"* code which allowed in the previous system to know their provenance. The *"département"* number figuring since then on the registration plate is of the owner's choice. This also applies to Italy where the registration plate is a sequential number not giving information on the car owner's origin.

1.3.9. *Air navigation system: important partner for the airport due to its influence on the capacity of airports and airspace, delays and noise levels*

The air navigation system includes all parties contributing to the good functioning of air transport within the airport's sphere of influence as well as outside. Its activity is based on rules and practices in order to guarantee the organisation and control of air traffic flows in complete safety (e.g. definition of air routes, organisation of arriving and leaving flights,…) Air navigation services include communications, navigation and surveillance for air traffic management (CNS/ATM), meteorological services (MET) for air navigation, search and rescue (SAR) services and aeronautical information services (AIS). These services are provided during the different steps during the flight, i.e. at the airport, during take-off/landing and cruising.

The air navigation system contributes to determining the capacity of airports and airspace and thus the number of flights that can be operated. With the growth in air traffic, congestion increased, at least during peak hours. For this reason, the air navigation system needs to be particularly efficient in order to handle a large number of flights while reducing delays. Moreover, the choice of flight paths and operational procedures, especially during take-off and landing, may strongly affect noise pollution. In order to find solutions to the concerns of residents over air traffic noise, the latter calling for further operating restrictions at individual airports and additional noise abatement measures, airports have to work closely with the representatives of the air navigation system.

1.3.10. *Owners and shareholders: the need for profitability*

Considering the restructuring of airports and the gradual withdrawal of state funding, airport managers take more and more into account profitability with which they have to provide their shareholders. The need for profits results also from financial requirements for airport development. National and local governments still play an important role concerning this matter since they are holding, in many cases, large participations in airport operation companies although most of them are under private law today.

1.3.11. *Public authorities/regulatory authority: gradual withdrawal of state funding, regulatory authorities come to the fore*

For a long time, the State maintained an extensive technical and financial control over aeronautical activities. It played a role as operator/manager, owner and regulator. Even after the liberalisation of air transport and despite the gradual withdrawal of state funding, public authorities and in particular regulatory authorities play a part, in particular as regards the definition of technical standards (e.g. security, pollution) and the control of their application, but also as regards operational matters (e.g. restriction of aircraft movements, ban on night flights) and the development and extension of airports. Moreover, government authorities (whether local or national ones) are still largely involved in airport management as most airports are in public-private ownership since the public sector kept in most cases at least a minority participation, if not a majority interest.

This is also the reason why regulatory authorities, which define e.g. competition rules and control their application, lack often independency. This concerns e.g. the setting of airport charges. Recently, financial aid granted by airports to airlines (Commission of the European Communities, 2004b), airport services (Directive 96/67/EC of 15 October 1999 on access to the ground handling market at Community airports) as well as slot allocation were, for instance, subject to State intervention.

1.3.12. Residents: serious concerns over the airport activity

Residents and neighbouring communities are primarily concerned by the negative effects of the airport activity, in particular by noise nuisance, air pollution, and an increased accident risk. For this reason, these populations are more and more aware of environmental problems. Via numerous associations, with specific interests, they demand a better consideration of their situation. Their criticism also refers to the *"logique d'entreprise"* ("business mentality" in English) of airport managers and their wish to *"gérer le ciel comme une enterprise privée"* ("to manage the sky like a private company") (Blazy, 1999, p. 26).

Despite the positive effects of the airport activity on the economy, in particular through job creation and local business taxes paid to the communes, the discussion with residents shows the insufficient integration of airports in their environment. Residents demand a ban on night flights, a decrease in noise nuisance and oppose to the extension of airports. These problems concern, in Europe, almost all big airports. Thus, at Paris Orly airport, traffic restrictions were introduced. A ban on night flights is discussed at airports like Brussels, Zurich, Frankfurt or London Heathrow. At Strasburg, for example, residents prevented definitively DHL from setting up its hub (Blazy, 1999, p. 31).

Nuisances from the airport activity provoke a conflict of interest between residents suffering from and the air transport industry producing it. Environmental constraints and congestion are the main threats to competition between airports because of their impact on airport operations and activities. Due to the size of environmental problems, their integration into decisions concerning the setting up or the development of airports should be in the centre of considerations. For this reason, information and consultation procedures have been launched for a number of airports.

Environmental impacts may be controlled by imposing conditions on operation authorisations, by regulatory framework (e.g. restricting aircraft movements) but airport and local authorities may also conclude agreements under private law which create contractual obligations forcing the airport operator to reduce nuisances. The latter method is the approach preferred at London Heathrow airport in the negotiations between British Airport Authority (Blazy, 1999, p. 43). The authorisation given by the French government in 1997 for the construction of two additional runways at Paris CDG airport was subject to conditions such as the application of certain measures for reducing noise nuisance, for improving the servicing of the airport by public transport, for a better distribution of the economic wealth created by the airport activity and for favouring employment and economic development (Blazy, 1999, pp. 32-33).

Nevertheless, a big problem is that residents are not a homogenous group, in particular due their geographic location. Therefore, communes benefitting from the airport activity e.g. by collecting local business taxes from the airport and companies settling next to the airport are not necessarily those suffering the most from noise nuisance due to local approach paths.

Conclusion: A first insight into the air transport system with a focus on airports whose business has become more complex

The first chapter was intended to give an insight into the air transport system. To start with, it underlined the strong link between passenger and freight transport due to the fact that half of air freight is carried aboard conventional passenger aircraft and the diversity of carriers according to their commitment to freight transport. This point is worth being underlined as it revives the discussion on the possibilities to separate freight from passenger transport and for airports to specialise in cargo traffic, despite very different requirements as regards the handling of freight and passengers at the airport. Moreover, the first chapter presented the different types of market segments in air transport. They are largely connected to the types of airlines as business practices and their way of operating influence the characteristics of air services: general cargo vs. express freight vs. postal services in cargo transport; charter, low-cost and “traditional” full-service carriers in passenger transport.

Besides, this chapter also gave an overview of the evolution of the airport business and of the airport’s relations with the other parties involved in air transport. It pointed out to which extent the airport business has become subject to the dynamics that have developed in the air transport and result from the decisions and actions of the different parties involved whereas prior to the liberalisation air service agreements determined which airline could operate a particular route from a specific airport, including frequencies and prices. In a largely liberalised system[49], the functioning of air transport depends on the decisions and actions of the different parties involved, all the more the room for manoeuvre has increased for some of them (like airlines). Thus, the airport has to embark on its own strategies for developing its activity allowing him to respond to the decisions of the participants in air transport, to react to changes in its environment and maybe even influence them in advance. At the same time and in particular due to the growth in air traffic, the number of stakeholders has increased thus multiplying the relations of the airport. In this respect, residents and local authorities have come to the fore launching the discussion on the nuisances and distribution of benefits from air transport.

[49] Air service agreements still exist for traffic to third countries, outside the EU although the latter has engaged in a large process of renegotiating traffic rights leading to an increasing number of open skies agreements.

2. *The airport's spatial embeddedness: a multi-faceted relationship between airport and territory*

Transportation is by nature a spatial activity as it allows people and goods to move on a given territory, in the case of air transport by aircraft. Being the spatially located nodes of the physical air transport network, airports have a strong relationship with the territory, if not territories because of their heterogeneity. This interaction may be considered from different points of view. Therefore, chapter 2 points out this multi-faceted relationship. As a start, "space" and "territory" are two terms that must be defined and explained.

A (geographic) *space* is both a system of relations and an organised social product as a society has used and developed the terrestrial area in which it has settled in. The notion of space includes all places and relations. This concept refers to the "new geography" of the 1950s and 1960s with the development of spatial analysis. In this respect, spatial analysis is not only interested in vertical relations of societies to their natural environment (which refers to the term of geographic milieu) but focuses also on horizontal relations that result from the interdependency of places introducing the concept of distance.[50]

The concept of *territory* is more recent. It refers to a geography that considers itself as belonging to social sciences. In this respect, territory is the space appropriated by a social group (or even by an individual) being conscious of this appropriation. It concerns often a space that is developed and managed by this group as well as a space of identity. Hence, the notion of territory is a legal, a social, a cultural and even an emotional one at once. Territorial studies consider vertical relations of a society to its natural environment and the horizontal relations resulting from the interdependency of places but concentrate on psychological and sociologic (even legal) relations that persons have to their spaces.[51] This definition corresponds to that of the dictionary of human geography according to which the territory is "[a] general term used to describe a portion of space occupied by a person, group, local economy or STATE... More generally, territory refers to the bounded SOCIAL SPACE occupied and used by different social groups as a consequence of following strategies of TERRITORIALITY. Sometimes territory is used as equivalent to such spatial concepts as PLACE or REGION, conveying the sense of a clustering or concentration of people or activities..." (Johnston, Gregory, Pratt, & Watts, 2000, p. 824)[52]. Marcel Roncayolo[53] specifies four characteristics that correspond to the dimensions of appropriating a territory by a social group and allow to distinguish a territory: the sense of belonging to the territory, the power exercised over the territory (that organises and structures links between the different places of a territory), its global nature (territory is a compact area, continuous and global as a social phenomenon that, in contrast to space, cannot be approached by layers or sectors) and the personal and collective representations made by the individuals of the territory.

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[50] Mérenne-Schoumaker (2002, p. 12), referring to Brunet, Ferras and Théry (1993, pp. 32, 194-195) and to Pinchemel and Pinchemel (1994, pp. 60-64).

[51] Mérenne-Schoumaker (2002, p. 13), according to Brunet, Ferras and Théry (1993, pp. 29, 480-481).

[52] Words in capital letters are cited in conformity with the original text.

[53] See Offner and Pumain (1996, pp. 63-64).

2.1. The airport as node of the physical air transport network

2.1.1. A spatial element allowing the transhipment within the air transport network

To begin with, airports are the nodes of the physical air transport network[54], the arcs being air traffic lanes. Constructed on the ground, airports are tangible, localised assets and spatial elements while air traffic lanes are immaterial. Links between airports exist only through air services operated by aircraft and fall within the commercial operating network of each airline.[55] As ground infrastructure of the air transport network, airports allow aircraft to take-off and to land. Within the air transport network, airports may act as transhipment point where arriving passengers change planes and cargo is loaded onto another aircraft so they can reach their final destination via a connecting flight.

2.1.2. An access point to the air transport network allowing the interconnection with other transport systems

Airports are not only nodes[56] of the physical air transport network where passengers and cargo may change planes but also access points to the air transport network. For this reason, airports are also interchange places[57] or interchange nodes. By linking different networks, they render possible the interconnection of different transport modes, in particular of air, rail and road transport (including public transport) which may be operated at local, regional, national, international and even intercontinental level. Interconnection is based on the planning and the management of the transfer between different transport modes for the purpose of softening the break in the passengers' transport chains and of facilitating the transhipment of freight as well.

Therefore, the airport is not only a node of the air transport network but also of other transport networks (like the road, motorway and railway, especially high-speed railway, network). These different networks, which are interconnected by the airport, are heterogeneous as

[54] According to Curien (2005, pp. 11-12), the air transport system consists of three sub-networks in interrelation: the physical network, the commercial operating network of each airline and the network related to the computer reservation system, each one consisting of three layers. These three layers are the infrastructure, the infostructure (intermediary service) aiming at optimising the use of the infrastructure and the upper layer that corresponds to the final service produced by the network. As regards the physical network, it is made up of three layers: the basic layer with nodes (airports) and arcs (air traffic lanes), the intermediary service referring to switching the traffic and the final services for airlines like allocating air traffic lanes, airport slots and parking areas.

[55] The commercial operating network consists also of three layers: the infrastructure relates to the air fleet; intermediary services of infostructure refer to the fleet management and to the choice of itineraries, stop over and schedules; the final service corresponds to the transport service for passengers (plus added services like car rental etc) and shippers (Curien, 2005, p. 12).

[56] In the graph theory a node is the summit of a graph where start and arrive more than two arcs. In transport, a node is a point where several paths (such as roads, bus services, railway lines or air links) intersect. These nodes can be open to the outside or not. In the first case, they are places of exchange, with entry and exit, allowing to interconnect different networks. In the second case, the node is only a technical one without entry and exit, closed to the outside (Offner & Pumain, 1996, p. 258).

[57] *"Lieux d'échanges"* in French, see Offner and Pumain (1996, pp. 32, 256).

regards their technical standards of functioning, methods of management, institutional responsibility, uses, and the coverage of the territory ranging from local to intercontinental scale. Consequently, the different flows of passengers and freight passing through the airport fall within the scope of territories of heterogeneous levels.[58] Accordingly, a multi-modal transport chain is also a multi-level one (Offner & Pumain, 1996, p. 30). This is one reason why network nodes constitute privileged places for interaction between networks and territories (Offner & Pumain, 1996, p. 32).

As Offner and Pumain (1996) underlined, network nodes, that are also access points, represent original community facilities raising specific problems as regards their architectural conception, their management as well as the technical and financial treatment of the generated nuisances. This may be explained by their function to concentrate and to redistribute traffic and by the multiplicity of flows they interconnect. This reflection applies in particular to airports. Moreover, airports can develop from network nodes to poles of economic activity that are acting as structuring elements of the surrounding space (Offner & Pumain, 1996, p. 33).

2.2. The airport as gateway to the world supporting the functioning of territories

Before discussing the role of airports as gateway to the world, it has to be pointed out that airports themselves have become poles with a diversified and complex economic activity and accumulate a multitude of uses and functions. In particular, the immediate vicinity of the airport[59] concentrates a variety of activities, including those being directly related to aviation but forced to locate outside due to a shortage of space on the airport site (e.g. air freight centres and airlines) and those being heavy airport users, mainly because they are subject to limited response times or need to be at nodes of the network convergence. But there are also wide-ranging activities (such as logistics and distribution centres, business parks) for which the airport area is attractive due to its good accessibility and the good image even though they do not necessarily need to locate in the immediate proximity of the airport (IAURIF; ADP, 2001, pp. 75-77). Beyond the airport area, the airport may give a geographic focus to the aviation industry and to the development of related businesses (IAURIF; ADP, 2001, p. 203).

2.2.1. A gateway to the world

The primary function of the air transport network, through airports, is to allow freight and passenger to circulate at a national, an international, and even an intercontinental level. In this respect, airports are gateways to the world and allow the city and region they serve to be

[58] According to Offner, Pumain (1996, p. 30) this phenomenon is also called *"télescopage des échelles"* which means the collision or interpenetration of different geographic levels.

[59] The immediate vicinity of the airport is called airport area by IAURIF and ADP (2001) which propose to consider an area with a radius of about 10 km around the platform. The airport area ranges between the airport site referring to the platform and its immediate surroundings and the airport region which is much larger.

connected to the worldwide movement of goods and persons. Thus, airports provide a service for the regions' habitants and firms allowing them to travel and to access foreign markets. The other way round, airports are a competitive factor for attracting tourists but also increasingly volatile business activities and inward investment (IAURIF; ADP, 2001). Hence, airports contribute to the territorial, economic and tourist-related, development of the region served. For remote, geographically isolated cities, airports constitute a vital link to the outside world.

2.2.2. A factor of the territories' development

It is largely acknowledged that airports influence positively the development of the territories served by them, although these effects, e.g. on employment and income, are not automatic; for this reason, infrastructure is mostly considered as a necessary but not a sufficient condition for development. Nonetheless, airports work as a support for the functioning of territories, in particular if they are well interconnected with other transport networks. Opinions rather differ on the precise link between infrastructure and development.

2.2.2.1. …by improving their accessibility

Airports, like other transport infrastructure, contribute to the territories' development by a major improvement of their accessibility. This depends of course on the airport's offer of air services (e.g. destinations, frequencies, direct or indirect flights) but also on the airports' localisation (and those of rival airports as the number of access points to the air transport network is limited) and its integration in other transport networks. As regards the air transport network, tunnel effects[60] may appear which have for consequence that two zones being spatially discontinuous can constitute one homogeneous zone regarding transport facilities.

In fact, the airport's own accessibility is an important factor for its attractiveness, even if demand for accessibility depends on the market segment (insofar as certain passengers do not accept long access times to join the airport while others do). The airport's accessibility is influenced by its integration in the secondary road and highway network and by public transport services to the airport (urban transport services since airports are often located outside the town, but also railway services, especially high-speed railway services).

Insofar as some regions benefit from a better accessibility, others are disadvantaged by reduced travel times between those regions having better train services whereas distances remain unchanged. Depending on choices as regards railway services, especially high-speed railway services, the railway network does reinforce to different degrees already existing differences in the accessibility of the territory and creates discontinuities where the notion of proximity loses its relevance and tunnel effects may appear.[61] To which extent, this depends on technical aspects of infrastructure (like HST lines vs. classical train lines) but also on the operating mode including aspects like transfers and waiting time but the number of stations

[60] See Offner, Pumain (1996, pp. 46, 251), according to Plassard (1989).

[61] On the contrary, the secondary road and highway network is much more homogeneous with a permanent access for users and a quite constant speed (Offner & Pumain, 1996, p. 45).

served on the way is also of relevance.[62] As regards air transport, this effect is even reinforced because of fewer access points and a higher travelling speed.

By improving the territory's accessibility, airports – like other infrastructure – have a socio-economic impact (Fritsch, 1999). In the short term, direct effects on mobility and trips/movements are quasi-automatic and may lead to modal transfers and spinoff traffic[63]. These can be explained by reduced transport costs, saved time, a better regularity, a higher security and more comfort from which benefit users (whether they were already travelling or are new users) resulting in changes in behaviour and an increase in mobility. Moreover, there are effects on employment and financial flows of activities that are related to the airport (concerning for example transport services to the airport, catering services etc). Furthermore, indirect effects resulting from changes in activities and their spatial distribution (like the creation and spatial distribution of employment/jobs, the localisation of the population, the development of tourism and the organisation of the firms' activities) can be observed. Concerning the long term, these indirect effects are slow to appear, quite diffuse and difficult to quantify. Above all, they are not automatic as they depend on numerous parameters, especially on the dynamics and potentialities of the zones that are concerned. For this reason, these long-term effects cannot be considered as structuring (Offner, 1993; Offner & Pumain, 1996, pp. 50-51). Most experts converge to say that infrastructure is a necessary condition for the social-economic development even if it is not a sufficient one (Fritsch, 1999). Other experts tend to say that infrastructure seems to reinforce already existing tendencies, accelerating the decline just as the growth of a region.[64]

2.2.2.2. ...by affecting territorial dynamics

In order to better understand territorial dynamics (urban and regional planning), recent approaches place emphasis on an improved quality of coordination between transformation and circulation activities, of which is composed production, whereas development is a non-spatial phenomenon that is perceived rather in terms of accessibility and transport cost in traditional transport economics (Colletis-Wahl, 2000). Circulation activities refer to a system of circulation of goods, persons, information and knowledge that is based on interactions between the transformation process and its environment of resources, suppliers, customers and other producers. In this context, transportation is perceived as a particular set of techniques of interaction in the space-time grid. Beyond geographical accessibility, the concept of organisational proximity with its spatial and circulatory dimensions may be used to comprehend improved coordination (Burmeister & Colletis-Wahl, 1997). The link between infrastructure and territorial dynamics refers to the role of transportation in better

[62] This remark refers to two major differences in operating HST in France and Germany. Firstly, in Germany most high-speed railway lines are classical railway lines that were upgraded for ICE (the German HST). Thus, speed is limited to 200-230 km/h (exceptionally 250 km/h) compared to 300-320 km/h speed of French TGV. Secondly, ICE stops at more train stations on the way than the TGV.

[63] *"Trafic induit"* in French, *"induzierter Verkehr"* in German. It refers to all additional traffic due to a new transport service or a new transport infrastructure that is brought into service, including additional trips by persons that already traveled but who now travel more as well as trips of new users that did not travel before.

[64] See Offner and Pumais (1996, pp. 51-52), according to Plassard (1992).

coordination. Accordingly, the effect of infrastructure on territorial dynamics is explained by a modification of the quality of coordination made possible by a different use of transport systems. As a consequence, the influence of infrastructure and transportation on territorial dynamics is an indirect one, not triggering development but being a permissive condition. (Colletis-Wahl, 2000). For this reason, infrastructure is considered as a necessary but not a sufficient condition for development, agreeing largely with traditional transport economics as mentioned above.

2.3. The airport as network operator

An airport operator manages a nodal infrastructure, thus contributing to the functioning of the network. Certain airport authorities operate, and sometimes, coordinate several platforms. Moreover, they have to manage the interface to other transport modes since most airports are well integrated in different transport networks. So the airport operator can be considered as a network operator even if he is, in the first place, operator of a network node. By running his own infrastructure node and by cooperating with airlines (the latter operating aircraft and coordinating air services), he reinforces the airport's position within the air transport network. This applies also to other transport networks with which the airport is interconnected.

2.3.1. Influencing functional spaces and territories

The network operator follows his own reasoning and is mainly preoccupied with the spatial characteristics of the demand he wants to meet. By his functionalities, i.e. the facilitation of the circulation of goods and persons by making easier the transfer within the air transport network but also between different transport modes, the operator influences both space and territory (Offner & Pumain, 1996, p. 64). By operating a technical infrastructure (even if it is a nodal one), the airport operator has an effect on the space as he modifies the relative position of places. As the airport operator cooperates with airlines, he is also a services provider (even if not operating itself aircraft). As services provider, the airport creates relations and acts within the territory and has also an effect on the territory by the integration of these relations in social-spatial practices (Offner & Pumain, 1996, pp. 77-78). Network operators look for extending their networks and thereby influence the space, i.e. the relative position and situation of places and the spatial analysis of markets.

Airport operators seek for improving their position within the different networks and for extending their catchment areas; the latter corresponding to functional spaces (Offner & Pumain, 1996, p. 29). But they act also on the territory as it is just their service offer that is confronted with the demand which corresponds to the users' practices; these practices creating the territory. The user's decision to use a service depends on its quantity, quality, accessibility, security and reliability. These characteristics of the network create a space of relations that the users will appropriate. As users appropriate the space produced by the network, this one is transformed into a territory. By allowing and facilitating the circulation of goods and persons, the network is involved in social practices and in the creation of a territory of flows. This territory of flows is defined by the possible relations between places, a territory that is in evolution as it depends on traffic flows and as socio-spatial practices are in evolution, too (Offner & Pumain, 1996, p. 97).

As regards the extension of catchment areas[65], it is important to note that an airport can have several catchment areas where passengers and cargo come from because different territories correspond to the different air services (market segments) offered by an airport (Wolf, 2003, p. 18). At the same time, the characteristics of the surrounding territory influence the airport's traffic potentials, just as the airport's supply-side policy. Landside accessibility is one important aspect and refers precisely to the airport's integration into urban public transport, road, railway, and high-speed railway networks and thus also to its connection to the surrounding territory. The diverseness of landside access reflects the diversity of territorial scales into which the airport is embedded (Savy, 2000).

2.3.2. Being embedded into several institutional territories

Besides, the airport is inserted into several institutional territories (municipality, district, "*département*"[66], region, State, European Union[67]). The institutional territory is an area that defines and delimits a community over which an authority rules (exercises political power) in charge of tasks of control and allocation (Offner & Pumain, 1996, p. 29). So, there are multiple actors being characterised by different motivations and interests, which even can be contradictory, and having relations with the other levels of regulation (Offner & Pumain, 1996, p. 71).

It is particularly problematic that the airport area[68] does not correspond to any specific territory or single management authority, despite its relevance for economic development. Actually, almost all airports are located at the boundaries of various political and administrative entities (e.g. several municipalities and "*départements*"). This is linked to the location of airports which are in general situated on the periphery of towns in order to reduce nuisances. Due to the multiplicity of political and administrative boundaries, necessary coherence in spatial planning policies is not self-evident. Instead of being at the centre of a strategic planning area, the airport is often located on the fringes of several such areas (IAURIF; ADP, 2001, p. 89)[69].

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[65] See chapter 4 for discussion of catchment areas.

[66] The "*département*" is a French administrative unit.

[67] The emergence of the European Union as institutional territory is a recent development and is based on the treaty of Maastricht in 1993.

[68] The term "airport area" was proposed in a study on the regional embeddedness of eight European airports (London Gatwick and Stansted, Paris CDG and Orly, Frankfurt, Amsterdam, Brussels and Dublin) published by IAURIF and ADP (2001). It refers to the immediate vicinity of airports, i.e. within a radius of about 10 km around the airport.

[69] In the Frankfurt conurbation, land use planning has been organised on a regional scale for more than 25 years with 43 municipalities forming the *Umlandverband Frankfurt* which established a common land use plan. The airport site will be integrated better in the strategic planning area after 01/04/2001 when the *Umlandverband*

This involves e.g. a lack of coherence and interaction between the planning of large-scale land-based infrastructure, conducted in general at regional, sometimes at national level, and planning for land use usually attributed to the local level (IAURIF; ADP, 2001, p. 89). This poses also a difficulty in resolving the conflicts on the nuisances from the airport activity. In this respect, the construction of real airport territories (Charmes, Synthèse des travaux du comité scientifique, 2000) around common interests is put forward. Therefore, the different parties involved have to become aware of the interdependence between the airport getting necessary resources, such as labour, services and equipment from the surrounding territories and the latter benefitting from induced territorial dynamics. In this context, structures for coordination and cooperation[70] have been established in a number of regions in order to reconcile the often divergent or even conflicting interests of the large number of parties involved, but with varying results.

Closely connected with are two other terms: territoriality and territorialisation. *Territoriality* relates to "[t]he assignment of persons and social groups to discrete areas through the use of boundaries... [H]uman territoriality is viewed as the strategy used by individuals, groups and organisations to exercise power over a portion of space and its contents..." (Johnston, Gregory, Pratt, & Watts, 2000, pp. 823-824). *Territorialisation* refers to all processes under way to construct and/or to produce a territory so that it exists. This process is intrinsically tied to another issue: the governance[71] of airports and thus to the legal, political and operative definition of the relevant territory and the concerned parties, to the modalities of consultation as well as to forms and levels of cooperation between the different parties involved (Charmes, 2000).

Conclusion: The spatial and territorial embeddedness of the airport reflected in the airport operator's tasks

The spatial and territorial implications of the implementation of a network, through the airport as physical, nodal infrastructure in this case, are also reflected in the airport operator's different tasks. He is responsible for the technical management of the airport, i.e. operating the airport in the strict sense of the word, the commercial management of the demand (of airlines, passengers and shippers) but also the strategic management with respect to relations with regulatory authorities, to investments, to pricing and to forecasts (as regards structural changes of demand and ecological considerations to be taken into account). Consequently, the

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Frankfurt will be transferred into a new planning association with 75 municipality members (IAURIF; ADP, 2001, p. 89).

[70] As IAURIF and ADP (2001, p. 19) observe, probably in Amsterdam the structures ensuring a certain degree of coherence in spatial planning in the airport area are the most developed. In France, the so-called airport communities ("*communautés aéroportuaires*") were established by the law n° 2004-172 of the 23 February 2004. Their task is to intervene in environmental and quality of life issues for residents, in issues related to the economic impact of the airport activity on the territory and to the access of residents to employment and to the public amenities of the airport as well as in terms of information to the population.

[71] Following the normative approach, governance refers to a form of institutional learning that is developing in search of mechanisms of regulation, coordination and control.

airport operator has to negotiate with the institutional territories into which it is embedded. Moreover, the airport operator is confronted with the territory of social practices (Offner & Pumain, 1996, pp. 78-79).

In this respect, the territory constitutes a constraint but also a resource and represents thus limits and potentialities; limits because certain aspect cannot be influenced (such as the airport's location and the socioeconomic characteristics of the population living in the airport region) but also potentialities if the airport manages to adapt to local conditions and to increase the airport's social acceptability for their durable integration into the surrounding territories. This means also to reinforce interdependency between the airport and local territories and to promote the concept of airport territories in order to overcome administrative boundaries and to reduce institutional interfaces. This is even more important since liberalisation and privatisation tendencies have affected the airport business and airport operators are caught between market reasoning, where he considers also private efficiency criteria and has to give an account of his activity to shareholders, and the intervention of public authorities, that requires him to take into account social-economic aspects. The increase in air traffic over the last years has still reinforced this necessity and only its successful handling may safeguard the future development of the airport.

3. The state of the art

The two preceding chapters placed emphasis on the evolution of the airport business, due mainly to the development of the political framework and to the growth in air traffic not only leaving airports more room for manoeuvre but also forcing them to map out their own strategies for responding to changes in their environment and for safeguarding future development, and on the strong relationship between airport and territory, the latter representing limits and potentialities to the airport activity.

From this first observations arises the idea to consider the territory as an instrument for analysing airport strategies as it represents constraints but also opportunities. The basic idea is to cross growth strategies pursued by airports, which are reflected in the specialisation or profile developed by an airport and inevitably fall within a territorial framework, and an analysis of the territory, which reveals the strategies that are implemented by the airports and are coherent with the interests and objectives of all other players that have a stake in the airport activity.[72] In this respect, the emphasis is on observed strategy[73], which can be deliberate (according to a plan), emergent (reflecting a pattern[74], i.e. "*consistency* in behavior, *whether or not* intended"[75]) or include both emergent and deliberate elements[76]. While a deliberate strategy is realised as intended, an emergent strategy corresponds to a pattern in a stream of actions (Mintzberg & Waters, 1982) that may appear without preconception. This means also that an observed strategy does not necessarily need to be intended or formulated.

The third chapter goes deeper into four major issues for airports which are connected to their spatial and territorial embeddedness: Chapter 3.1 focuses on the airport's capacity to attract air traffic which is affected by the location of the airport (external or so-called "natural" factors) in addition to the airport's supply-side policy. Then, chapter 3.2 pays attention to intra- and intermodal competition, the degree of which depending once again on the airport's location, in addition to other factors. As regards competition in the airport sector, it has not been an attractive subject to research in the past even if first works date back to 1970s (Christiansen, 1977). It is the liberalisation of air transport, which has been followed by a significant growth of air traffic that has attracted the scientific and public attention on airports. However, there is still some debate over certain aspects. Chapter 3.3 concentrates on publications on the geography of air transport which analyse the consequences of airline strategies on the distribution of air traffic. Certain of these publications take, to different degrees, into account the spatial and territorial context but they generally reduce airports to a

[72] As underlined by Offner and Pumain (1996, p. 97), changes in networks and in territories are characterised by conformity and similarity: On the one hand, the airport operator has to interpret the territory and to adapt the network; on the other hand, social practices take advantage of spatial evolutions for transforming the territory.

[73] Compared to declared strategy (by the airport authority itself or another actor having power over it) where the difficulty is that it does not necessarily correspond to the intended or the realised one.

[74] Plan and pattern are two of the five definitions of strategy distinguished by Mintzberg (1987). See also Mintzberg and Quinn (1991, pp. 12-19) in particular on strategy as a pattern.

[75] Mintzberg and Quinn (1991, p. 13). Words in italics or American English are cited in conformity with the original text.

[76] See Mintzberg and Quinn (1991, p. 14) for the distinction between deliberate and emergent strategies.

simple infrastructure allowing aircraft to take-off and to land. Finally, chapter 3.4 refers to strategic airport management: Only few publications deal with this subject and mostly from business studies' point of view thus neglecting the spatial and territorial context into which airports are embedded.

From this literature review, conclusions will be drawn regarding lacks in existing research which will lead to the emergence of objectives of this work.

3.1. The airport's capacity to attract air traffic

Although giving parts of an answer, most studies on air transport demand or on airport choice in a large metropolitan area[77] do not respond to a rather simple question which arises when focusing on airports: How can be determined the traffic volume of an airport? Otherwise, how can be explained its capacity of attracting traffics? The attractiveness of an airport is determined in particular by airline strategies as their flight planning may render an airport's transport offer more or less interesting for travellers. However, the traffic volume depends on various factors of which Wolf (2003) proposes a classification. Therefore, he subdivides the potential total traffic of an airport into its potential origin-destination traffic and its potential transit traffic.

The origin-destination traffic refers to passengers and freight (including mail) starting or ending their trip at the airport in question *(terminating passengers/freight/mail)*. Mostly, they join the airport by ground transport (i.e. by car, bus or train). On the contrary, transit traffic is related to passengers and freight arriving and leaving the airport by plane. In this respect, *transfer passengers/freight or indirect transit passengers/freight* arrive and leave on a different aircraft within 24 hours or on the same aircraft but under a different flight number while *direct transit passengers/freight*, after a short stop, continue their journey on the same aircraft on a flight having the same flight number as the flight on which they arrived.[78]

In both cases of origin-destination traffic potential and transit traffic potential, Wolf (2003, pp. 12-19) distinguishes between so-called "natural" or external factors, that the airport

[77] Most studies on air traffic are realised at a national level linking the traffic volume to socio-economic factors that characterise air transport demand. In general, they give an insight into factor that may explain air traffic but do not take account of the choice of a specific airport, such as Liese (1977) and Abed, Ba-Fail and Jasimuddin (2001). In return, a number of publications focus on the factors that may explain the choice of a specific airport by a passenger from several platforms in a large metropolitan area. These studies are usually based on the traffic analysis of specific air routes and to surveys about a sample of passengers often carried out by the airports themselves. Different variables like the access time to the airport, the frequency and the ticket price are used for explaining airport choice. See e.g. Pels, Nijkamp and Rietveld (2000) on airport and airline competition for passengers departing from a large metropolitan area; Cohas, Belobaba and Simpson (1995) on the role of prices and of frequency when modelling an airport's market share showing the repercussions of changes in the airport's offer on the choice of an airport; Hess and Polak (2005) and Holzschneider (2000) on the use of different models for explaining the choice of an airport in a multi-airport region.

[78] These definitions correspond to the terms generally used in air transport studies. A glossary of terms used in air transport statistics was published by Eurostat, ITF and UNECE (2009) in order to resume definitions coming from various sources like ICAO, ACI and AEA. The term "terminating freight" does not figure in this list. Nevertheless, it is used and can be found in numerous publications.

cannot influence directly, and factors related to its supply-side policy. Besides, its scope for action is limited by the legal, institutional framework in which Wolf is interested in particular. His analysis applies to passenger and goods transport even if this is not specified in each phrase in order to avoid repetition.[79]

3.1.1. Factors determining the origin-destination traffic potential

Factors determining the demand for origin-destination traffic have been subject to several studies.[80]

Concerning the potential origin-destination traffic, the *"natural" factors* are strictly connected to the airport's catchment area like its economic structure, its density and the socioeconomic structure of the population living there, its offer of ground transport and the location of the airport within this zone. Contrary to these "external" factors out of the airport's reach, *factors related to the airport's supply-side policy* depend on the airport's strategies. These factors include the quality of its services, its pricing policy, and in certain cases the performance of ground transport to the airport and the offer of ground transport in general.

As the natural factors refer to the characteristics of the catchment area, it is necessary to suppose in a first step that the catchment area is fixed, i.e. it can be clearly delimited from other airports' catchment areas. In practice, this clear distinction is impossible. This is why the airport's transport offer is of such an importance and consequently the airport's supply-side policy, too.

"Natural" factors

The importance of the *economic structure of the catchment area* results from the fact that certain branches (electrical engineering, mechanical engineering, consulting and liberal professions…) have a pronounced affinity with air transport and ask more often than the average for these services. Besides, business travellers use more often the plane than persons travelling for other reasons (such as leisure activities or holidays). The foreign trade intensity of the airport's catchment area is also of a certain importance. The example of Germany shows that by far the biggest part of the air transport is international traffic.

Concerning the *population density and the socio-demographic structure of the catchment area*, studies showed a positive cause-effect relation between the amount of disposable personal income and the frequency of flights. Especially, the demand for international flights is characterised by a high income elasticity. Within the catchment area, a high average disposable income per capita implies a relatively high potential for air traffic in comparison to a similar zone where the disposable income is lower. Besides, a comparable link exists

[79] Discussion of factors determining the origin-destination traffic potential and the transit traffic potential refers to Wolf (2003), or else other references are cited.

[80] Wolf (2003) refers to Christiansen (1977, p. 50ff), Doganis (1991, p. 200ff), Pompl (1998, p. 141ff), Tretheway and Oum (1992, p. 11ff).

between the potential traffic and the population density: the more the number of inhabitants in the catchment area increases, the more the number of flights increases.

The *location of the airport within the catchment area* is very important for its accessibility. An airport being situated close to the centre can be joined often more easily by most travellers and haulage companies than an airport being situated in a peripheral area. However, the last sentence has to be put in the right perspective as this is true as long as the accessibility of an airport in a densely populated zone is not hindered by traffic jams which can reduce its attractiveness.

The *ground transport offer competing with the air transport* has direct repercussions on the airport and an influence on its intermodal competitiveness. Car and high speed railway are the two most important competitors, especially on short distances. In parallel, the airport can take advantage of their services if the latter is complementary and not intended to act as substitute for air transport. Thus, the good integration of an airport in the railway network can lead to a decrease in access time and thus to an increase in the air traffic potential.

Factors related to the airport's supply-side policy

The *quality of airport services* concerns in particular infrastructure installations and handling facilities which determine the services (flights and other services, e.g. concerning the handling of goods) that can be proposed to potential users. For example, the various types of aircraft have different requirements as regards the physical structure of constructions as well as safety and security devices/installations. In this context, the behaviour of potential passengers also plays an important role: business travellers often prefer flights in the morning and in the evening and to a lesser extent around midday. The infrastructure capacity and the whole activity have to be adapted to satisfy, during rush hours, a demand with a high time inelasticity otherwise the airport would risk that a part of this demand switches to competitors or renounces the journey. In this case, the airport would also lose in attractiveness for airlines.

The *pricing policy* applied by the airport has consequences on the calculation of costs for airlines and on the profitability of the transport offer. In general, a negative correlation between the amount of airport charges and the number of operated flights can be observed. According to a study realised by the Boston Consulting Group (2004, p. 21), airport charges (aeronautical charges and station/ground handling fees) represent about 25 % of the price of a plane ticket. This proportion depends on the airlines' cost structure and pricing policy; it may be much higher for low-cost and charter airlines.

The *importance of landside access* has already been discussed as one of the "natural" factors determining the airport's capacity to attract air passenger and freight traffic assuming that decisions concerning ground transport services cannot be directly influenced by the airport. This does not necessarily correspond to reality as airport operators are concerned about access to their platform even if their ability to influence such decisions depends on circumstances. However, landside access becomes a parameter of the airport's action if the airport operator finances such offers by targeted investments or provides ground access on its own responsibility (may even act as operator of ground access). Good examples are the airport authorities of London and Frankfurt: Fraport participated with about 14 million EUR in the financing of the new ICE train station at the airport (FAZ, 1998, p. V9) and BAA operates since the beginning of the 1990s in cooperation with the national railway authority its own rail link connecting Heathrow airport to the city centre of London by running this railway line on its own responsibility (Doganis, 1992, p. 29).

3.1.2. Factors determining the transit traffic potential

The transit traffic is of a particular importance. It does not only contribute to the airport's overall traffic but has also a positive, direct effect ("induced traffic") on the origin-destination traffic through the airlines' flight planning (e.g. a large range of destinations[81] and high frequencies) due to technical-economic production conditions in the airline business and certain characteristics of the demand for flights. Contrary to the demand for origin-destination traffic, transit traffic has often been neglected. Its importance has grown with the implementation of hub and spoke networks[82] since the liberalisation of air transport. The transit traffic volume depends also on "natural" factors as well as on the airport's supply-side policy.

"Natural" factors

In principle, the "natural" factors determining the transit traffic potential are largely the same as in the case of the origin-destination traffic potential: *the economic structure of the catchment area, the population density and the socio-demographic structure of the catchment area as well as the offer of ground transport competing with air transport.* In addition, empirical analyses have shown that also *the location of hub airport in comparison with international traffic flows* has to be considered. This similarity results from the airlines' behaviour: The latter try to propose direct air services to the biggest number of their customers even when operating a hub and spoke network. Nonstop flights represent a service of a better quality for which especially business passengers are disposed to pay a higher price thanks to shorter journey times in comparison with stopover connections as well as to a reduced probability of missing connections and of losing baggage (Bauer, 1987). In practice, airline networks that are organised according to the hub and spoke model are often hybrid ones combining flights via the hub and direct connections if the traffic volume is sufficient. On that account, airlines consider those airports as the most appropriate for a hub position which already have a high origin-destination traffic volume and a large number of passengers with a relatively high price inelasticity.

[81] Including those destinations that would not be proposed in the case of direct air services as demand was not high enough but which could be served by combining passengers with different origins and destinations. Hub and spoke networks allow the airlines to operate routes more frequently with larger aircraft at higher load factors, thus reducing costs (Bailey, Graham, & Kaplan, 1985, p. 74; Bauer, 1987). See also chapter 5 on the impact of the implementation of the hub concept on the flight offer at the hub airport.

[82] A hub and spoke network is hierarchically organised with a small number of platforms (hubs) which allow to consolidate traffic from diverse origins (spokes) or to redistribute traffic to a range of final destinations (Button, 2002). See chapter 5 for more details on the emergence of hub and spoke networks.

As for *the location of the hub airport with regard to international traffics flows* (Bauer, 1987; Butler & Huston, 1991; 1993), it can be noticed that airlines prefer airports as hub, which are situated close to their main markets, i.e. near the regions where passengers start or end their trips. This contributes to a decrease in flight distance and consequently to a reduction in transport costs and time. For this reason, the location of an airport with respect to the airlines' markets, and thus indirectly the economic structure of the airport region, determines its potential for the development as hub (Bailey, Graham, & Kaplan, 1985, p. 74; ADV, 1997, p. 46ff).

Factors related to the supply-side policy of the airport

In respect of the airport's supply-side policy aiming at attracting transit traffics, the same factors like those determining the origin-destination traffic potential can be cited. However, the hub function makes high demands on the quality of airport services in order to reduce the inconveniences of transfers for travellers and to avoid that passengers switch to other airports or towards other transport modes. The ideal hub is thus characterised by the biggest number of flights from spokes arriving at the hub at the same time in order to take off immediately after the time necessary for transfer (Bauer, 1987).

Hubbing has considerable consequences on the organisation of the airport activity because it is based on both a spatial and a temporary concentration of air traffic flows[83] (Burghouwt, Hakfoort, & Van Eck, 2003; Burghouwt & De Wit, 2005). For this reason, the hub airports are confronted with the following exigencies:

- to meet peak load requirements
- to guarantee fast transfers (which requires often the reorganisation of activities and the development or modification of airport installations)
- to assure that delayed flights disturb the least possible the traffic in the hub
- high-performance logistics for baggage handling (ADV, 1997, p. 55)

The minimum connecting time can be considered as a good quality feature of airport services as it represents the minimum time necessary for a transfer. The latter depends on several factors: on the construction of the airport as it determines the airport's possibilities to compensate delays on short notice; on process organisation and operating procedures; on the airport's total traffic volume which affects the probability of delays as well as on flights schedules since they set the maximum load for airport capacity (ADV, 1997, p. 55).

3.2. Intra- and intermodal competition

The question of competition in the airport sector has been debated for a long time. Traditionally, the airport industry was regarded as a natural monopoly industry not being capable of supporting competition (Starkie, 2002, p. 66). For this reason, regulation was

[83] See also Burghouwt (2007, pp. 37-147), including a large number of airlines cases.

considered to be indispensable. However, a differentiated analysis is necessary as situations are heterogeneous (Wolf, 2003, p. 44). Relating to airports, their power can be noticeably restricted for two reasons: the counterbalance of airlines and the competition from substitutes.

As regards the competition from substitutes, according to the competitors' origin, two types of competition may be distinguished: competition from rival airports, i.e. intramodal competition, and competition from other transport modes, i.e. intermodal competition.

3.2.1. Intramodal competition

Intramodal competition concerns the origin-destination but also the transit traffic in the case of hubbing.

Competition for origin-destination traffic

Being a hub or not, nearby airports can compete for origin-destination traffic when their catchment areas overlap, even partially. This means that the airport's catchment area is not longer considered to be fixed, i.e. it cannot be sharply separated from other airports' catchment areas. In this respect, competition refers to the potential passenger and freight volume coming from overlapping catchment areas. As it is impossible for the airports to differentiate passengers according to their geographic origin, all passengers living in both catchment areas, which overlap only partially, are going to benefit from this situation of competition. This point is important because the market power of an airport usually increases with the size of its catchment area. However, competition works only if there are no capacity constraints at the airports (Starkie, 2002, p. 68). As a number of large European airports are confronted with shortage in capacity and opposition to the further growth of their activity, they also compete just on their ability to deal with these problems of capacity management and of the social acceptability of their development (Savy, 2000).

According to different studies[84], the tendency towards increasingly overlapping catchment areas and thus intramodal competition depends largely on the distance between airports, the density of population as well as the transport offer (including ticket prices and flight frequency)[85] of rival airports in a given area. In this respect, intramodal competition has been favoured by a number of previously little-used secondary airports becoming attractive for the operation of new point-to-point air services with the market entry and growth of regional and low-cost carriers since the liberalisation of air transport. In addition, the transport offer at a large number of existing airports has been extended with the growth in air traffic.

The economic structure of the area has an impact on the proportion of business travellers who are generally less sensitive to the ticket price and attach great importance to short access times. Thus, the higher is the proportion of business travellers and the shorter is the distance to the rival airport, the higher is intramodal competition. However, the relative importance of

[84] See e.g. Beckers et al (2003, pp. 24-25), Wolf (2003, pp. 45-50), Malina (2006, pp. 49-79) on factors influencing intramodal competition.

[85] Holzschneider (2003).

access time decreases with the flight distance and for leisure passengers who are more sensitive to ticket prices[86]. It is just the number of leisure passengers that has increased over the last years, in particular with the emergence of a new low-cost transport offer contributing to a further segmentation of air transport; a segmentation that is reflected in the several catchment areas of an airport with different transport offers (Wolf, 2003, p. 18).

Moreover, the degree of competition depends on the mobility of demand of passengers/freight coming from the overlapping catchment areas and thus on the airport choice in a multi-airport region (see chapter 4). Passengers' airport choice is often considered within large metropolitan areas with multiple departure airports, suggesting that a "large metropolitan area" could also refer to broader regions like Central Europe and explain competition between airports like Frankfurt, Paris, Amsterdam and London (Pels, Nijkamp, & Rietveld, 2000).

The role of ticket prices in airport choice has been largely explored. In contrast, little research has been done on the price elasticity of demand for airport services as they are generally included into ticket prices. However, airport charges are sometimes indicated separately, otherwise within an item including all charges (e.g. airport charges, security fee, etc.) in addition to the airfare. However, a study (Mandel, 1999b) conducted at Hamburg airport in 1991 suggested that a rise in airport charges per passenger of 50 DM[87], i.e. an increase by more than 700 % as airport charges were very low at that time, would have resulted in a decrease in traffic of 12 % of which about three-fourths would have switched to other modes of transport whereas only one fourth would have switched to other airports. The airports of Bremen, Hanover, Kiel and Copenhagen sharply benefited from this situation to the detriment of other aerodromes having relatively important traffics with Hamburg (as Frankfurt, Dusseldorf or Munich). This means that demand would be rather inelastic with -0.02 (-0.01 for intramodal demand and -0.04 for intermodal demand). However, it is not evident if these results would be the same at other airports. Moreover, the ticket prices have fallen since the liberalisation of air transport while passenger airport charges have increased so that the latter represent today a larger proportion of ticket prices. Therefore, the passengers' price elasticity could be different, too.

The intramodal competition for freight traffic is based on the same logic of overlapping catchment areas. This applies in particular to the West-European context, one of the richest and densest regions where a large part of economic activity is concentrated thus generating relatively big volumes of cargo but where are also located several international airports and distances are relatively short.

In air freight, three different market segments have emerged according to the shipments' weight and volume as well as to the terms of delivery and the corresponding price: general cargo, freight express and postal services. In order to provide diverse services, the transport companies mapped out different strategies in line with the respective market segment and being reflected in the price (Savy, 2000). Delivery times for general cargo are usually of three to six days while the price is relatively low in comparison with express freight (and may even

[86] Beckers et al (2003, p. 25) citing Wolf (1997, pp. 41-46).

[87] Equivalent to about 25 Euros.

be competitive compared to maritime transport). Moreover, the general cargo is subject to fewer restrictions on shipments' weight and volume. Due to the high cost of air transport, the shipment by air of general cargo is usually limited to intercontinental flights whereas ground transport is used over relatively long distances for bringing freight to an airport before it is loaded onto an intercontinental flight or for distributing it after its arrival. For this reason, catchment areas for general cargo are even larger[88] and consequently show an even stronger tendency towards overlapping. Only express freight operators and postal services use intra-European and even domestic flights in order to meet very short delivery times (usually 24 to 48 hours) for what customers accept to pay a higher price. However, they also resort to trucking if it is feasible with respect to transport times in order to reduce costs (Savy, 2000).

Competition for transit traffic

Moreover, the existence of several airlines operating hub and spoke networks leads indirectly to competition between different hubs for transit passenger[89] (Starkie, 2002, p. 66). Only little empirical research has been done on this subject. Nevertheless, some results on the airport choice of passengers in the origin-destination traffic may be applied to the choice of a hub airport (Malina, 2006, p. 56). This means of course that a flight to the hub airport and connecting flight to the final destination must be available. Then, as indicated in studies on origin-destination traffic, the travelling motive is important. Passengers travelling for personnel reasons are more sensitive to the ticket price: An alternative flight via another hub must be available at the same price level. In contrast, business travellers pay more attention to the overall travel time.[90] The overall travel time depends on the minimum connecting time indicating the time necessary for changing the plan, the flight frequency as a higher one allows to reduce additional waiting times and the geographical location of the airport in comparison to the flight direction since an unfavourable location contributes to an increase in flight time (Malina, 2006, p. 56).

Competition for airlines and air services

As intramodal competition depends much on the airport's transport offer, it results also in competition for airlines. It is just on airline companies that the liberalisation of air transport was targeted leaving them the freedom to choose the EU-airports they want to serve. Indeed,

[88] This in line with the results of a study published by the Cranfield University Air Transport Group (2002a; 2002b).

[89] This corresponds to the case where a passenger coming from e.g. Berlin may travel to New York i.a. via Munich or Frankfurt airports (with Lufthansa, United or Continental Airlines), via Madrid airport (with Iberia), via London Heathrow airport (British Airways), via Paris CDG or Amsterdam airports (with Air France/KLM or Delta Airlines). A passenger coming from Lyon may chose a connecting flight i.a. at London Heathrow (with British Airways), at Zurich (with Swiss), at Düsseldorf (with Continental Airlines), at Munich or Frankfurt airports (with United), at Rome Fiumicino, Amsterdam or Paris CDG airports (with Air France-KLM, Delta Airlines). Another alternative would be to go to Paris CDG by train in order take a direct flight operated by Air France or Delta Airlines. (Information taken from current flight schedules.)

[90] Already at the end of the 1960s, a survey on behalf of KLM Royal Dutch Airlines showed (Midgley & Wills, 1969) the vast preference of business travellers for a short overall travel time when choosing an air route via a hub airport.

research on factors of the choice of an airport by an airline reveals differences according to the type of airline. In particular, low-cost airlines are very volatile, ready to launch a promising air route but also to cancel it on short notice if the traffic volume is not sufficient.

Regulatory framework: factors promoting but also reducing intramodal competition

It is just the liberalisation of air transport that contributed to the increasing competition between airports. However, Barrett (2000, p. 14) underlined two aspects that risk decreasing competitive pressure: the dominance of one airline on certain airports being favoured by the current system of slot allocation that is based on the grandfather's rights as well as the structure of airports and their management as the insufficient independence in the organisational structure of airport firms tends to weaken their management and leads to a lack of performance and efficiency and thus of competition. The second point is particularly important as it is related to the picture of the airport as partner within the system that the parties involved in air transport get as well as to the way that the airport perceives itself. The reorganisation of the airports which the liberalisation of the air transport market has brought with opened the possibilities for competition between airports trying to attract airlines as the latter may chose the routes they want to operate within the EU (assuming that they dispose of the necessary slots for take-off and landing).

Generally speaking the competition between airports has considerably increased even though airports are unequally concerned. The intensification of the competition has been favoured by the following factors[91]:

- the modernisation of road and motorway networks and the better integration of airports into interurban railway networks improving the airports' accessibility and bringing them, as regards travel times, closer together
- the development of high-speed railway networks which contribute to the widening of the catchment areas of the airports that are served by high-speed train
- the distribution of charter and freight offers which create immense zones generating traffic for a big number of airports
- the emergence of low-cost airlines following a different business model: being reactive (e.g. opening and cancelling air routes) but attracting less price sensitive passengers
- organisation of air transport networks according to the hub and spokes model creating competition for transit passengers
- as regards the political framework, efforts at the European level to liberalise the whole sector being subject to enormous regulatory constraints
- the increasing efforts of the airports to conceive and develop a real marketing approach.

The considerable potential for competition between airports had also been underlined in a study realised for the European Commission (Cranfield University Air Transport Group,

[91] On the basis of Carré (2000a, p. 11).

2002a). Besides the already mentioned factors, an important potential of competition results from the emergence of point-to-point traffics (as in the case of low-cost carriers), a high number of airports which are, despite the saturation of the very big aerodromes, not used at full capacity and the logic of freight networks with characteristics that are different from those of passenger networks (night flights, not necessarily need for transfers,…). The freight traffic is characterised by different requirements and needs from those of passenger transport. This provides opportunities to attract traffic for airports being capable to meet these demands.

The above mentioned modernization of motorways and the better integration of airports into railway networks improved their accessibility, but the recent progress of HST had more far-reaching consequences: On the one hand, it contributes to the widening of the airports' catchment areas thus increasing intramodal competition; on the other hand, it may act as a substitute for air transport. For this reason, the following chapter deals with intermodal competition.

3.2.2. Intermodal competition

Intermodal competition refers to competition from other transport modes. As regards air transport, competition comes from motorway and railway networks, in particular from high-speed train (HST) running at a speed of up to 300 to 350 kph[92]. However, its relevance is limited to the short-haul air traffic (Starkie, 2002, p. 69), in particular along the principal transport axes.

HST and air transport competing on distances from 300 to 600 km

The choice between different transport offers generally depends on the generalised cost[93], which is understood as a "disutility" i.e. the lower the generalised cost, the greater the utility of the mode. It is composed of the total travel time (including time necessary to reach the airport or the train station), the ticket price and the passenger's value of time[94], the latter indicating the cost of one hour spent in transport and thus what the user is willing to pay to

[92] Givoni (2006) underlined that there is no single definition for high speed as regards railway services: High speed can refer to the infrastructure capability to support high speed, to the rolling stock capability to achieve high speed and/or to the actual operation speed. The EU definition, given in Directive 96/48 (Commission of the European Communities, 1996a), is 250 kph for dedicated new lines and 200 kph for upgraded conventional lines. However, some HST can reach a commercial speed of up to 300 to 350 kph. Even though the technical feasible speed is substantially above, for the present, it seems that a higher average commercial speed would not be feasible due to noise nuisance, high operating costs and other technical problems. See Givoni (2006) for history of HST and main models. Usually HST relates to passenger transport but projects exist for adapting it to cargo services, notably express freight, e.g. the CAREX project (Cargo-Rail-Express) involving Aéroports de Paris, Federal Express, Air France Cargo, La Poste and WFS World Flight Service is intended to operate freight express services by rail from 2012 on, in a first step, between Paris CDG and Lyon Saint Exupery, London, Liege, Amsterdam, and Cologne airports.

[93] Assuming that a passenger will make his choice rationally. See ITA (1991, p. 27ff) for further details on generalised cost calculations and graphic representation. Finally, one can imagine that this simplified model may be extended in order to take into account other parameters (such as the comfort or the preference for a specific transport company which may compensate to a certain degree a higher ticket price).

[94] See chapter 4 for more details on the value of time.

save one hour in travel time. Taking into account the value of time, which is specific to a given traveller, it allows to assess if a passenger would accept to pay a higher ticket price for reducing the journey time. Consequently, the potential for a shift of passengers from air to railway transportation depends largely on the average speed of the HST service and the distance to cover. Different studies estimate that the competition between both concerns distances generally varying from about 300 to circa 600 km[95] but may even go up to 1000 km[96] if the average speed of the HST service is high enough as the latter's rise leads to an increase in the distance on which both transport modes compete. 600 km distance would correspond to an approximate flight time of 1 hour (to which must be added times due to check-in deadlines and baggage claim as well as the time necessary to reach and to leave the airport whereas the train station is usually located in the urban centre).

Evidence from the experience with HST for its capacity to capture market share, in particular up to 3 hours travel time

Indeed, experience with HST reveals its competitiveness as substantial shifts from air to railway transportation could be observed. This effect is particularly strong in lines that are well established (De Rus, 2008, p. 17).

The first HST, the Japanese Shinkansen, was launched in 1964 with an operation speed of 210 kph connecting Tokyo with Osaka (via Nagoya) in 4 hours instead of 7 hours. Since 1992, the travel time has been reduced further to 2.5 hours (Givoni, 2006). Already two years after its inauguration, the air traffic between Tokyo and Osaka (500 km by HST) had dropped by 30 %, on the section Tokyo and Nagoya (300 km by HST) even by 70 % (Wolf, 2003, p. 52). Recent figures indicate a market share of air transport of 15 %, in comparison with 85 % for HST (De Rus, 2008, p. 34).

In France, the first TGV, the French HST, was launched on 27 September 1981 on the Paris - Lyon route (400 km "as the crow flies"[97]) allowing to connect both cities within 2 hours 40 minutes (and even 2 hours since 1983). Between 1981 and 1984, the market share of air

[95] Wolf (2003, p. 51), citing Pieper (1986), Giese (1993) and Wolf (1997, p. 46ff). Railway transportation is more advantageous for distances below 300 km as regards overall travel times due to check-in deadlines, baggage claim and the time necessary to reach and to leave the airport whereas the train station is usually located in the urban centre (Pieper, 1986, p. 196; Baum & Weingarten, 1992, p. 36ff). However, as the plane ticket is usually more expensive than a train journey, passengers may choose the train even for longer distances. Nevertheless, the disadvantage in price of the flight decreases as travel distance increases (Knitschky, Allemeyer, Lehmann, Jakubowski, & Tegner, 1998). See also Malina (2006, p. 83ff) for more details on competition from railway transportation as well as from road transport for German domestic air transport.

[96] 1000 km as an upper limit for competition between HST and aircraft was cited by ITA (1991, pp. 39-40) and Givoni (2006, p. 602). In fact, ITA (1991, pp. 39-40) considered that HST and aircraft are competing between 250 and 1000 km with a modal split being in favour of HST on distances from 250 to 600 km and in favour of the airplane from 600 to 1000 km. However, only beyond 1000 km there is no more competition between airplane and HST. Note that ITA's results are based on (relatively high) air fares charges at the end of the 1980s and on the estimated fares for HST of the future, whereas Givoni (2006, p. 602) took into account a higher average speed for HST services as his study is more recent. Just as increases in operating speed, any changes in ticket prices will affect the modal split.

[97] The indicated distances refer to the distance "as the crow flies" (i.e. the shortest distance between two cities), except as noted otherwise. The railway line is usually longer due to its routeing.

transport in total traffic has decreased from 31 % to 7 % whereas that of railway increased from 40 % to 72 %.[98] (The market share of car and bus also dropped from 29 % to 21 %.) During this period, the total traffic increased by 37 %, being composed of 10 % estimated growth and 27 % induced traffic (Givoni, 2006, p. 601). The number of passengers travelling by air between Paris and Lyon decreased from almost 1 million in 1981 to less than 500 000 in 1985 (Mathieu & Pavaux, 2004, p. 294). The air service on this route is mainly used by persons that want to take a connecting flight in Paris (Baum & Weingarten, 1992, p. 21ff).

On the Paris - Nantes line[99] (350 km), the number of passengers dropped from 550 000 in 1989 to less than 350 000 in 1992 (Mathieu & Pavaux, 2004, p. 294). In 1993, the TGV Nord to Lille, Arras, Calais, and Fréthun is inaugurated and consequently flights to Lille (200 km) have been stopped since then as the travel time by TGV is of only 1 hour. This also happened to flights to Brussels that can be reached within 2 hours since the HSR line has been extended behind the French-Belgian border.

After the inauguration of the Channel tunnel in 1994[100], the Eurostar linking Paris and Brussels via Lille and Calais with London in 2 hours 56 minutes (then 2 hours 35 minutes and finally 2 hours 15 minutes) started operations. On the Paris - London route, the air traffic has fallen by 20 % (Bonnassies, 1997, p. 7) shortly after the launching of HST. Since then, the latter's market share has risen up to about 70 % to 80 %[101]. However, airlines continue to operate flights between Paris CDG and London Heathrow airports (60 flights a day in 2005) which also act as feeder services for their respective hubs.

Since June 2001, the TGV Mediterranée has been connecting Paris via Lyon and Avignon with Marseille (about 660 km) or with Nîmes (580 km) in only 3 hours.[102] Finally, in 2007, the TGV Est linking Paris and Strasburg (400 km) was inaugurated.

Departing from Paris CDG and Orly airports, 28 destinations were already competing with HST for passengers in the 1990s.[103] Between 1989 and 2002, the overall traffic volume between Paris and these destinations increased only slightly from 16.4 million to 16.8 million passengers, i.e. HST stopped the traffic growth on these links. According to estimations,

[98] According to Baum and Weingarten (1992), the share of air transport in total traffic dropped from 21 % to 7 % whereas the share of railway increased from 47 % to 74 %.

[99] The Paris - Nantes line is part of the Bretagne branch of the TGV Atlantique that was inaugurated on 24 September 1989 (serving Rennes, Brest, Quimper, Nantes, and Le Croisic). On 30 September 1990 the South-West branch of the TGV Atlantique serving La Rochelle, Bordeaux, Hendaye, Tarbes, and Toulouse started operations.

[100] The same year, Thalys which is operating the Paris - Lille - Brussels line (continuing i.a. to Cologne and Amsterdam even though on conventional tracks) started services.

[101] Givoni (2006), citing Eurostar 2005, and De Rus (2008, p. 34) indicated a market share of respectively 70 % and 80 % (the latter taking to account only railway and air transportation).

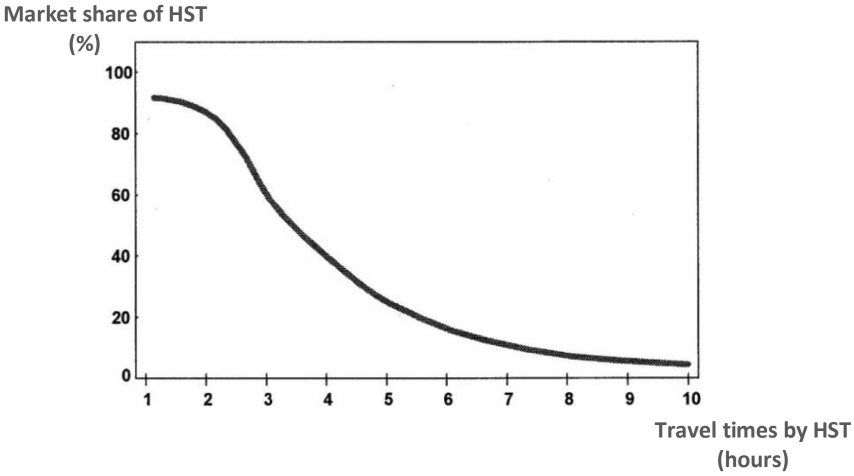
[102] Already in 1994, the Paris - Lyon line was extended to Valence. In June 2001, the TGV Mediterranée started operations with new tracks between Valence and Avignon; then, the main line is dividing up into one branch going to Marseille and another one to Nîmes.

[103] Mathieu and Pavaux (2004, pp. 294-295) considered only air routes with more than 30 000 passengers in 1989 and where the travel times were below 5 hours 30 minutes with more than three round trips per day in 2002, namely London, Marseille, Toulouse, Bordeaux, Montpellier, Toulon, Amsterdam, Geneva, Lyon, Nantes, Perpignan, Biarritz, Pau, Brest, Nîmes, Grenoble, Brussels, Lorient, Quimper, Rennes, Cologne, Avignon, Saint Etienne, Chambéry, Bézier, Lille, La Rochelle, and Annecy.

without the competition from HST about 28 million passengers would have travelled by air on these routes in 2002 (Mathieu & Pavaux, 2004, p. 295).

The following figure 6 indicates the market share of HST according to its travel times on different routes in 2002. It shows that HST is very competitive for distances up to 3 hours (which includes also e.g. a Paris - Marseille trip) where its market share is above 50 %. These results are in line with other studies, e.g. Gonzalez and Savignat (2004, p. 103) considering 3 hours travel time as an upper limit for the competition between air transport and HST.

Figure 6: Modal shift according to the travel time by TGV



Source: Guyard, Chapulut and Ranfaing (2004, p. 20), figure taken from the SNCF

As regards the traffic on the German Frankfurt/Main - Hannover route (260 km), about 30 % of business travellers shifted from air to railway transportation during the first year after its launching (Baum & Weingarten, 1992, p. 31).

The new Madrid - Seville link (470 km by HST) started operations in 1992 reducing travel time from 6.5 hours to 2.5 hours (Commission of the European Communities, 1996d) leading to a drop in the market share of air transport from 40 % to 13 % between 1991 and 1994. During the same period, the train's market share increased from 16 % to 51 %. (The share of car and bus decreased also from 44 % to 36 %.) Moreover, the total traffic increased by 35%.[104]

With the passing of time, the well established HSR lines perform even better. The following table 1 resumes the travel times, commercial speed and the resulting market shares of ten important routes, of which nine routes concern some of the biggest European cities.

[104] According to figures from the Commission of the European Communities (1996d), cited by Givoni (2006, p. 601).

Table 1: Travel time and market share in some high speed rail lines

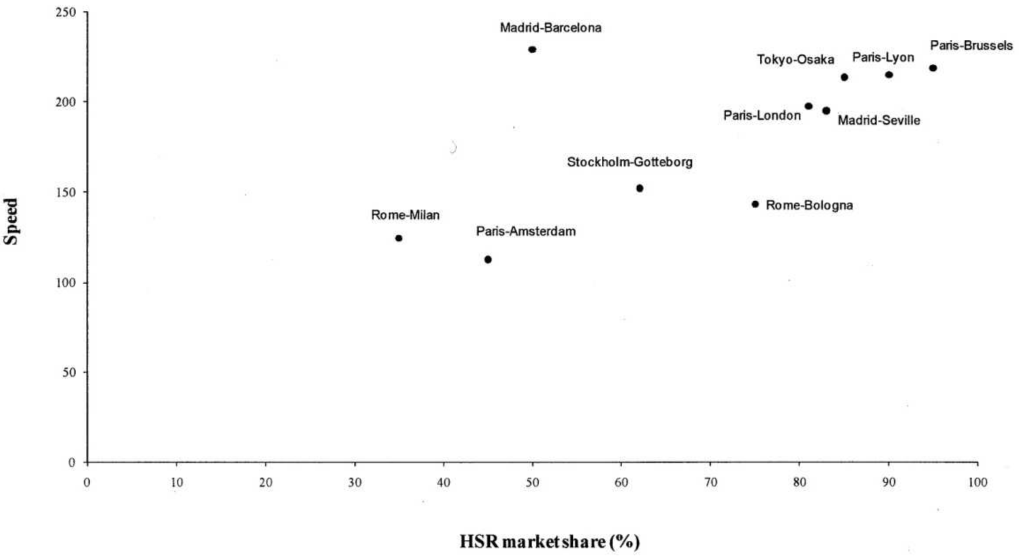
	Length (km)	Travel time (h:min)	Speed (km/h)	Market share (%)	
				Rail	Air
Madrid-Barcelona	630	2:45	229.09	50	50
Madrid-Seville	471	2:25	194.90	83	17
Paris-Amsterdam (1)	450	4:00	112.50	45	55
Paris-Brussels	310	1:25	218.82	95	5
Paris-London	444	2:15	197.33	81	19
Paris-Lyon	430	2:00	215.00	90	10
Rome-Bologna (2)	358	2:30	143.20	75	25
Rome-Milan (3)	560	4:30	124.44	35	65
Stockholm-Gotteborg (4)	455	3:00	151.67	62	38
Tokyo-Osaka	515	2:25	213.10	85	15

(1) High speed only Paris-Bruselles
(2) High speed only Rome-Florence
(3) High speed only Rome-Florence
(4) Upgraded conventional line

Source: De Rus (2008, p. 34)

The market share of HST is correlated with commercial speed (figure 7). At a commercial speed of more than 200 kph, it rises above 80 %. The only exception is the Madrid - Barcelona[105] line despite reducing travel times from 6 hours to 2 hours 38 minutes[106] but it was launched only in February 2008 and it is too early for assessing changes in modal shift.

Figure 7: HSR market share and railway speed



Source: De Rus (2008, p. 34)

There is evidence from the experience with HST that the latter is seriously competing with air transport for passengers, in particular on routes with travel times of up to 3 hours. Intermodal

[105] See e.g. Gonzalez and Savignant (2004) for estimations of the deviation of airline passengers towards HST.

[106] The complete HSR line was launched on 20 February 2008. However, the line has been starting operations in sections since September 2003 thus progressively reducing travel times from 6 hours before the inauguration of the first section.

competition concerns primarily airports located in regions that are well served by HST or in such a central position of a dense area that travel times are already relatively short. This concerns e.g. Hannover, Frankfurt/Main, Cologne, and Düsseldorf in Germany but also Belgium, Luxembourg, the Netherlands and parts of France served by HST. In contrast, airports that are located on the periphery, in regions that are less well integrated into the high-speed network, may be protected against the direct competition from HST, in particular if flight distances are long (Wolf, 2003, p. 52).

However, HST may also be complementary to air transport and represent an advantage for airports having direct HST services as it allows them to extend their catchment areas. Therefore, airports not having access to the high-speed network may be in certain circumstances indirectly affected by competition from HST through the extension of the catchment area of a better served airport increasing the intramodal competition.

The ambivalent character of HST, that may act as substitute but also may be complementary, explains in part the difficulties of the development of intermodal transport even though much progress may be observed in this respect (e.g. cooperation between airlines, airports and railways companies).

3.3. The geography of air transport

There is some literature on the geography of air transport focusing on the impact of airline strategies on the distribution of air traffic within a given territory. Publications such as those of Graham B. (1995), O'Connor K. (2003) and Dobruszkes (2008) appear to be relatively close to this work; that is why they will be shortly presented in the following. Apart from these works, a number of publications deal with the analysis of air transport networks, in particular since the liberalisation of air transport [e.g. Burghouwt and Hakfoort (2001), Burghouwt (2007)]. But as already observed by Dobruszkes (2008, p. 39), they generally consider air transport networks independently of their territorial context with all its diversity.

O'Connor K. (2003) examined passenger movements between 1990 and 2003 showing a development of traffics to the detriment of very big cities and very big hubs for the benefit of next largest cities and hubs. According to him, this reflects changes in demand, technological progress in aircraft construction as well as a new regulation relating to air transport and alliance strategies between airlines. However, airports are not considered separately as the latter's activity is limited to the provision of services to airlines, their main customers. As regards Graham B. (1995; 1998), he analysed the geography of air transport demand. Therefore, he distinguishes seven types of airports based on their function and passenger throughput: intercontinental hubs; airports serving free-standing metropolitan regions; major regional airports; airports serving peripheral core cities; airports serving leisure destinations; secondary regional airports and local airports. Dobruszkes (2008) studied in detail the strategies on which the different airlines embarked on since the liberalisation of air transport and competitive dynamics between them. Therefore, he examined the air transport offer of passenger airlines (i.e. number of flights, seats and destinations) for January 1991, 1995, 1999 and 2005. Results are very interesting, in particular because Dobruszkes took into account the regions' economic nature, re-urbanisation tendencies around metropolises and changes in tourism pattern. In return, he limits his analysis to passenger traffic and focuses on the consequences of changes in the airlines' transport offer on air services to European cities and region, not to airports. This has two consequences: Airports serving the same city[107] are merged to a fictitious one; airports do not exist independently of airlines and thus are not considered to interact with other parties involved in air transport.

3.4. Strategic airport management

Not much literature is focusing on airport strategies. In this respect, the recent publications on airport management of Graham, A. (2003) and Trumpfheller (2006) may be considered as exceptions.

Graham A. gives a large insight into airport economics recognising that "[i]n most of published literature the airport industry has received relatively little attention and has traditionally been overshadowed by the airline sector. Attitudes towards airports have changed dramatically as their role has shifted from that of public utility to that of a dynamic, commercially oriented business" (Graham A. , 2003, p. XII). The latter provided an overview of key management issues to airports; this work will come back to certain of them later on. Trumpfheller (2006) focused on the strategic airport management according to three airport types, namely low-cost airports, origin and destination traffic airports and hub airports.

However, both works neglect the spatial and territorial context into which airports are embedded, and thus also their positioning with respect to other airports or intermodal competition. Indeed Trumpfheller (2006, p. 176 f) acknowledged the relevance of the airport's location but the latter does not seem to influence the choice of a particular strategy and is not reflected either in the consideration of environmental issues although European airports are well competing on the social acceptability of the growth in their activity and on capacity shortage, also for environmental or political reasons not only technical ones, including e.g. the authorisation to handle night flights...

Conclusion: From existing research towards this work

The third chapter considered four major issues to airports which are also closely connected to their spatial and territorial context: Their capacity to attract air traffic which depends on the airport's supply-side policy but also on its location (chapter 3.1); the latter has also an impact,

[107] Dobruszkes (2008, p. 37) considered that airports serve the same city if they are located within a radius of 60 km around the city (e.g. Paris CDG and Paris Orly airports). In certain cases, he even carried out a second grouping in order to include more distant, specialised airports: Beauvais for Paris, Hahn for Frankfurt and Skavsta for Stockhom.

in addition to other factors, on the degree to which airports are competing with rival platforms or with other transport modes (chapter 3.2). Whereas works on the geography of air transport usually consider the airport as simple infrastructure allowing aircraft to take-off and to land (chapter 3.3), publications on strategic airport management are based on an approach from business studies and therefore neglect the airport's spatial and territorial context.

Thus, this short overview of recent research confirms the idea, emerging from the first two chapters, to focus on the emergence of the airport as a strategic player within the air transport industry and to consider the spatial and territorial context as an instrument for analysing airport strategies as it represents constraints but also opportunities. Airport strategies inevitably fall within a territorial framework; the analysis of the territory reveals the strategies that are implemented by the airports and are coherent with the interests and objectives of all other players that have a stake in the airport activity.

Considering the airport as a player within the air transport system, even if it is affected by its environment in a large sense, this work proposes a contribution to current discussion about airport economics. Therefore, this works has two objectives.

Objective 1: Analysing the European airport business within which the airport emerges as a full player.

One objective of this work is a comprehensive analysis of the European airport panorama and of the airport business focusing on the emergence of airports as strategic actor in the air transport system: identifying different agents, their rationales and their relationships with a focus on airports that are subject to the dynamics arising from the interactions between the different parties involved. This analysis includes very diverse elements like those creating new potentialities for developing the airport activity (the evolution of the political framework, characteristics of airports, revenues and ownership patterns) but also those that may be restrictive, such as factors of the choice of airport by airlines and public policies being directed at the airport (flight restrictions in order to reduce noise nuisances, slot allocation), but whose control may contribute to safeguard the airport's future development. With respect to airport strategies, the specific situation of an airport, i.e. the spatial and territorial context into which it is embedded, is important and this aspect is just neglected in existing literature since most of them are based on a business studies approach.

Considering the airport business as a whole, the review resulting from this analysis necessarily tends to generalise in a sense as it cannot take into account the specificity of each individual situation. However, this analysis is necessary because the large majority of literature related to airports is very specific, concentrating on one particular aspect. Of course, it is justified and necessary to research issues like the optimal structure and level of airport charges or the optimal noise surcharge to apply at a specific airport, the optimal way to allocate slots, etc. But by placing emphasis on specific details, one can lose sight of the airport business as a whole. For this reason, this work proposes to leave this level of "details" and to consider the airport business as whole within the air transport system with different elements working together, of which emerges the airport as a new strategic player.

Objective 2: Exploring more in detail the link between airport strategy and the spatial and territorial context into which the airport is embedded.

Existing research on the airport's capacity to attract air traffic (Wolf, 2003) underlines the importance of the airport's catchment area and its economic structure, its density and the socio-economic structure of the population living there, the offer of ground transport and the location of the airport within this zone in addition to factors related to the airport's supply-side policy. Since there is a link between the general traffic volume of an airport and particularly the socio-economic characteristics of its catchment area, another question arises: It refers to the link between the spatial and territorial context into which an airport is embedded and the airport's profile. Supposedly, a bidirectional link between territory and airport strategy exists: On the one hand, the territory which is affected by the airport depends on the different market segments served by the airport and thus on the airport's profile; on the other hand, the territory influences the airport's potential to develop certain traffics. Thus, the airport's catchment area, which is defined as the territory where the existing and potential traffic lies, cannot be considered to be fixed and unique but different catchment areas emerge from different market segments which by the way may overlap with the catchment areas of nearby airports.

For this reason, the second objective of this work is to explore this link between airport strategy and the spatial and territorial context into which the airport is embedded, a link that is missing, or at least not explicit, in recent research.

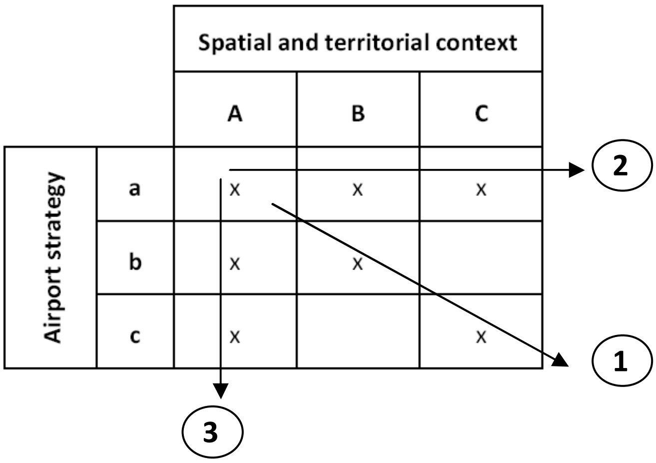
Considering the European airport panorama, the focus is on the specific territorial context within which the different airports develop their activity. In this respect, the following question comes up: *In which way do territorial aspects determine airport strategies?*

In fact, this question is composed of two subquestions that should be answered first: *Which strategies do airports implement? Into which spatial and territorial context are they embedded when pursuing their strategy?*

Finally, three further questions arise from the possible combinations of airport strategies on the one hand and the spatial and territorial context on the other hand as illustrated in figure 8, <u>even though the objective is not to come up with a precise taxonomy</u> as regards the spatial and territorial context:

1) Airports pursuing similar strategies are they embedded into a similar spatial and territorial context?
2) Airports embarking on similar strategies may they be in a differing spatial and territorial context?
3) Airports being embedded into a comparable spatial and territorial context, do they choose different strategies?

Figure 8: Airport strategy and spatial/territorial context



Own figure

By exploring this link, this work proposes a different view on airports. The territory constitutes an instrument for analysing airport strategies; it reveals the strategies that are implemented by the airports and are coherent with the interests and objectives of all other players that have a stake in the airport activity; the strategies being revealed through an analysis of the territory

4. Method applied

This work is based on an observation of the European airport panorama which shows a much nuanced scenery, not only as regards the size of the airports but also in respect of their functions, their markets and customers, with generalist platforms and more specialised ones. The scope of this development emerges when leaving the national level for the benefit of the European one beyond the countries' frontiers. Thus, this work deals with observed airport strategies. Using the term "strategy" may evoke discussions. In order to guard against misunderstandings, it shall be underlined that the emphasis is on observed strategy, that can be deliberate, and thus correspond to a plan, but that can also be emergent, hence reflecting a pattern (Mintzberg, 1987) which is some kind of "*consistency* in behavior, *whether or not* intended" (Mintzberg & Quinn, 1991, p. 13)[108]***.*** This concept of strategy is relatively comprehensive. However, it does not require official declaration or insider information. This is an important point in respect of the feasibility of this work as the airport industry has been less disposed to inform about their activity (apart from well controlled official communication) since undergoing a large restructuring process with widespread tendency towards privatisation.[109]

One objective of this work is to explore the link between airport strategy and the spatial and territorial context into which the airport is embedded in order to find clues as to how the territorial context determines airport strategy. This leads to a two-step analysis which will be explained chapter 4.1. In this respect, the notion of catchment area is essential and will be considered in detail. The following chapter 4.2 deals with the implementation of the analysis for which two points are interesting: the application of the concept of catchment area and the data used for analysis.

4.1. Analysis in two steps

As aforementioned this work was based on an analysis in two steps: a first one focusing on strategies airports are embarking on whereas the second one is concentrating on the spatial and territorial context into which the airport is embedded.

4.1.1. Airport analysis

In a first step, the emphasis was placed on airport strategies. Therefore, the analysis consisted in gathering information on about 100 European airports as regards their functions and their

[108] Remember the difficulty of declared strategy: it does not necessarily correspond to the intended or the realised one.

[109] This impression is based on personal experience with different airport authorities that were contacted during the realisation of this work. Therefore the author is grateful to Aéroports de Paris, Strategy Department (Risk Analysis and Monitoring Division), and in particular to Mr Christophe Lebre, for having welcomed her to a 4-month internship.

market segments. Therefore, information on passenger and freight traffic was collected and analysed, including destinations, traffic volumes, airlines, etc. The result of this first step is a kind of taxonomy[110] which allows to distinguish different types of airports according to their position within the air transport system: hub airports, airports with a specialisation in freight traffic (general cargo or express freight), low-cost or charter traffic or having a regional specialisation. Besides, a number of airports combine different activities. Their geographical distribution will be visualised by means of MapInfo®, software for mapping and geographic analysis.

4.1.2. Analysis of the spatial and territorial context

In a second step, the spatial and territorial context into which the airports are inserted will be examined as it has an impact on the origin-destination traffic as well as on the transit traffic. Therefore, the analysis will focus on the airport's catchment areas with their socio-economic characteristics using MapInfo® software. This allows also to identify overlapping catchment areas and thus to better understand the relative situation of the different airports in comparison with the profiles developed by other aerodromes.

To begin with, the term "catchment area" must be defined and explained, in particular because terms like "hinterland", "umland" and "market area" are frequently used as synonyms for catchment area. This accounts for the need for specifying the different concepts behind.

4.1.2.1. Catchment area, hinterland, umland, market area

Different terms are used in order to describe the territory around an airport: catchment area, hinterland, umland and market area.[111]

Hilsinger (1976) reminded of the origin of the term **"catchment area"** which comes from hydrology and signifies drainage basin (*"bassin versant"* or *"bassin hydrographique"* in French, *"Einzugsgebiet"* in German). A drainage basin is "an area drained by a river system. It includes all areas that gather precipitation water and direct it to a particular stream, stream system, lake or a body of standing water."[112] Following this idea, the term "catchment area" is also used in a figurative sense: Catchment area as "[t]he surrounding area served by an institution, such as a hospital or a school."[113] By analogy, the term is used in a figurative

[110] Taxonomy vs. typology: Taxonomy is s a scheme of classification (Oxford dictionary), a system for organising similar things into groups (MacMillan dictionary); typology is a classification according to a general type (Oxford dictionary), a system for arranging things in groups (MacMillan dictionary).

[111] When speaking about catchment areas, the following terms are frequently used in French and in German: The catchment area is translated as "*zone de chalandise*" or "*zone d'influence*". Moreover, the term "*hinterland*", coming from German, is also used in French or translated into "*arrière-pays*". In German, the catchment area corresponds to "*Einzugsgebiet*", but the German speak also of "*Einflussgebiet*". Besides, the terms "*Hinterland*" and "*Umland*" come from German. For more details on German terms, see Hilsinger (1976).

[112] See The American Heritage Science Dictionary (2005).

[113] The American Heritage Dictionary of the English Language (2000); similar definitions can be found in Collins Essential English Dictionary (2006) or in Compact Oxford English Dictionary of Current English (2005).

sense for all means of transport in order to describe the area where traffic volume comes from or is directed to.

According to Hoffmann (1958) the airport's catchment area (*"Einzugsgebiet"* in German, *"zone de chalandise"* or *"zone d'influence"* in French) is the "area where the outgoing traffic volume of a certain transport distance or transport direction has its origin".[114] He introduced a second German term *"Verteilungsgebiet"* describing the "area in which an airport delivers the incoming air traffic volume"[115]. Hilsinger (1976) criticised that there is no clear German term allowing to summarise both notions *"Einzugsgebiet"* and *"Verteilungsgebiet"* so that mostly the first one is cited even though congruency between both areas can rarely be assumed (Hilsinger, 1976, p. 4). This remark also applies to the English term "catchment area" and to the French terms *"zone de chalandise"* or *"zone d'influence"*.

The **hinterland** is "[t]he tributary (or catchment) area of a port, from which materials for export are collected and through which imports are distributed..." according to The Dictionary of Human Geography[116]. Following this definition the term "hinterland" is a synonym for catchment area. But "[i]n more general usage, the term refers to the sphere of influence of any settlement (or of an establishment within a settlement): it is the area for which the settlement is the trading nexus (as in the hexagonal hinterlands of CENTRAL PLACE THEORY)."[117] Hinterland is borrowed from German. It is composed of *"hinter"* which signifies "behind" and *"land"* referring to "land" or "territory".[118]

Already in 1941, Van Cleef discussed this term in view of different definitions. He considered that it should not be limited to ports basing on "the assumption...that *all* trade centers have hinterlands" (Van Cleef, 1941, p. 308)[119]. Moreover, he proposed to distinguish between the continuous hinterland and the discontinuous hinterland explaining that the "[f]ailure to recognise these two types of hinterland may have been the cause of the confusion that has given rise to the many different definitions and interpretations" (Van Cleef, 1941, p. 309). According to Van Cleef, the continuous hinterland is the "area adjacent to a trade center[120](extending to and including its satellites) within which economic and some cultural activities are focused largely on the primary center" (Van Cleef, 1941, p. 308). He underlined that this definition includes "all physical area that would be affected by the human relations involved" (Van Cleef, 1941, p. 309). The discontinuous hinterland "takes into consideration

[114] Translated from Hoffman (1958, p. 20), cited by Hilsinger (1976, p. 4): "Ein Einzugsgebiet eines Flughafens ist der Bereich, in dem das abgehende Verkehrsaufkommen einer bestimmten Transportentfernung bzw. Transportrichtung seinen Ursprung hat."

[115] Translated from Hoffman (1958, p. 20), cited by Hilsinger (1976, p. 4): "Bereich, in dem ein Flughafen das ankommende Luftverkehrsaufkommen abgibt".

[116] See Johnston, Gregory, Pratt and Watts (2000, p. 337).

[117] See Johnston, Gregory, Pratt and Watts (2000, p. 337). Words in capital letters are cited in conformity with the original text.

[118] See Compact Oxford English Dictionary of Current English (2005).

[119] Words in italics or American English are cited in conformity with the original text.

[120] Van Cleef added by way of explanation that the term "…'trade center' is used as synonymous with 'city', 'town', 'village', or any other settlement term given a specific political connotation. It is used in a geographic sense to serve an all-inclusive purpose" (Van Cleef, 1941, p. 308).

the fact that some regions are economically closely associated with the primary center but that the intervening territory has no particular interest for the center" (Van Cleef, 1941, p. 309).

Furthermore, Van Cleef brought up the term "**umland**" which is also borrowed from German and signifies 'the land around' and is thus close to the term "hinterland".[121] According to Van Cleef (1941, p. 308), umland is the "area contiguous to a trade center (extending to and including its suburbs or 'urblets') whose total economic and cultural activities are essentially one with those if the primary center". Van Cleef recognised that "neither 'umland' nor 'hinterland' can be defined with great exactitude. These terms apply to human activities primarily and hence are conditioned on many circumstances... Many nongeographic elements affect the limits of these regions" (Van Cleef, 1941, p. 311).

Arnold (1992, pp. 175-177) considered that "airport hinterland" and "airport catchment area" are synonyms. However, he distinguished "airport umland" from "airport hinterland" even though both terms are often used synonymously. While the airport hinterland is the territory where passengers and goods come from and are directed to, the airport umland refers to the territory on which the airport has an environmental impact[122]. It concerns, of course, nuisances from airport activity (especially noise pollution) having serious consequences on the territory and people living there. But it includes also the territory where labour comes from as well as services for airports and where airport-oriented businesses are located.

Finally, the term **"market area"** (*"aire de marché"* in French, *"Marktgebiet"* in German) is borrowed from marketing/economics. "A **market area** is the surface over which a demand or supply offered at a specific location is expressed. For a factory it includes the areas to where its products are shipped; for a retail store it is the tributary area from which it draws its customers" (Rodrigue, Comtois, & Slack, 2006, p. 94). By analogy, the term "market area" is used in air transport in order to describe the area surrounding an airport from which customers (as passengers, freight in the case of goods transport) come from. Accordingly, the market area is a synonym for catchment area or hinterland. It reflects the idea that airports are confronted with a market economy like context where they have to attract traffic and are competing with other airports for airlines as well as for passengers and freight.

4.1.2.2. Airport catchment areas

As regards airports, the catchment area (or hinterland, market area) refers to the territory where the most of the existing or potential traffic of an airport lies. It depends on several factors determining the airport's capacity of attracting traffics among which figure the

[121] For more information concerning the origin and use of the term "umland", see Van Cleef (1941, pp. 309-311). According to Van Cleef, the term "umland" was introduced by a French geographer from the University of Lyon (Allix, 1914) in order to express the concept of "economic domain". When looking for a "term applicable to the areas immediately around an interior city, more particularly the fair center, the meaning of which would be comparable with that of 'hinterland (continuous)' as applied to a port" (Van Cleef, 1941, p. 309). Allix did not find an appropriate term in French language and thus had to borrow it from German. The term was taken up some years later in another paper (Allix, 1922). Van Cleef (1941, p. 310) also examined the origin of the term "umland" and its use by German geographers.

[122] Arnold (1992) used the German term *"umweltbelastend"*.

transport offer, the price level (airport charges and price of the plane ticket), the importance of the airport on an international scale, the importance and the location of the alternative airports, the weight of the alternative modes of transport, the airport's accessibility, the season (for example in the case of charter traffic) as well as political, economic and socio-demographic factors already cited (see also chapter 3.1). Most factors determining the passengers' airport choice have been studied extensively. Less research has been done on airports' accessibility.

Depending on market segments, different catchment areas can be distinguished for the same airport (Beer & Paesler, 1997; Wolf, 2003).[123] These market segments result from flight distance (short-/medium-/long-distance), traffic type (charter/low-cost carriers vs. network carriers) and travelling motive (professional, personnel/leisure travel). Considering available data and their precision, a too fine distinction, certainly, is not reasonable, especially for an analysis on a European scale.

The airport's catchment area depends on the market segment and thus on the type of traffic operated by the airport. The catchment area tends to be broader for long-distance than for short-distance flights since access time is less important for total travel time. This concerns also international flights, especially flights with a transfer at another airport. Passengers with a lower value of time (like tourists, customers of charter or low-cost carriers) would also accept a longer journey to reach the airport (e.g. to join a more distant secondary airport) while for business travellers the airport's proximity is significant (Pels, Nijkamp, & Rietveld, 2003a). The catchment area of an airport having good air services (many destinations, high frequencies, low tariffs), all other things being equal, tends also to be larger (Cranfield University Air Transport Group, 2002a).

In recent years, airport catchment areas have developed for two main reasons: The airports' accessibility has considerably improved since a growing number of airports have train services, especially direct train services, and an increasing part of railway traffic is operated by HST. The growing differentiation of air services, in particular due to the development of charter and low-cost traffic, has led to the emergence of different catchment areas, partly larger, according to market segments.

The airport's catchment area, often associated with a metric distance unit, is rather described as a circle around the airport – an approach that is easy to implement but neglects accessibility. As accessibility is as a key factor determining the catchment area's form and size[124], access time as a temporal distance unit is to prefer. Access time allows to calculate the generalised cost of access to the airport which includes, on the one hand, the monetary cost of

[123] Hoffmann (1958, p. 8ff) distinguished already three types of catchment area according to the flight distance: catchment areas for short-, medium- and long-distance flights.

[124] Munich airport can be cited as example where an analysis of the catchment area showed very clearly that its catchment area is far from having the form of a circle. It extends more towards the South/southeast of the city and so reflects differences in accessibility of the airport for people living around the airport (Beer & Paesler, 1997).

access (e.g. train ticket or cost for using an automobile) and, on the other hand, the cost resulting from access time (using the value of time[125]).

The exact determination of the catchment area of an airport is difficult and very expensive as it requires empirical data collection and questioning of a sufficient number of passengers of the airport in order to know where they come from. These surveys are realised more or less regularly by various airports as they give access to very precious information but they are expensive and time-consuming. Another possibility consists in counting the cars parked at the airport according to their origin thanks to the registration number of the car which is less cost-intensive than questioning passengers. However, it is only feasible if the registration number is based on the car owner's place of residence[126]. Moreover, this procedure excludes passengers arriving by public transport or by taxi while including people going to the airport in order to pick up or to depose a passenger. In addition, only few results of these surveys are published by the airports which consider them rather as confidential.

The lack of comprehension and clearness as regards the term "catchment area" is illustrated by a survey made by the Cranfield University Air Transport Group (2002a; 2002b). 40 airports gave information about their catchment areas: indicating traffic within a specified distance, referring to access time or mentioning urban/country areas.[127] Therefore, the results were disappointing.

However, the survey, completed by other studies, gives an idea of access times accepted by different passengers: 30 to 60 minutes maybe 1.5 hours access time for short-distance scheduled flights, 1.5 to 2 hours for medium-distance scheduled flights and 2 hours, even 2.5

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[125] In transport, the value of time represents the cost for one hour spent in transport. Thus, the value of time indicates the maximum price a passenger would accept to pay in order to reduce travel time by one hour or the minimum compensation that he expects in order to accept one additional hour of travel time. The value of time depends on different factors (like the purpose of the journey, dependence from schedule, personal resources, taste, etc.). Taking the value of time into account allows to carry out a monetary estimation of the time saved according to the purpose of journey. According to empirical studies, it seems that, whatever the purpose of journey may be, the value of time depends on the passenger's income. For business trips, the value of time is approximately equal to the income per hour of the user. For private trips, the value of time is estimated at about 50 % of the income per hour for short trips and at 25 % of the income per hour for long-term trips. See Téfra (1996, p. 50) referring to estimations carried out by INRETS, SETRA, OEST and the report of Boiteux (2001). See also Gonzalez (1997) for a theoretical review, but also Becker (1965).

[126] As regards France, this will not be possible anymore as of October 2009 all vehicle registration plates (already since April 2009 in effect for new cars) are issued using a new format without the local "department" code which allowed in the previous system to know their provenance. The "*département*" number figuring since then on the registration plate is of the owner's choice. This also applies to Italy where the registration plate is a sequential number not giving information on the car's origin.

[127] Cranfield University Air Transport Group (2002a; 2002b) surveyed airport operators in order to know more about their catchment areas but most of them were not able or disposed to provide this information. Nevertheless, the answers published in the study give an idea of the way the questioned airports identify their respective catchment area. For example, concerning the origin-destination traffic, Frankfurt airport indicated that 80 % of all passengers on domestic flights, 50 % of all passengers on international flights and 40 % of passengers travelling for professional reasons come from a zone of 50 km around the airport. As regards the origin-destination freight traffic, goods are transported by lorry from all over North-western Europe. The airport of Milan/Linate considers that passengers for domestic scheduled flights accept an access time of up to 30 minutes while passengers for international scheduled flights accept a 60 minute access time (whether the flight is nonstop or not). On the other hand, passengers for charter flights come even from a zone where they need up to 120 minutes for arriving at the airport.

to 3 hours for long-distance scheduled flights, but also for charter and low-cost flights, maybe even 3.5 hours for the two latter.

A survey among air-rail passengers at Paris CDG airport supports the access times assigned to the market segments. In 2005, 1.8 million passengers used a HST in combination with a flight from/to Paris CDG airport. 60 % of TGV passengers arrived at the airport by a long-distance flight (North America, Asia-Pacific, and Africa) and 37 % by a medium-distance flight (in particular from the EU). The average travel time of the HST journey was 2 hours 15 minutes but it varies since TGV passengers come from all over France to Paris CDG airport: 13 % from the Mediterranean TGV link (Montpellier, Marseille etc.), 17 % from the south-east TGV link (Lyon, Valence, Dijon), 22 % from the west (Rennes, Nantes, Le Mans), 16 % from the south-west (Tours, Poitiers, Bordeaux…), 20 % from the north link (Lille) and 12 % from Brussels. Flights from Paris CDG airport to the EU are concentrated on Italy/Spain for passengers coming from the north; on Italy/Germany for those coming from the west and on Italy/Germany/UK for passengers from the south-west. As regards flights to North America, passengers arrive by HST from all over France, even from the south, despite direct flights Nice-North America (DAST, 2006, pp. 1-2).

4.1.2.3. Implications for competition

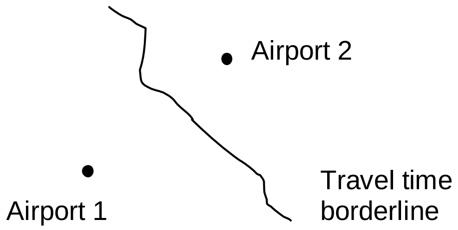
Actually, the catchment area is not fixed but dynamic. To abandon the hypothesis of a fixed catchment area allows to carry out a more realistic analysis. It means not only that an airport has several catchment areas depending on market segments, but also that the hinterland of an airport cannot any more be sharply separated from the hinterland of another airport. This concept allows to identify overlapping catchment areas where two or more airports (through the airlines operating at those airports) compete for the same traffic (Cranfield University Air Transport Group, 2002a, pp. 4-7; Starkie, 2002, p. 68).

In order to understand this concept, it is useful to remind the notion of travel time borderline[128] which is based on the idea that every passenger will choose, all other things being equal, his airport of departure according to journey time. It means that an air passenger will select, according to his preferences, in general, the offer of the nearest airport (in access time).[129] Figure 9 illustrates the concept of travel time borderline. For each point which constitutes this line the distance (measured in travel time) to both airports is the same. Consequently, passengers being located exactly on the borderline are indifferent to both airports and thus have no preference for any of these two airports. All other passengers prefer either the first airport (as it is nearer if they are on the left of the line) or the second airport (as it is nearer if they are on the right of the line).

[128] *"Reisezeitscheide"* in German, see Hoffmann (1958), ADV (1965, figures 12 and 13), Hilsinger (1976, p. 4).

[129] Except for passengers for whom already the arrival to the airport and the stay on its ground represent a consumption activity.

Figure 9: The concept of travel time borderline



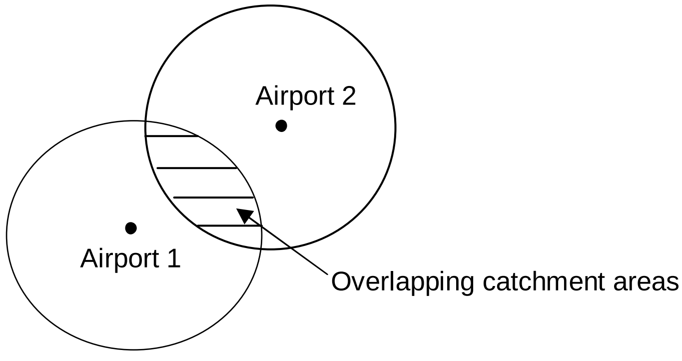
Own figure

If both airports propose a similar service (as regards airlines, destinations, prices, etc.) passengers will choose the airport according to distance (measured in access time). In this case, catchment areas are clearly separated from each other as each passenger can be unambiguously assigned to the catchment area of one airport or another.

However, the assumption, on which the travel time borderline is based, does not any more correspond to reality as air transport has become increasingly differentiated regarding prices (e.g. airport charges, prices for plane/train tickets) and air services (e.g. destinations, frequencies, direct/indirect flights) since the liberalisation.

The differentiation of air services (development of charter, low-cost and freight offers generating dense traffics for a big number of airports, the organisation of networks according to the hub and spokes model) and the improvement of ground transport links (and particularly the growing number of airports having train services, especially direct train services, and an increasing part of railway traffic is operated by HST) draws airports towards each other. Whereas catchment areas were quite distinct formerly, they tend to overlap which creates competition between airports for air services/passengers. Despite the saturation of the very big hubs, a certain number of airports in Europe are underused, a factor favouring competition. Figure 10 illustrates the concept of overlapping catchment areas (Starkie, 2002). The black line around each airport is composed of all points being at the same distance from the respective airport. It represents the maximum travel time, depending on the market segment, accepted by an average passenger in order to join the respective airport. Consequently, people living in the striped area are likely to use both airports.

Figure 10: The concept of overlapping catchment areas



Source: own figure, referring to Starkie (2002, p. 68).

Each passenger will calculate the generalised cost for his journey and choose the less expensive one. The generalised cost takes account of monetary cost (plane ticket price and cost for joining the airport) as well as of cost resulting from overall travel time (total journey time, including access time, flight time and waiting times, multiplied by the passenger's value of time).

Consequently, be careful when interpreting overlapping catchment areas. A passenger living in the striped area would accept going to both airports (for a given market segment), even if one of them is closer than the other one. Thus, he is likely to use the airport 1 for one trip and the airport 2 for another, depending on the generalised cost of the journey and thus on the abovementioned variables. As prices and air services at the different airports are not necessarily the same, potential passengers of the airport 1 come even from zones that can be closer to airport 2 (and vice versa). Anyway, the definition of the airport's catchment area refers to the area within which existing and potential (!) traffic lies...

Overlapping catchment areas are a phenomenon particularly interesting for airports aiming at playing the role of a hub: For changing planes, the hub airports in Europe are often substitutable among each other.[130] As regards transfer traffic, the concept of catchment area has another meaning: In theory, it extends to the whole world. Moreover, the hub logic modifies this concept by disassociating the constraint of localisation from the place of interconnection, even if airlines have preferences as to the choice of a potential hub airport.

4.2. Implementation of the analysis: and data

In line with the approach chosen for this work, according to which the focus is on observed strategies (i.e. strategies that have been implemented and succeeded or at least have left their mark and can therefore be observed), information on airports, air traffic and characteristics of the territory came mainly from the Eurostat transport and Urban Audit statistics as well as from the Official Airline Guide (OAG) in order to ensure that data are coherent as regards methodology. Sometimes it was necessary to add information from airport-websites as well as from other publications (e.g. national statistical offices).

MapInfo®, software for mapping and geographic analysis, was used for both steps of the analysis, i.e. for analysing spatial information on airports and air traffic flows at the European level and for analysing information on the characteristics of the territory. In order to visualise these data, they had to be prepared under Microsoft® Excel and to be linked to a unique airport code or city code, the same that was used in the map of Europe indicating airports and cities. Then, Microsoft® Excel files had to be imported into MapInfo®. The representation of air routes necessitates a special tool named Arrow40.mbx.

Considering the difficulties related to the use of statistical data in general and in particular in air transport (Button, 1999; Arndt, 2002), it is also necessary to precede the main analysis with some explanations on the statistics used.

[130] See chapter 3.2 on competition for transit traffic.

4.2.1. Identifying airport strategies

As mentioned-above, the analysis was based mainly on air transport statistics for 2006/2007 published by Eurostat because they cover national as well as international traffic (whether it is intra-EU or extra EU traffic) for both passengers and freight. Besides, the data are available free of charge on the Eurostat homepage under Microsoft® Excel which facilitates considerably their analysis. In addition, OAG data were used in order to supplement information on scheduled airlines serving the different airports. Thus, it can be summarised that information comes from Eurostat; only data on airlines come from OAG. It is indicated when data were completed by information available from national statistical offices or from airports.

4.2.1.1. Eurostat air transport statistics

As regards air transport in Europe, different statistics are available. IACO and Eurostat air transport statistics are the only one indicating traffic between two airports (at the route level).[131] Eurostat data have the advantage of referring to all air traffic while ICAO data limit to international scheduled air services, excluding domestic air services as well as non-scheduled services.[132] On the other hand, ICAO statistics is more detailed giving information relating to airlines operating on a route (capacity, aircraft type, number of flights and passengers, tons of freight/mail). But, ICAO data are accessible only with difficulty since statistics are not longer published in paper version whereas Eurostat statistics is accessible free of charge via the air transport database on the Eurostat homepage.

According to Eurostat, three levels of traffic can be distinguished: national, international intra-EU traffic and international extra-EU. National (or domestic) traffic is “airport traffic performed between two airports located in same country/territory” (Eurostat; ITF; UNECE, 2009). International air traffic is “traffic performed between the designated airport in one country and an airport in another country/territory” (Eurostat; ITF; UNECE, 2009). In the case of international intra-EU traffic, both countries are members of the European Union (including Norway, Iceland, and Switzerland) whereas in the case of extra-EU traffic one country is member of the European Union while the other is not. Traffic between airports is measured in aircraft movements (take-off or landing) or passengers and tonnes of freight/mail, departing or arriving at the airport.

Nevertheless, Eurostat air transport statistics pose two problems although they have to be put into perspective: data completeness and two different concepts of counting passengers/freight/ mail.

[131] Other statistics are published by the Association of European Airlines (AEA Yearbook) and by International Air Transport Association (IATA World Air Transport Statistics).

[132] ICAO data refers to traffic operated by airlines being registered in one of the ICAO member states (about 190 members in 2009) covering almost all air transport.

The first problem concerns data completeness as only since 2003 member states are required to transmit air transport data to Eurostat.[133] Before, data were provided on a voluntary basis and so there are some data missing. From 2003, there are very few gaps in the data provision but data availability over the time depends on each country.

The second problem refers to two different concepts that exist for counting passengers and freight/mail: On-Flight Origin and Destination (OFOD) and Flight Stage (FS). On-flight origin and destination traffic refers to "traffic on a commercial air service identified by a unique flight number subdivided by airport pairs in accordance with point of embarkation and point of disembarkation on that flight" while flight stage data refer to the "operation of an aircraft from take-off to its next landing" (Eurostat; ITF; UNECE, 2009). As member states were not required to transmit data before 2003, they were not obliged either to provide data according to both concepts. As only the second concept includes direct transit passengers, these two concepts are not comparable.[134] However, Eurostat showed in a study on the comparability of both concepts that the number of passengers in direct transit is generally quite low in relation to all other passengers (indirect transit passengers or passengers who are starting or ending their trip at the designated airport). The difference between both figures is 3 to 6 % on average. There are two cases where direct transit passengers are more important: on long-distance flights and on circular traffic between islands. If both FS and OFOD data are available, priority is given to OFOD data as more countries used this concept until 2003.

Despite the defaults mentioned above, Eurostat data has been used for this analysis: They are the best statistics at our disposal and give a more than rough idea of air transport even if one should be careful when interpreting certain figures.

Moreover, overall accuracy of the data is good. According to Eurostat, the comparison with other relevant international sources shows a high level comparability. Data comparability across countries is very high which is ensured by the implementation of a common methodology. The present methodological approach has been applied for a number of years now and it is well understood and applied at airport and country level. So the analysis of the

[133] Data transmission is done according to the Commission Regulation (EC) No. 1358/2003 on statistical returns in respect of the carriage of passengers, freight and mail by air, published at the Official Journal of the European Communities on the 31 July 2003, to the Regulation (EC) No. 437/2003 of the European Parliament and of the Council of 27 February 2003 on statistical returns in respect of the carriage of passengers, freight and mail by air, as well as the new Commission Regulation No. 546/2005 of 8 May 2005 adapting Regulation (EC) No. 437/2003 of the European Parliament and of the Council as regards the allocation of reporting-country codes and amending Commission Regulation (EC) No. 1358/2003 as regards the updating of the list of Community airports following the new EU membership of ten countries (Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia) on 1 May 2004. Finally, statistical data is also transmitted by Bulgaria and Romania which joined the EU on 1 January 2007.

[134] The following example shows the difference between the "On flight origin and destination" data and the "Flight Stage" data: a flight is operated on a route New York-London-Paris 185 passengers travel from New York to London, 135 from New York to Paris and 75 from London to Paris. Thus in terms of on flight origin/destination data the figures recorded are 185 passengers New York-London, 135 passengers New York-Paris and 75 passengers London-Paris. New York would record the figures for New York-London and New York-Paris; London would record New York-London and London-Paris; Paris would record New York-Paris and London-Paris. In terms of flight stage data there are two flight stages and the figures reported by New York and London airports are: New York-London 320=(185+135) passengers and by London and Paris airports are London-Paris 210=(135+75) passengers (Eurostat, 2009a, p. 11).

data over time produces very reliable results. In addition, quality of data is checked in order to detect data that might be incorrect. Therefore, the internal consistency of the data is high. Three types of quality checks are made on the datasets received for national and international transport. Data checks include mirror checking, time series checks and inter-datasets checks.[135]

4.2.1.2. OAG data

In order to deepen analysis, flight plan data from the Official Airline Guide (OAG) was used. OAG data refer only to scheduled passenger flights (excluding charter traffic) but indicate the names of the airlines which operate air routes from European airports (only departures) as well as the capacity (number of seats available) and the frequency (number of departing flights scheduled) for 2006.[136] These statistics give a precise idea of the overall scheduled flight offer for European airports and also allow to calculate the market share of airlines on certain air routes and at airports. A large number of scheduled airlines transmit their flight data to OAG[137], including the "traditional" full service carriers (such as Lufthansa, British Airways, Air France, KLM) and a large number of low-cost carriers (e.g. Easyjet, Air Berlin, Germanwings, Vueling, Wizzair). The only big airline missing is Ryanair. For this reason, it was not possible to calculate market shares when Ryanair was serving an airport or a route. In this case, additional information came from airport publications (annual reports, websites). Nevertheless, OAG data give a relatively precise idea about the importance of low-cost traffic.

In contrast to Eurostat statistics, OAG data refer to flight plans. For this reason, there may be some discrepancy between the flights scheduled for a certain period and the effectively operated flights as some of them might be cancelled while others might be added. Nevertheless, differences are relatively small (Dobruszkes, 2007, p. 46f). Double entries due to code sharing had already been removed so that all flights were counted only once according to the airline that was actually operating the flight. If a flight was operated on behalf of another airline, the flight was counted according to its flight code (e.g. Brit Air on behalf of Air France appears under the Air France flight code). Nevertheless, OAG data needed a relatively long, time-consuming treatment: Data was already aggregated for the whole year 2006 but the available excel-file contained 19 420 data sets[138] referring to all departing flights from all European airports by all airlines but for which were only indicated

[135] "Mirror checks" allow to compare the data declared by partner reporting airports and find possible inconsistencies that are corrected as much as possible. Time series checks are made in order to detect unlikely increase or decrease of transport at one of the reporting airports. This check is applied separately for international and national transport. Finally, "missing routes checks" allow detecting the routes between two declaring airports where only one of them has declared the information.

[136] Information on the available seat kilometers was not used but also available.

[137] Contrary to what might be supposed, the "Official Airline Guide" data comes not from an official institution but is collected from the different airlines by a private company which provides the air transport industry with global airline information, including airline schedules, real time flight status information, timetables, code share and connection services.

[138] Data were too exhaustive for appending but are available to the reader on simple request. See Appendix 17 for an example of departing scheduled flights from London Heathrow airport in 2006 according to OAG data.

the origin and destination airport code (three letters) as well as the airline code (two letters or figure and letter). Thus, all codes had to be identified. As regards airlines, this was partly complicated as the same airline code could be attributed successively to different airlines if a code was not longer used by an airline due to bankruptcy or merger.

4.2.2. Analysing the spatial and territorial context

The analysis of the spatial and territorial context into which airports are embedded is based on the analysis of the airports catchment areas. Having discussed the concept of catchment area in chapter 4.1.2, this chapter will focus on the application of the concept to this analysis. Then, statistical information used for characterising catchment area will be presented shortly.

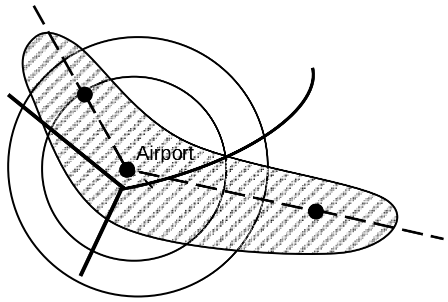
4.2.2.1. Two approaches for identifying catchment areas

As already explained, two approaches exist to delimit airport catchment areas: the distance measured either in kilometres or in hours. A survey on each airport is not possible given the number of considered airports. Besides, this is not really necessary as some studies have already been published on this subject of which the degree of precision will be sufficient for carrying out our analysis. *The first approach* consists in drawing a circle for example of 50 km, 100 km or 150 km around the airport and to integrate the territory covered by this circle in the analysis. As MapInfo® has the necessary tool, this approach is very easy to apply but it is not satisfactory because it neglects a fundamental factor of the choice of an airport: its accessibility! *The second approach* consists in drawing isochrones around the airport according to the access time to the airport. This is more difficult to implement as information has to be gathered. Moreover, a special tool for MapInfo® is necessary in order to carry out this analysis. In this case, results are much more relevant since the airport’s catchment area’s form and size are determined by the airport’s accessibility: A factor which has not been considered sufficiently when studying intra- and intermodal competition in the airport sector, in particular at the European level.

The route and motorway network is very well developed in most parts of Europe, especially in Western Europe. It is characterised by a high number of access points and a relatively high density allowing a quite equal access to this infrastructure independently from the place where a person is located and a good connection to most places even if some of them (like big urban areas) are better linked to the route and motorway network). The situation is substantially different for HST as the network consists of a limited number of railway lines and train stations are situated relatively far from each other.

In order to illustrate the second approach in consideration of HST, figure 11 shows an airport having access to HST.

Figure 11: Form and size of isochrones in the case of access to HST



Own figure

Thanks to the airport's integration in the railway network, people living within the striped zone can join the airport within a certain access time. According to this figure, people living close to a HST station need even less time to reach the airport than people living at the same distance from the airport but without access to a HST station.

4.2.2.2. Identifying the catchment areas of European airports

As regards the airports of Amsterdam, Frankfurt and Paris CDG airport which are well served by HST, the second approach using access times was applied in order to identify their catchment areas. As regards the other European airports considered in this study, their catchment areas were determined by using the first approach that is based on kilometric distances. This is certainly not the ideal solution but acceptable under the prevailing circumstances.

Frankfurt, Paris CDG and Amsterdam airports: from access time to catchment areas

As regards the airports of Frankfurt, Paris CDG and Amsterdam Schiphol, the second approach was used for identifying catchment areas. It is based on the airports' accessibility. For the purpose of determining the accessibility of Amsterdam Schiphol, Frankfurt and Paris CDG, for each airport access times[139] to different cities and information on transfers were collected and mapped by means of MapInfo®.

Access times originate from the Deutsche Bahn's travel information system accessible on its homepage. It covers public transport timetable (train and bus) for many destinations in Europe. For this analysis, destinations were chosen in order to cover rather evenly a large area around the airport. Thus, data on journey times were collected: from Frankfurt airport to 539 destinations, from Paris CDG to 485 destinations and from Amsterdam Schiphol to 243 destinations. The shortest overall travel time starting from the airport, and including waiting

[139] Calculations are based on access times from the airport to different cities, knowing full well that access times may depend on the travel direction (i.e. from the airport to a city or from the city to the airport) but assuming that variations of travel times are insignificant as regards the degree of accuracy of the analysis.

time due to stops or transfers but not frequency, is considered. Therefore, it is possible that the shortest overall travel time represents only one train per day. Often, the shortest travel time refers to the journey that requires no or a minimum of transfers. In some cases, the shortest journey obliges the passenger to change trains while another itinerary needing more time but fewer transfers exists. Hence, the alternative is more comfortable and so preferable. In this case, the passenger's choice depends on the additional travel time for the alternative journey. By definition a passenger is supposed to prefer the shortest journey unless he finds an alternative that avoids at least one transfer but takes less than 25 minutes in addition to the shortest travel time. Otherwise, the passenger is supposed to prefer still the first solution even if he has to make one more connection. This situation is quite rare: As regards Frankfurt airport only about forty destinations are concerned by this problem that is less than 10%. Travel times refer to Thursday 15 March 2007 (no school holidays) and were converted into minutes.[140]

Then, Vertical Mapper® for MapInfo® was used for visualising and analysing spatial information. This tool creates continuous surfaces of information (grids) from point data by estimating journey time for cells situated between the points for which travel time data are known. By means of this method, continuous zones depending on access time can be drawn around the airport. The nearest neighbour method (linear interpolation) was used as gridding algorithm. In spite of the high density of points for which travel time data are known, be careful when interpreting values on the outside edge of the calculated surface.[141]

The analysis shows big differences in the accessibility of the three airports.[142] It underlines not only the importance of technical aspects of infrastructure (like HST lines vs. classical train lines) but also the relevance of the operating mode including aspects like transfers, waiting time and the number of stations served on the way. Access times, increasing by 30-minute steps, are represented by different colours from blue over green, yellow and orange to red. The analysis focuses on the area where passengers arriving at the airport can get within 3 to 3.5 hours. Small rectangles mark all destinations for which travel time from the airport is known. Their colour indicates the number of transfers. Access time zones differ significantly from the form of a circle emphasising that equidistant points from the airport are not necessarily of the same accessibility.

Considering the access times accepted by different passengers, catchment area can be drawn according to the traffic type operated by the airport: 30 to 60 minutes maybe 1.5 hours access time for short-distance scheduled flights, 1.5 to 2 hours for medium-distance scheduled flights and 2 hours, even 2.5 to 3 hours for long-distance scheduled flights but also for charter and low-cost flights. By the way, 3 hours seems also to be the range where air transport and HST are competing.

[140] See Appendix 18 for an example of journey times from Frankfurt airport to 539 destinations.

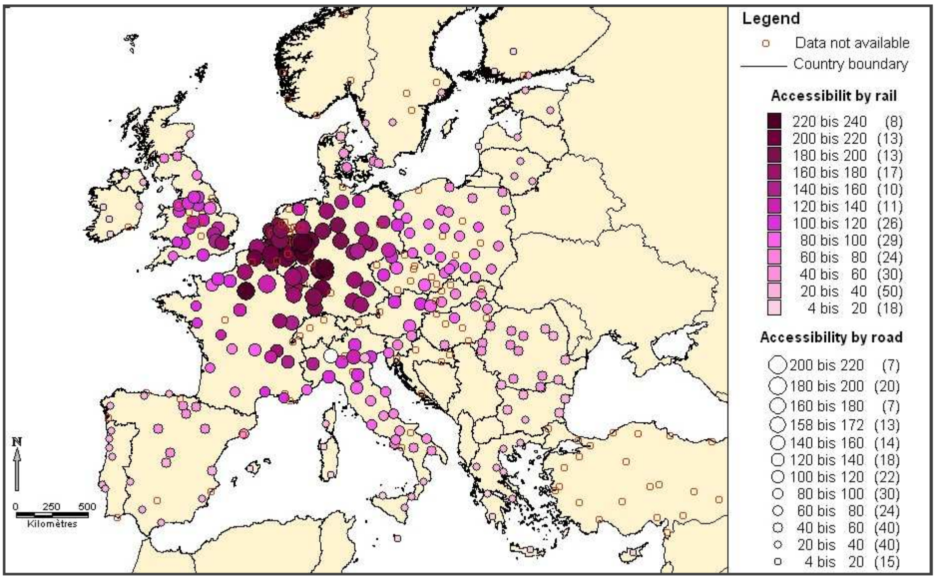
[141] See Figure 44 for an example of journey times from Frankfurt airports as visualised by means of Vertical Mapper®.

[142] See chapter 8.1.2 for a detailed analysis.

As regards the other European airports considered in this study, their catchment areas were not determined by using access times, i.e. the second approach. It was unavoidable to return to the first approach which is based on kilometric distances. This is due to the fact that it is very time-consuming to calculate access times as a very large number of cities have to be considered for each airport. Nevertheless, one also has to keep in mind, that for most airports other than Frankfurt, Paris CDG and Amsterdam, the situation is substantially different as they do not have such an excellent access to HST or not at all.[143]

In contrast, the road and railway network is relatively well developed in most parts of Europe, especially in Western Europe, with a large number of access points and a relatively high density allowing a quite equal access to this infrastructure independently from the place where a person is located and a good connection to most places. Even if some urban areas are better linked to the route and motorway network, one can consider that the access times to airports are relatively homogenous for a given distance, unless the airport has direct access to the HST as in the case of Frankfurt, Paris CDG and Amsterdam airport. This is also illustrated by figure 12 which shows the accessibility of European cities by road and by rail for 2003-2006 (index, EU-27=100, i.e. index 100 corresponds to the average accessibility of all European cities in the Urban Audit)[144]: Accessibility by road is relatively homogeneous, in particularly when comparing cities belonging to the same regions. As regards accessibility by rail, differences are more important due HST serving only certain cities. Apart from these cities that are characterised by a very high accessibility due to HST (like e.g. Paris or Frankfurt region), differences in accessibility by rail are less important, in particular when comparing cities that are located in the same region.

Figure 12: Accessibility by road and by rail (index, EU-27=100)



Own figure

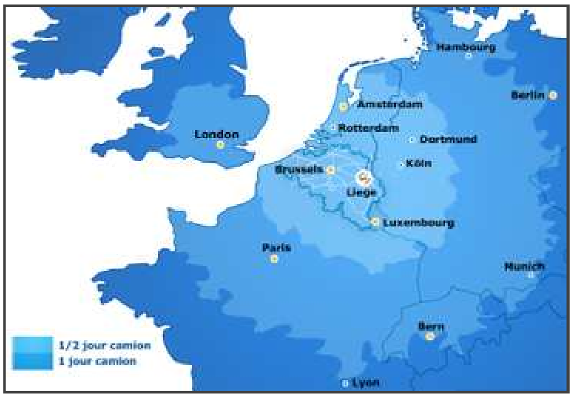
[143] Only Cologne/Bonn airport is directly served by ICE but less well than Frankfurt airport.

[144] See Appendix 4 for detailed data.

The difficulty of implementing this approach consists in determining the kilometric distances which correspond to the access times accepted by different passengers as well as by freight forwarders in order to join the airport. Kilometric distances were assigned to the access times accepted in order to reach the airport according to practical experience, backed up by comparison with samples.

As regards freight transport, Liege airport published the following map indicating the airport's catchment area where existing and potential traffic volume comes from and is bound for (figure 13). It underlines the extension of catchment areas for freight traffic as road transport is easily substituted for air transport whenever this is reasonable, in particular for general cargo. Accordingly, a distance of up to 250 km has been assigned to half a day road haulage and up to 500 km to one day road haulage.

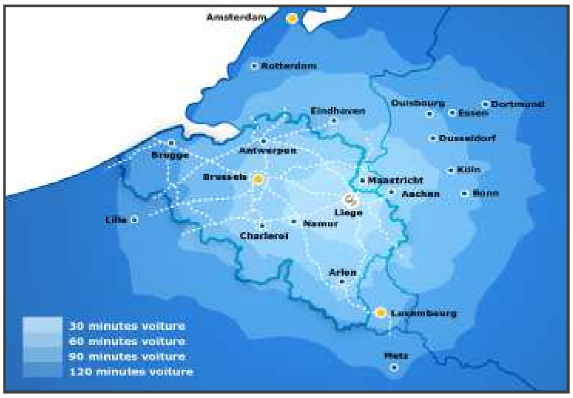
Figure 13: Example for an airport's catchment area for cargo traffic (1/2 day and 1 day road haulage)



Source: http://www.liegeairport.com/fr/zone-chalandise-cargo, accessed on 14 March 2010

Liege airport published also a map illustrating the airport's catchment area for passenger traffic (figure 14). For a given distance, access times are rather short when there is a direct access to the motorway network. Access times are also rather short in dense urban zones. At the same time, travel times may vary significantly between peak hours and off-peak hours since main transport axes are also characterised by congestion contributing to an increase in travel times. In return, access times outside of dense urban zones, which tend to be rather long, fluctuate less as there is no or little difference between peak hours and off-peak hours. Moreover, one has to keep in mind that these distances are air-line and real routes are necessarily longer.

Figure 14: Example for an airport's catchment area for passenger traffic (30, 60, 90 and 120 minutes by car)



Source: http://www.liegeairport.com/fr/zone-chalandise-passagers, accessed on 14 March 2010

Knowing full well that the determination of catchment areas is only approximate, in particular when using kilometric distances, the following values have been attributed to the different access times: an air-line distance of up to 50 km corresponds to 30 to 60 minutes (maybe 1.5 hours) access time by road, of up to 100 km to 1 to 1.5 hours (maybe 2 hours), of up to 150 km to 1.5 to 2 hours (maybe 2.5 hours) and of up to 200 km to 2 to 2.5 hours (maybe 3 hours).

Finally, the relevance of the different access times zones (although indicated by kilometric distances) for an airport may be assessed thanks to a detailed analysis of its flight offer, for which reason the chapter 8 pays also attention to the airports' traffic patterns. Nevertheless, it is evident that zones which are closer to the airport tend to be of greater importance than zones which are more distant.

4.2.2.3. Characterising catchment areas by means of statistical data

In order to describe the catchment areas, a new layer was created in MapInfo which contains all information characterising the territory. This layer was placed underneath the two already existing ones (one layer containing airport data and another one representing the airports' catchment areas). This allows to link information on airports, their catchment areas and the spatial and territorial context.

The territory was characterised by using statistical information about its demography, its economic activity and its attractiveness for tourism which is coming from the Urban Audit[145]. It is completed by other sources: Data on meetings refer to 2003, 2005 and 2007. They were provided by the Union of International Associations. Finally, the maps in general also indicate the location of 7269 Pan European settlements available from the GISCO reference data base,

[145] Regional data were not used for two reasons mainly: They refer to the nomenclature of territorial units for statistics (NUTS) and thus to surfaces rather than to points which makes a difference with respect to the visualisation of the data; Urban Audit statistics are more detailed and contain certain information, e.g. on the location of headquarters, which is not available from regional statistics.

bibliographically referred to as “European settlements”. This allows to assess the density of settlements and thus of population as Urban Audit statistics include only a limited number of cities.

Urban Audit statistics

The Urban Audit statistics describe 365 European towns and cities. They are published by Eurostat and accessible free of charge via the Eurostat website.[146]

The following information was available from Urban Audit statistics:

- Demography:
  - Population of working age (15-64 years)
  - Proportion of foreign nationals
- Economic activity:
  - Gross domestic product (GDP) per inhabitant
  - Employment according to economic activities
  - Unemployment rate
  - Location of headquarters
- Attractiveness for tourism
  - Beds available
  - Beds available per 1000 residents (including a distinction between high- and low season for a limited number of cities).

In order to facilitate better comparison between the largest cities in Europe, an additional special unit, the “Kernel”, has been developed for seven capital cities: For Copenhagen, Helsinki, Stockholm, Paris, Athens, and Lisbon the Kernel is larger than the cities’ administrative boundaries including nearby suburbs; for London, the Kernel refers to Inner London as the city’s administrative boundaries are too vast in comparison to the other larger cities.[147] Thus, Paris Kernel corresponds to Greater Paris including the *“petite couronne”* (i.e. the small “ring” of *“départements”*) which corresponds to London, whereas London Kernel, called Inner London, corresponds to Paris (without its suburbs). Nevertheless, only in some cases both data are available. Therefore, most data refer to the cities’ administrative boundaries, except of population data where Kernel data[148] were used for Helsinki, Stockholm, Paris, Athens, and Lisbon as differences with London would otherwise be too large.

The latest data collection for Urban Audit started in 2006 and was completed in early 2008. Data refer to 2003 to 2006.[149] In only some cases, when recent data were not available, information was used from the previous 2003/2004 data collection referring to 1999-2002 (indicated if it is the case).

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[146] See Eurostat (2004; 2007; 2009b) for more details on the methodological background.

[147] See Appendix 2 for the data availability in Urban Audit statistics.

[148] Kernel data was not available for Copenhagen.

[149] See Appendix 3 for the reference year.

In a first step, the statistical data on 365 European cities were analysed separately. Results are presented in chapter 7; they indicate strong disparities as regards the geographical distribution of population but also of economic activity and of the attractiveness of certain destinations for tourism. Hence, the spatial and territorial context into which airports are embedded varies strongly.

The separate analysis of the different variables was not adapted for comparisons and for examining airport strategies. Information was to rich complicating its summing up. Therefore, it was necessary to reduce information content. Indeed, such a decision is of an arbitrary nature and may be questioned. Reducing information facilitates its handling but means also losing details. Thus, it is important to find an appropriate level of information reduction, sufficient in order to facilitate its handling, but not excessive so that not too much information gets lost. Consequently, the degree of accuracy is limited and figures indicate only orders of magnitude. However, this is sufficient as precise figures are not needed; the more so they would pretend a degree of accuracy that does not exist given all the problems connected to the handling of statistical data.

For this reason, the second step consisted in aggregating data. Therefore, the cities were classified[150] according to three criteria: its population of working age, its economic and touristic importance respectively in five categories (1=very small, 2=small, 3=medium, 4=large and 5=very large). Table 2 indicates the limits of the different categories. Once again, these limits are arbitrary. However, they were fixed according to common sense and a more or less general acceptance of what is a very small or a very large city, of what is a very small or very large importance for economic or touristic activity.

Table 2: Categorisation of data on population, economic and touristic importance

Indicator	Variables	Very Small 1	Small 2	Medium 3	Large 4	Very large 5
Population of working age	Inhabitants	< 50 000	50 000 to < 200 000	200 000 to < 500 000	500 000 to < 1 million	≥ 1 million
Economic importance	GDP per head (in EUR)	< 10 000	10 000 to < 20 000	20 000 to < 40 000	40 000 to < 50 000	≥ 50 0000
	Headquarters	< 10	10 to < 30	30 to < 50	50 to < 300	≥ 300
	NACE J_K (in % of employment)	< 10	10 to < 20	20 to < 25	25 to < 30	≥ 30
Touristic importance	Beds available	< 10 000	10 000 to < 20 000	20 000 to < 40 000	40 000 to < 100 000	≥ 100 000
	Beds available per 1000 residents	< 20	20 to < 30	30 to < 50	50 to < 100	≥ 100

Own table

150 See Appendix 10 on the results from the categorisation of data on Urban Audit cities.

As regards the *population of working age*, this indicator is based on the number of inhabitants which is given for all 365 cities. The proportion of foreigners was not included since too many figures are missing but it was considered where appropriate and therefore was also categorised as indicated in table 3.

Table 3: Categorisation of data on foreign nationals, unemployment and meetings

Variables	Very Small 1	Small 2	Medium 3	Large 4	Very large 5
Foreigners (in % of population)	< 5	5 to < 10	10 to < 15	15 to < 25	≥ 25
Unemployment rate (in %)	< 5	5 to < 10	10 to < 15	15 to < 25	≥ 25
Meetings	< 20	20 to < 50	50 to < 100	100 to < 300	≥ 300

Own table

Concerning *the economic importance* of cities, three variables were used, namely the GDP per head, the number of headquarters and the proportion of financial and business services in employment. First, each city was classified for each one of these three variables. Then, the indicator of economic importance was established through combining these variables. Contrary to the categories for headquarters and for the proportion of financial and business services, the GDP per head category factors in with coefficient 2 as it is strongly related with a city's economic importance.[151] The unemployment rate was also categorised even though it was not used due to a large number of missing values; it was considered only where appropriate.

The indicator for a city's *touristic importance* is based on the number of beds available in registered accommodation according to which 300 cities were classified.[152] Moreover, each city was categorised following the number of beds available per 1000 residents. The latter takes account of the size of a city and thus gives an idea about its tourism orientation. If for a given city the second category was higher than the first one, the second one was used but the city could increase its touristic importance by maximum two categories.[153]

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[151] For 297 cities, all three variables are known. For another 91 cities only two variables are available: in general the GDP per head and the proportion of financial and business services, except for 16 cities where the GDP per head and the number of headquarters and for four cities where the number of headquarters and the proportion of financial and business services are given. For another 48 cities, only one variable is indicated: the GDP per head (23 cities, e.g. Rumanian and Irish ones), the number of headquarters (11 cities: relatively small Greek cities but also Athens, as well as Salzburg and Innsbruck in Austria) and finally the proportion of financial and business services (14 cities, including relatively small cities but also Zurich and Geneva with more than 25 % of employment in financial and business services).

[152] For 65 cities, no information was given on the number of beds available but in seven cases at least the number of beds in the low and the high season was known so that the average number was used for categorising the concerned cities.

[153] 105 cities were concerned by a revision of the indicator for touristic importance. For 66 cities the touristic importance increased by one category and for further 25 cities by two categories. As regards the remaining 14 cities, the rise in their touristic importance was limited to two categories, such as for Funchal and Cork both reaching category 4 (instead of category 5 according to the number of beds available per 1000 residents since

Moreover, this indicator was revised by information on meetings hold by international organisations due to the results from the detailed analysis on meetings (see chapter 7.2.5). The latter are organised in cities of a large or very large economic importance or in cities which have only a limited economic importance but are very attractive from a touristic point of view, maybe more attractive than it could be expected from the number of beds available. Therefore, all cities were categorised according to the number of meetings hold in 2003, 2005 and 2007. As regards the cities that concentrate an increased number of meetings, in a first step, their economic importance was verified. If it was large or very large, nothing was done as one can suppose that the large number of meetings is due to the city's economic importance. If their economic importance was limited (very small, small or medium), than the city's touristic importance was checked. If the latter was relatively limited (i.e. more than one category below the category for meetings), than the city's touristic importance was increased by one category. A total of nine cities were concerned, such as Valencia with a small economic and touristic importance (both category 2) but a large attractiveness for meetings (category 4). In this case, the indicator for touristic importance was increased by 1 (new category 3).

Finally, 305 cities[154] were classified by means of hierarchical clustering (using SPSS Statistical Package for Social Sciences). The average linkage within groups method was applied as the purpose is homogeneity within clusters. This method considers the mean distance between all possible inter- or intra-cluster pairs. The average distance between all pairs in the resulting cluster is made to be as small as possible in order to create clusters that are as homogenous as possible inside.

Different solutions were calculated in order to find an appropriated one: 5 to 15 clusters using three distance measures, namely the Euclidean distance, the squared Euclidean distance and the City Block distance (also called Manhattan distance).[155] The comparison of the solutions reveals many similarities but also some differences which were examined more in detail in order to determine an acceptable solution. Finally, the 10 clusters solution calculated by using the squared Euclidean distance was accepted, although the assignment of some cities to their specific cluster is questionable. However, it is due to the wish to restrict the number of clusters in order to facilitate their handling. Results are presented chapter 7.

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they figure only in category 2 for the total number of beds available) and e.g. Luxembourg, Bruges, Innsbruck, Weimar, Galway scoring category 3 (instead of category 4 according to the number of beds available per 1000 residents since they figure only in category 1 for the total number of beds available).

[154] 60 cities could not be classified as data were not complete.

[155] See Appendix 11 on the results from hierarchical clustering of Urban Audit cities. For lack of space, results are shown only for 5 to 15 clusters using the squared Euclidean distance and 10 to 12 clusters using respectively the Euclidean and the City Block distance. The column in bold type indicates the accepted solution. The proximity matrix was too large for appending but is available to the reader on simple request.

Conclusion: Statistical data with a limited degree of accuracy but giving a review of the European airport panorama with a focus on specialisations and the territorial embeddedness of airports – tendencies and structures which would not have become apparent if the analysis had been restricted for the benefit of "better" data

Of course, the analysis of the territorial context is only approximate for two reasons mainly: the data from urban statistics refer to the period 2003-2006 and were restricted to 365 cities; the delimitation of catchment areas is a rather rough estimate. Consequently, the degree of accuracy is limited and figures indicate only orders of magnitude. Nevertheless, another approach was not realisable since the objective was to consider a large number of airports at a European scale. Thus, it was unavoidable to rely on official European statistics in order to ensure methodological coherence although some data are missing. Moreover, it was not possible either to study in detail the catchment areas of all 100 airports considered in this analysis.

However, the degree of accuracy may be considered to be sufficient insofar as one keeps in mind that figures indicate only orders of magnitude and even more detailed data would only pretend a degree of accuracy that does not exist anyway given all the problems connected to the handling of statistical data.

In return, the analysis gives a review of the European airport panorama with a focus on the emergence of specialisations. The extent of this phenomenon, giving reasons for studying the territorial context into which these airports are embedded, would not have become apparent when the analysis had been restricted to a smaller number of airports or to airports within a certain region or country for the benefit of getting "better" data on the territorial context or for a "better" delimitation of catchment areas. Certain tendencies and structures would not have become apparent also for another reason: interactions between airports, such as the consideration of specialisations developed by other airports, do not limit to national frontiers.

Conclusion of part 1: The evolution of the airport business and complex relations with the other parties involved in air transport shed new light on the airport which emerges as a strategic actor

This part was intended to give the reader a basic familiarity with the airport within the air transport system. Underlining the characteristics of passenger and freight transport by air, the evolution of the airport business which shows the airport's intention of being recognised as a full partner in the air transport system and the increased number of stakeholders thus multiplying the relations of the airport, chapter 1 pointed out the emergence of the airport as a strategic actor in an air transport system who is subject to the dynamics resulting from the interactions between the different parties involved.

The strong relationship between airport and territory, analysed in chapter 2, highlights the importance of the spatial and territorial context into which the airport is embedded: Not only it explains the necessity to take into account e.g. environmental problems, to increase the social acceptability of the airport activity and to negotiate with the different institutional territories into which the airport is embedded, it has also, in addition to other factors, an influence on the airport's capacity to attract air traffic and on the degree of intra- and intermodal competition.

The two last named issues are presented in the literature review in chapter 3 which also gives an insight into recent publications on the geography of air transport and strategic airport management. However, studies on the geography of air transport in general consider airports as simple infrastructure and the few publication on airport management neglect the spatial and territorial context into which airports are embedded.

From the observations in the chapters 1 and 2 as well as from the literature review in chapter 3 result the two objectives of this work:

- *Analysing the European airport business within which the airport emerges as a full player*
- *Exploring more in detail the link between airport strategy and the spatial and territorial context into which the airport is embedded.*

The emergence of the airport as a strategic actor in the air transport system is due to the liberalisation of air transport which had far-reaching consequences on the whole activity although, basically, it referred only to airlines which got the freedom to choose the airports and routes they want to serve. New airlines entered the market; existing carriers were obliged to adapt their business models. Airports were pushed in a market economy like context where they have to compete for airlines, air services, passengers and freight. At the same time, the liberalisation of the air transport created new potentialities for airports: They got more room for manoeuvre, which still has been reinforced by the large restructuring process that most airports have gone through since then although the latter also created tension between certain parties involved in air transport due to the risk of a short-term profit seeking.

For this reason, the second part focuses on the new potentialities for airports to develop their activity which arise from the liberalisation of air transport before the third part concentrates on the spatial and territorial context into which airports are embedded.

PART 2

NEW POTENTIALITIES FOR DEVELOPING THE AIRPORT ACTIVITY

Introduction

The first part of this work presented the airport within the air transport system, described its business and analysed its relations with the other parties involved as well as with the territory. It also focused on the dynamics resulting from intra- and intermodal competition which characterise the today's airport business. In this context, the airport emerged as strategic actor in the air transport system. This emergence is closely connected to the liberalisation of the air transport which pushed the airports in a market economy like context where they have to compete for airlines, air services, passengers and freight. In order to react to changes in their environment and to respond to other parties involved in air transport, they need to embark on their own strategies allowing them to develop their activity. At the same time, airports also got more room for manoeuvre since air transport (at least for the liberalised part) is not longer subject to restrictive bi- and multilateral air service agreements.

For this reason, the second part starts by the fifth chapter that presents the political framework that constitutes the context within which airports are exercising their activity. The latter has been profoundly modified by the liberalisation of air transport creating new opportunities but also uncertainties.

If the airports have to embark on their own strategies allowing them to develop their activity, this results mainly from the competitive context into which airports were pushed but it is also connected to the increasing need for profitability due to the arrival of private shareholders. Therefore, the sixth chapter concentrates on three major aspects characterising the airport industry: their economic characteristics, the growing role of commercial activities and as many airports have gone through a large restructuring process in recent years, finally the focus is on the changes in the management and the organisation of airports.

Thus, the second part focuses on the new potentialities for airports to develop their activity; it provides a basis for understanding major developments inside the air transport system but also the specificities of the airport industry and their consequences on airport strategies.

5. *A new political framework due to the liberalisation of air transport*

The liberalisation of air transport within the EU has profoundly modified the context within which airports perform their activity. Prior to its liberalisation, the air transport was strictly regulated[156] as regards capacity, frequency and pricing. Thus, airlines could perform their activity only according to the provisions of bilateral agreements between EU member states to which had to be added IATA negotiations (i.e. between airlines). In this situation, airports had not much scope for strategic development. To the extent to which the airlines' economic decisions were constrained by the state (e.g. as regards the routes or airports they wanted to serve or the number of flights operated, the number of seats offered or ticket prices), the airports' destiny was connected to the airlines' one. This situation changed when the EU started liberalising air transport in order to create a single European air transport market allowing all airlines holding an EU air carrier's licence to operate on any intra-EU air route without any restrictions on capacity, frequency and pricing.

Having observed the effects of the liberalisation of the domestic air transport by the USA in 1978 and its implications for the sector, the EU introduced a new, single set of rules for all member states allowing both harmonising and liberalising air transport. This new political framework was introduced in three steps maintaining temporarily certain restrictions in order to facilitate to all actors the adaptation to changes. Moreover, stepwise reforms allow policy makers to modify and adapt measures in view of adjustments of the market.[157] This decision can also be explained by the specificities of the European market distinguishing it from the US market: The intra-EU market is smaller than the US market as regards its geographic scope, economic links between EU countries are less developed and the air transport has to compete with railway and car traffic (Carré, 2000b, p. 185). Moreover, the EU member states were the main shareholders of their respective national air carriers and thus interested in phasing the new political framework allowing them to adjust themselves to this change.

This liberalisation movement has its seeds in a change of mind connected to the will to leave more freedom to industrial and commercial activities that need a certain degree of freedom for their development.[158] Moreover, advances in economic theory, especially the theory of contestable markets, provided the theoretical justification for deregulation. Nevertheless, this does not mean that there is no regulation at all.[159] Regulation is justified by the failure to

[156] In a broader sense, economic regulation is "defined to be government intervention to change market outcomes". Intervention can both directly and indirectly affect market outcomes: directly through determining prices, quantity, product variety or the number of service providers or indirectly through changing or imposing constraints on market participants (consumers or firms) in order to influence their behaviour and thus the market outcome (Church & Ware, 2000, p. 749).

[157] In contrast, a "sudden and comprehensive regulatory change… gives actors in the market, particularly incumbent suppliers, less time to capture the reform process" but only if incumbents do not contribute largely to its definition (Alamdari & Mason, 2006, p. 112).

[158] Estienne-Henrotte (1988, p. 157).

[159] For this reason, the term "deregulation", which is often used as a synonym to "liberalisation", is somewhat misleading as it suggests the complete removal of regulation. However, regulation is not completely removed but limited to aspects where state intervention is necessary for the reasons of market failure. In this case, regulation

comply with the rules of competition leading to the distortion of competition.[160] This change in the regulatory framework follows also the political will to develop the air transport and to make of it a full industry. As the air transport had already realised a considerable growth in the past, it was not any more possible to ignore questions of efficiency turning around customer satisfaction and social welfare.

As the EU followed the US example when liberalising air transport, it is advisable to take a look at the American experience in air transport liberalisation before turning to the European one. As the US domestic air transport was the first industry in the USA to be deregulated, it produced much interest, especially for providing a basis for examining the likely effectiveness of deregulation in other sectors. Moreover, the air transport is an activity fascinating many people who want to understand therefore the developments in that sector. Finally, the necessary data were available allowing detailed analysis (Morrison, 2005). Nevertheless, the experiences with airline deregulation in the USA cannot be directly transferred to the European Union as there are differences in the scope of state intervention (e.g. in the coordination of the industry) but also in basic market characteristics (e.g. as regards demand) and in the degree of market organisation (Button & Stough, 2000).

5.1. The liberalisation of the domestic air transport in the USA

The US domestic passenger transportation by air had been strictly regulated since 1938 by the Civil Aeronautics Board (CAB)[161]. Regulation was considered to be necessary for reasons of public interest.[162] However, it concentrated on interstate and foreign traffic whereas intrastate traffic[163] and commuter operators providing feeder services to the trunk haul routes were not subject to CAB regulations.

The CAB had far-reaching authority over passenger air transport as it regulated not only the entry into the market and controlled the expansion of established air carriers into new and existing routes, but also market exit as air carriers needed approval by CAB for ceasing service to a point or a route. Moreover, the CAB regulated fares and awarded direct subsidies to carriers. It controlled mergers and inter-state agreements and investigated unfair methods of competition and trade practices. Finally, it could exempt carriers from certain provisions of

is justified if it allows to reduce inefficiencies resulting from market failure and the cost of regulation is lower than its benefit. This explanation for regulation is often termed normative theory of regulation as it is based on the premise that intervention is justified because it leads to an improvement in social welfare. (Church & Ware, 2000, p. 750) See for the distinction between the normative and positive theory of regulation also Fritsch, Wein and Ewers (1996, p. 296ff) and Viscusi, Vernon and Harrington (2000).

[160] Button (2005, p. 11) underlines that market failures "*per se* do not justify regulations and controls; they are only desirable if they demonstrably bring about improvement".

[161] The Civil Aeronautics Board was established through the US Civil Aeronautics Act in 1938 under the name of Civil Aeronautics Authority (but was called CAB from 1940).

[162] For more information on the beginnings of CAB regulation and its political and economical context, see e.g. Button and Stough (2000, pp. 85-87) and (Morrison, 2005).

[163] Intrastate traffic had been subject to more liberal state regulation and not to federal regulation. See for example La Mond (1974) on intrastate airline regulation in California. California and Texas were two states having large cities far enough apart in order to justify intrastate air service.

the Act.[164] Hence, in practice, the air transport market was virtually inaccessible to new entrants for the benefit of incumbent carriers which did not have to worry about price competition as fares were strictly regulated.

5.1.1. Questioning air transport regulation

Over the years, the extensive regulation of the government had been called into question. Economists criticised generally that the regulatory and policy making system was captured by the firms it was supposed to control. According to economic theory, regulation is not only demanded by industry but the regulators themselves have an interest in establishing and maintaining a complex administrative structure for their own ends, such as obtaining votes, financial resources, or the promise of future employment. Moreover, politicians use regulation to redistribute income for the purpose of getting support of other groups with influence (Posner, 1971; Stigler, 1971; Peltzman, 1976). Besides, the performance of the CAB's air transport regulation had been examined since the 1950s. Most of these studies compared the interstate traffic with the intrastate traffic as the latter did not fall in the CAB's sphere of influence pointing out the deficiencies of the regulatory framework at that time.[165] Despite the contribution of empirical academic studies to a better understanding of the shortcomings of the former regulation, changes in the political context as well as advances in economic theory, especially the theory of contestable markets[166] provided the theoretical justification for deregulation.[167] However, the assumptions underlying the theory of contestable markets have been criticised for being unrealistic and lacking robustness (Borrmann & Finsinger, 1999, p. 301ff).

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[164] Initially the CAB was also assigned with social regulation of the industry and safety issues but both responsibilities were transferred to the Federal Aviation Administration through the Federal Aviation Act 1958. For more details on CAB's responsibilities, see e.g. Button and Stough (2000, pp. 85-91) and (Morrison, 2005).

[165] According to Button and Stough (2000, pp. 88-91) first studies on the CAB's performance were published by Keyes (1951) and Caves (1962), the latter observed problems with the industry's performance requiring changes in the regulatory structure but he was not opposed to regulation. Most of works of Levine (1965), Jordan 1970, Keeler 1972, Douglas and Miller 1974, DeVany (1975) and Keeler (1978) concentrated on the comparison of CAB routes with intrastate routes, and especially those in California. In short, fares on CAB routes were higher than those on comparable intrastate routes, while load factors were too low since national regulation caused excess capacity. Moreover, this regulation led to a sub-optimally high quality of service. In order to attract more passengers, airlines "increased service (and other amenities)" on long-haul routes (Morrison, 2005) while they reduced (as far as possible) frequency on unprofitable short-haul routes. This can be explained by the CAB's pricing policy according to which prices on short-haul routes were fixed below costs while fares for long-haul routes were set above costs even though this allowed internal cross-subsidisation between both activities.

[166] See e.g. Bailey (1981) and Baumol et al (1982, 1988),

[167] For more details on the "move towards reform" explaining the steps towards the deregulation of US domestic air transport see Button and Stough (2000, pp. 91-93) who cited Baumol et al (1982) stating that "it is highly plausible that air travel provides real examples of contestable markets" (Button & Stough, 2000, p. 92). In transport, the contestable markets theory led to the separation between the operation and commercialisation of transport services on the one hand and the management of the infrastructure on the other hand. While transport services are considered to be contestable and are often opened up to competition, infrastructure is rather considered as a natural monopoly and therefore stays in most cases under government regulation. This also applies to e.g. railway transportation in the EU.

In this context, the USA liberalised its domestic air transport in 1978 through the Airline Deregulation Act.[168] In order to allow airlines to adapt to the new framework the Act, which was signed on 28 October 1978, scheduled a transition period before removing completely price as well as entry and exit regulation. The CAB was commissioned to relax and finally abandon controls over market entry (1 January 1982), route competition, levels of service, pricing policies (1 January 1983) and market exit. The last step consisted in closing the CAB from January 1985. Nevertheless, regulation continues to exist on safety and antitrust matters as well as on international aviation and the social provision of air transport to small communities.[169]

Since 1978 the airline industry has changed considerably; partly in order to deal with the effects of deregulation but also with those of economic slowdown. Thus, the effects of deregulation have to be put in perspective. Even without liberalisation the airline industry would have evolved.[170] Moreover, the evidence of certain effects remains heavily contested, such as the effects of mergers and acquisitions that resulted in an increased concentration although the number of new competitors grew rapidly during the first years after deregulation or the effects of more competitive fare structures and quality of service as regards the benefits on customers. The discussion about the impact of deregulation is in part an ideological one concerning the degree to which the government should intervene to correct market failures. Therefore, “little real consensus exists as to the comparative costs and benefits of deregulation, either for suppliers or consumers” (Graham B. , 1995, p. 123).

Nevertheless, some results of studies on the effects of the liberalisation of the US domestic air transport will be presented in the following. Effects in the short-term were quite different from those in the long-term (i.e. since the mid 1980s). Furthermore, in addition to the predicted consequences like increasing route competition and load factors, reducing fares, as well as raising profits (chapter 5.1.2), there could be observed some less expected ones as airlines developed different strategies in order to reduce the competitive pressure (chapter 5.1.3). Finally, there are new problems that have become apparent since the deregulation of air transport necessitating regulatory intervention (chapter 5.1.4).

[168] The CAB started already in 1976 “interpreting the regulatory statutes more liberally, and allowed some pricing and entry freedom” (Morrison, 2005). Nevertheless, the US airline deregulation can be considered as a sudden and comprehensive regulatory change, a “big bang” according to Button (2006, pp. 111-113), as a single act completely changed the functioning of a market.

[169] Safety matters are controlled by the Federal Aviation Authority whereas the responsibility of international aviation as well as of the social provision of air transport to small communities was transferred to the Department of Transportation. The control of airline mergers and acquisitions was first assigned to the Department of Transportation before being placed under the responsibility of the Department of Justice in 1989 (Button & Stough, 2000, pp. 93, 102).

[170] In order to evaluate the effects of regulatory reform, the situation under deregulation should be compared to what would have prevailed if air transport was still regulated. Nevertheless, in the following the comparison relates mostly to the situations before and after deregulation (Morrison, 2002; 2005).

5.1.2. Consequences on new entrants, route competition, load factors, fares and profits

By removing market entry barriers and price regulation through the Airline Deregulation Act policy makers expected the emergence of many new airlines competing for air services and passengers, thus developing air transport as well as leading to more efficiency and consequently to a decrease in fares and better service etc.[171]

5.1.2.1. Growing concentration follows the large entry after the market entry of new competitors increasing concentration

One objective of the liberalisation of air transport was to encourage the market entry of new competitors and the expansion of established carriers into new and existing routes. The first 18 months following the deregulation about 106 000 city-pairings were authorised. The number of carriers increased considerably in the short-term. About 70 % of the 168 new passenger and freight carriers that were certified by the Department of Transportation between 1979 and 1992 began service the first years after deregulation, i.e. until 1985.[172] Then, a tendency towards concentration could be observed, especially the years 1986 and 1987 were characterised by a wave of mergers and acquisitions.[173] The concentration of air carriers continued and has become more pronounced through bankruptcy, alliances as well as mergers and acquisitions.

5.1.2.2. Increased route competition, reinforced by pressure from low-cost airlines

As the number of competitors has only a limited significance, it will be completed by the competitors' respective market shares. This allows to calculate the number of effective competitors[174] and to assess route competition. Results show that route competition has increased since the deregulation of air transport. For all routes, the number of effective competitors per route raised from 1.7 carriers in 1977 to 2.5 carriers in 1986. Between 1986 and 2003, the number of effective competitors per route has slightly decreased, fluctuating

[171] This section relies heavily on Morrison (2002; 2005). In addition, more recent publications from European authors are cited (e.g. on airline alliances) as their analyses refer to phenomena that could be observed after the liberalisation of the EU as well as of the US domestic air transport market (such as airline alliances).

[172] Cited by Graham B. (1995, pp. 123-124) according to Nocella (1993) and US Department of Transportation (1990).

[173] See Graham B. (1995, p. 128) for a diagram on merger and acquisition in the US airline industry.

[174] The number of "effective competitors" (Morrison, 2005) is the inverse of the Herfindahl-Hirshman index (HHI), 1/HHI, and indicates the equivalent number of equal-sized firms in the market that results in the same HHI. The HHI is the sum of each firm's squared market shares: $HHI = \sum_{i=1}^{N} s_i^2$ (with s_i corresponding to the market shares of the firms i = 1,…,N). The HHI is a common measure of market concentration and can vary between 0 (perfect competition) and 1 (monopoly). Fewer firms and larger variations in market shares increase HHI, indicating a greater degree of competition. (Church & Ware, 2000, pp. 239-240, 429, 718) For instance, if two firms had each one 50 % market share, the HHI would be $0.5^2 + 0.5^2 = 0.5$, corresponding to two effective competitors. If one firm had a market share of two-thirds and the remaining two firms each had a market share of one-sixth, the resulting HHI would also equal 0.5, resulting in two effective competitors (Morrison, 2005).

between 2.2 and 2.4. However, competition depends still on the flight distance. Competition remains not only more important on long-haul routes (more than 2000 miles i.e. around 3200 km) than on short-haul routes (less than 500 miles i.e. 800 km). Moreover, on short-haul routes, competition decreased from 1.6 effective competitors per route in 1977 to 1.5 in 2003, despite an increase in its number to 2.0 until 1986. By contrast, on long-haul routes, competition increased with the number of effective competitors growing from 2.0 in 1977 to 3.5 in 1986 and fluctuating between 3.3 and 3.6 since then (Morrison, 2005).

The degree of competition depends also on the market segments to which carriers serving a route belong. In this respect, low-cost carriers as new market entrants played an important role through exerting competitive pressure on other airlines. The share of low-cost carriers increased from 0 % in 1978 to 7 % of total domestic revenue passenger-miles in 1985 and continued growth after a decline between 1985 and 1987 reaching over 20 % in 2003. The low-cost carriers' impact on airline competition does not only result from an increasing market share but also from their pressure on competitors to lower fares in order to be competitive.[175] This effect is considerable as in 2003 almost 45 % of domestic passenger-miles were flown (by all carriers) on routes where low-cost carriers had a market share of at least 10 % (Morrison, 2005, pp. 410-411).

5.1.2.3. Higher load factors

Since deregulation, load factors have increased from 55.9 % in 1977 to almost 74 % in 2003. As they indicate the percentage of available seats sold to paying passengers, they affect airfares and profitability (Morrison, 2005).

5.1.2.4. Decrease in airfares and multiplication of special offers

The US domestic yield (i.e. the average fare divided by the product of the distance travelled and the number of passengers, adjusted for inflation)[176] have been falling by around 54 % between 1977 and 2003. Nevertheless, a part of this decrease is likely to be due to other factors than deregulation as a decline in fares had already been observed before 1978 and would probably have continued without deregulation (Morrison, 2005). According to counterfactual analysis, Morrison and Winston (2000) estimated that the decrease in fares resulting from liberalisation was of 27 % which means that fares were 27 % lower than they would have been without the deregulation of air transport. Moreover, in 1998, 80 % of passengers (corresponding to 85 % of passenger-miles) paid lower fares than what they would have paid without deregulation.

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[175] See Morrison (2001) for an analysis of competition pressure exerted by the low-cost carrier Southwest Airlines. Using data of 1998, he calculated that $ 12.9 billion had been saved; 25 % due to Southwest's low fares and almost 75 % due to actual, adjacent and potential competition from Southwest on other carriers' fares. Results are both "troubling and encouraging" for Morrison: "troubling" as the pressure of one carrier led to such a large part of price reductions from airline deregulation and "encouraging" as this suggests that policies in favour of market entry have a large impact on passenger welfare.

[176] The airline passenger revenue divided by revenue passenger-miles.

Carré (2000b, p. 139) underlined that the decline in the yield does not result from a decrease of standard prices, i.e. standard fare without any reduction, but from the multiplication of special offers as airlines introduced numerous different price categories granting diverse discounts, even though these generally had restrictive conditions attached. These special low prices showed a further decrease and moreover their share in total ticket sales increased. This pricing policy is reflected in the dispersion of fares, measured by the Gini coefficient[177] which increased slightly just after deregulation in 1978 and stabilised at about 0.13 for a few years before showing a steady rise between 1984 and 1991 reaching 0.22. At the beginning of the 1990s, when the airline industry was undergoing a period of weak demand leading to heavy losses, fare dispersion decreased but rose again from 1994 until 2001 when it reached its peak at more than 0.23 before decreasing again after 2001 when the airline industry[178] was experiencing again weak demand and heavy losses (Morrison, 2005).

5.1.2.5. Profits affected by cyclical variation but higher despite decrease in fares

According to Morrison (2005) the airline industry, which is characterised by cyclical variation, realised on average an operating profit margin[179] of 3 % between 1970 and 2000. Despite the decrease in fares after deregulation, industry profits in 1988 were even higher than they would have been if the air transport had remained regulated as showed Morrison and Winston (1995) in a counterfactual analysis: Deregulation did not only lead to a fall in fares but also to a decrease in costs and a rise in load factors.

5.1.3. Rather unexpected consequences

The airline deregulation aimed at increasing competition through the market entry of new competitors and the expansion of established operators into new and existing routes leading thus to a decrease in fares and an increase in air traffic and service quality. However, airlines adapted to the new situation and developed different strategies in order to reduce the competitive pressure. For this purpose, airlines extended hub and spoke networks. They strengthened their position through alliances, code sharing agreements with other airlines as well as mergers and acquisitions. Moreover, the introduction of Computer Reservation Systems and Yield Management modified dramatically the airlines’ commercialisation strategy and pricing policy. In particular, they allowed the multiplication of price categories granting diverse reductions. Frequent flier programs are another tool for reducing competitive pressure as they allow to establish customer loyalty. These consequences of the deregulation were more or less expected.

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[177] The Gini coefficient, multiplied by two, indicates the “expected difference in price of two randomly selected tickets, expressed as a fraction of the average price in the market” (Morrison, 2005). If the Gini coefficient was 0.15, two randomly selected tickets would, on average, differ by 30 % of the average fare.

[178] For more information on the airline industry’s crises in 1992 and 2002, see e.g. Horan (2002).

[179] The operating profit margin (or operating net margin) corresponds to the operating profit before taxes and interest on long-term debt for a certain period divided by revenues for that same period. Thus, it indicates how effective a company is at controlling the costs and expenses associated with their normal business operations.

5.1.3.1. *Introduction of hub and spoke networks*

A hub and spoke network is hierarchically organised with a small number of aerodromes (hubs) which allow to consolidate traffic from diverse origins (spokes) or to redistribute traffic to a diverse range of final destinations (Button, 2002)[180]. Hub and spoke networks are not only characterised by a spatial concentration of air traffic but also by a temporal one as traffic is organised in waves (also referred to as banks) allowing to interconnect a maximum of arriving flights with a maximum of departing flights in a minimum of time.[181]

Morrison (2005) noted that hub and spoke networks existed already for many years in the USA before the deregulation of the US domestic air transport in 1978 and that therefore they could not be considered as a product of airline deregulation. Most authors do not agree and consider them as a consequence. Even though in 1977 about 29 % of US domestic air travellers changed planes on their trips (Morrison, 2005), these changes involved often interlining agreements and a change of airline but through ticketing, baggage transfer and schedule coordination between the different carriers did not exist. In fact, connecting flights did not play a strategic role within the organisation of the airlines' route networks, although a certain degree of hubbing existed already. Most routes were served on a point-to-point basis as, before deregulation, the CAB granted licences on a route basis, not with the purpose of optimising the network. However, when airlines asked for new licences, they usually tried to introduce new services that fitted with the existing route network (Button, 2002).

Only since the entry into force of the Airline Deregulation Act of 1978 "airlines have been constructing route networks of their own choosing rather than operating ones implicitly chosen for them by the Civil Aeronautics Board" (Bania, Bauer, & Zlatoper, 1998, p. 53). For example, United Airlines restructured its route network between 1965 and 1989 from a network with many multistop flights into a network being characterised of mostly nonstop and one-stop flights (Bania, Bauer, & Zlatoper, 1998)[182]. The importance of connecting flights increased since airlines started joining forces within airline alliances and/or signed code share agreements[183] according to which a flight could be operated under different codes allowing thus through ticketing and baggage transfer.

As the hub and spoke network has features providing advantages on the supply side as well as on the demand side thanks to synergies[184], it can be found today, to different degrees, also in other transportation networks (like railway, route or maritime transport).

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[180] Note that "there is in fact no unique or even widely used definition of what is exactly constitutes a hub airport" (Button, 2002). The given definition refers to an air traffic management perspective. Form a competition policy point of view, hubs are characterised by the dominance of the airport by one or two major airlines.

[181] See Burghouwt, Hakfoort and Van Eck (2003), Burghouwt and De Wit (2005) and Burghouwt (2007) on the spatial and temporal configuration of airline networks even though his analysis concentrates on European airline.

[182] Bania, Bauer & Zlatoper (1998) analysed hub and spoke networks of 13 largest domestic carriers in 1989: Alaska Airlines, America West, American, Braniff, Continental, Delta, Eastern, Midway, Southwest, TWA, United and USAir which represented more than 90 % of the US scheduled traffic, measured in revenue passenger-miles, in 1989.

[183] For code sharing see e.g. Gurrea (2006), Ito and Lee (2006) ans Heimer and Shy (2006).

[184] For a general discussion of hub and spoke networks vs. point-to-point networks see e.g. Savy (2007, p. 112ff).

As regards air transportation, the operation of hub and spoke networks allows airlines to reduce costs (McShan & Windle, 1989) by exploiting economics of density and scope. By consolidating flights at key hubs, airlines may concentrate traffic on fewer and bigger planes and thus benefit from economies of aircraft size (Kanafani & Ghobrial, 1985). This strategy makes it possible for airlines to exploit routes where the origin-destination traffic volume is not sufficient for the successful operation of point-to-point connections from a commercial point of view. Thanks to transfer passengers, the transport volume is high enough so that the degree of utilisation allows to provide commercially viable air service. Hubbing increases airline profitability (Toh & Higgins, 1985) and is according to Oum, Zhang and Zhang (1995) a dominant strategy in an oligopoly allowing to deter entry by other airlines.

Passengers benefit from hub and spoke networks through higher flight frequency (Morrison & Winston, 1986; 1995) than in a network which is composed of point-to-point connections. This is also the case of passengers using services from small non-hub airports to hub airports even though services to other non-hub airports have been reduced. Moreover, the number of destinations that can be reached by either a nonstop or a one-stop flight has increased (Butler & Huston, 1990; Barnett, Curtis, Goranson, & Patrick, 1992). Contrary to the general feeling that nonstop flights would have been reduced, a traveller was more likely to find a timely nonstop flight in 1989 than in 1977, even when taking into account the growth in passenger traffic since 1977. Actually, most airline networks are hybrid networks where airlines, despite the adoption of the hub and spoke model, continue to operate point-to-point flights if the traffic volume is sufficiently high. Nevertheless, the adoption of hub and spoke networks contributed to an increase in travel times for passengers who lost direct flights and an increase in fares for passengers originating from hub airports or other airports with capacity constraints. However, as regards passengers originating from hub airports, they benefit in return from relatively more destinations that can be reached by nonstop flights and an increased frequency for these nonstop flights (Huston & Butler, 1988).[185]

5.1.3.2. Commercial concentration of airlines: mergers, acquisitions, alliances and bankruptcy

The deregulation resulted in a growing concentration through mergers[186], acquisitions, alliances or bankruptcy in the airline sector although many experts foresaw rather the emergence of many small carriers competing for routes (Button, 2002). It seems that larger carriers have a competitive advantage in many markets because of the range of services they provide. In particular, the airline alliances have been extensively studied.[187] They can take various forms, including financial links, even though at the beginning strategic alliances had been distinguished from mergers and acquisitions by the absence of financial participation. Airline alliances have an international dimension as they involve carriers from different

[185] For further literature on hub airports see e.g. Zhang (1996) and Brueckner and Zhang (2001).

[186] See e.g. Button, Haynes and Stough (1998, p. 102ff) on mergers and cross equity holding.

[187] Button, Haynes and Stough (1998) note that airline alliances are one of the most rapidly growing business practices although not unique to air transport, nor to transport in general.

countries and with route network structures focusing on different geographical zones. Button and Stough (2000, p. 313) underlined that the exact number of alliances is unclear: The dynamic nature of these arrangements makes it almost impossible to keep abreast of changes. Moreover, “alliance” is a generic term with no precise definition (Tretheway, 1990; Ehmer & Berster, 2002, p. 11)[188]. In some countries, an alliance means some degree of equity ownership of one carrier by another, but it is more often interpreted in looser terms including such things as code sharing agreements, interchangeable frequent flyer programs and coordinated scheduling of services (Button, Haynes, & Stough, 1998).

Due to definition problems, it is also difficult to determine the precise reasons for airline alliances. However, one can distinguish two major reasons explaining the growth of airline alliances: They improve technical economic efficiency due an increase in scale, the creation of optimal networks and the coordination of services; they create market power and limit competition (Youssef, 1992). According to Button, Hayes and Stough (1998, pp. 117-123), alliances provide different advantages to their member airlines[189]: cost savings due to the coordination between activities by partners; market penetration and retention thanks to an increase in the range of options offered to potential passengers; financial injections to partners in difficulties since many alliances were created just when an airline was experiencing financial problems; reduction of infrastructure constraints since alliances allow entry to capacity constrained airports by permitting partners to buy blocks of space on incumbent aircraft or schedule services using fewer, larger aircraft; circumventing constitutional constraints e.g. thanks to the partner an airline may get access to cities to which it has no traffic rights due to restrictive air service agreements; finally, alliances may contribute to market stability by reducing extreme competition which is an important point for network industries that are characterised by a potential for instability (e.g. code sharing agreements allow to fill better capacity and with more certainty).[190]

The increasing concentration in the airline sector has led to a large discussion about the market power of larger, hub-based airlines, about the hub domination by an alliance to the detriment of new entrants or other incumbent carriers and about predatory behaviour in airline market.[191] The latter refers to airlines that accept to sustain a loss in the short term with the expectation that this will force other airlines to leave the market so that it can recoup short-term losses thanks to long-term market position (Dodgson, Katsoulacous, & Pryke, 1991). This type of behaviour is particularly difficult to distinguish from competitive behaviour.

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[188] This also applies to the term “cooperation” which refers to different forms of collaboration between firms, ranging from tacit agreement to acquisition and mergers as Ehmer and Berster (2002) underlind. Their research is particularly comprehensive as they started with an analysis of the term “cooperation” before focusing on strategic alliances and considered not only reasons for the emergence of alliances but also its consequences on the different parties involved in air transport. They also analysed the state of airline alliances at that time and give and outlook on future developments.

[189] See Button, Haynes and Stough (1998, pp. 112-117) on the economic theory of alliances.

[190] For strategic alliances in the airline sector see also e.g. Lutz (1993), Laaser, Sichelschmidt, Soltwedel and Wolf (2000) and Laaser (2002).

[191] See e.g. Button, Haynes and Stough (1998, pp. 131ff, 145ff) on hub domination and predatory behaviour but also Ehmer and Berster (2002) and Forsyth, Gillen, Mayer and Niemeier (2005).

Despite this concentration, most studies consider that deregulation had positive effects from a cost-benefit analysis point of view. However, the air transport market is obviously neither perfectly competitive nor perfectly contestable: Keeler T. E. (1990) speaks of a "workable competition", Kahn (1988) observes oligopolistic structures, and finally, Baumol and Willig (1986) reach the conclusion that aviation may be less contestable than they suggested initially. Button and Stough (2000, p. 113) refer to empirical work of Moore (1986) and Morrison and Winston (1987) that showed that the deregulated aviation market was not strictly purely contestable, a point of view being consistent with analysis done by Levine (1987) saying that certain "benefits of deregulation 'have come about in spite of impediments to contestability brought about by customer preferences for market practices and product features that incidently inhibit competition'".

5.1.3.3. Introduction of Frequent Flyer Programs

Frequent flyer programs are a marketing device that was introduced by American Airlines in 1980. They allow passengers to accumulate points that can be used for free travel thus establishing customer loyalty and reducing actual and potential competition[192] (Button & Stough, 2000, pp. 110-111).[193]

5.1.3.4. Introduction of Computer Reservation Systems and Yield Management

A computer reservation system (CRS) contains all information concerning the flights operated by airlines (flight schedules, available tickets, fares, etc) with or without the possibility to make a reservation or to issue a ticket. Airlines developed CRSs in order to reduce paperwork but their implementation allowed them also to become more flexible when setting fares thus introducing a multitude of different ticket categories with corresponding prices. Based on the computerisation of seat reservations, the yield management allows to handle available capacities (such as available seats in air transport[194]) aiming at maximising the turnover of a flight (revenue management) through price discrimination, demand control and demand shift.[195]

As the CRS's development and maintenance is expensive, only bigger airlines could afford this investment but some of them accepted to be paid by other carriers for granting access to their system. Especially SABRE and APPOLO (which were developed respectively by

[192] Today almost all airlines participate in a specific customer loyalty program. Moreover, Frequent Flier Programs further developed especially through partnerships between airlines and other companies (mostly hotels, car renting but also other companies) allowing passengers to accumulate as well as to spend these points on flights but also on other products.

[193] See also Strohbach (2007, pp. 53-57).

[194] The yield management has been adopted by other industries like the hotel sector in order to handle available hotel rooms.

[195] For more information about CRS and yield management, see e.g. Button and Stough (2000, pp. 110-113) and Cournanel (2001, pp. 43-55).

American Airlines and United Airlines) thus achieved a market share of 67 % in 1987 (Button & Stough, 2000, p. 111).

CRSs got a subject of discussion as they, in particular in combination with programmes for customer loyalty, “can serve to manipulate information available to potential travelers and result in favorable bookings for the controller of the system used” (Button & Stough, 2000, p. 111). One problem concerned the relation between airlines and travel agents[196] as the latter more and more used CRSs (Levine, 1987). As they link flights with other products, travel agents got an essential intermediary between airlines and travellers, the latter moreover relying on travel agents to get the most appropriate information.[197] In this respect, the order of displaying flights was a point to be regulated. 80 % of bookings refer to the research results on the first page[198] of information explaining why airlines systematically displayed own flights first. Before its dissolution, the CAB set out rules aiming ay replacing this practice by displaying flights according to objective criteria like travel time or fare for example. Halo effects referring to travel agents favouring the CRS-owning carrier’s flights and resulting from their close business relationship were another problem, in particular as they were rather unaffected by CAB measures.[199]

5.1.4. Other issues

Even though air transport is less competitive and less contestable than economists argued before its deregulation, most publications draw a positive balance. Nevertheless, Morrison (2005) points out some new problems that have become apparent since airline deregulation and should be subject to effective policies as they could, once resolved, contribute to improving benefits from airline deregulation.

Among these problems figures the access for airlines to airport gates which is, in the USA, often provided on the basis of long-term leases with exclusive-use rights. This practice could already be observed before deregulation. According to Morrison (2005), the US General Accounting Office (1990b) confirmed that 88 % of the gates at 66 large and medium-sized airports are leased and 85 % of these give the airline exclusive-use rights. As a number of airports are congested and the extension of airport capacity often poses a problem, this type of

[196] According to Button and Stough (2000, p. 112) the share of travel agents having access to CRSs increased from 15 % in 1979 to 82 % in 1983 and reached 95 % in 1988. This is also reflected in the increase in the share of commission costs paid by the major airlines to travel agents in return for the sale of flights: They rose from 4.4 % of their operating expense in 1976 to 8.7 % in 1986.

[197] In 1979, in the course of the US air transport deregulation, the market for travel agencies was liberalised, too. For more details see Meyer and Oster (1987) according to Button and Stough (2000).

[198] 70 % according to Weimar and Jansen (2001, p. 62).

[199] See e.g. Strohbach (2007, pp. 26-31), in particular on the EU’s approach to CRS. Note also that a code of conduct for CRS was designed in 1989 along with EU regulation 2299/89. However, since then, CRS technology and economics have developed considerably due to the emergence of alternative distribution channels, including the airlines' Internet websites or their call centres, giving consumers access to a multiplicity of information and booking channels for air transport services. In consequence, about 40% of all airline tickets in the EU are booked via alternative channels and about 60% via travel agents and CRSs (http://ec.europa.eu/transport/air/internal_market/distribution_en.htm, accessed on 12 April 2010).

contracts makes the access for new carriers to airports difficult, increasing costs for passengers (Morrison & Winston, 2000). A solution could consist in reducing the duration of leases as well as removing exclusive-use rights. Another problem arises from the so called perimeter rules according to which airlines have to respect allowable flight distances for services to or from certain airports. Airports like New York's La Guardia or Washington's Reagan National Airport[200] are concerned by these rules which lead to a shift in flights to neighbouring airports (Morrison, 2005).

5.2. Liberalisation of air transport in the European Union

The liberalisation of the European air transport[201] has been promoted against the background of US air transport deregulation but it also follows from the common European transport policy and thus goes back to the Treaty of Rome which came into force on 1 January 1958 and established the European Economic Community (EEC). This treaty had the objective of creating a common market allowing the free movement of goods and the mobility of production factors (such as workers, enterprises, and capital but also the freedom to provide services). As transport is essential to the free circulation of goods and persons, transport markets were also concerned by this policy. Moreover, the restrictive access to the market was contrary to the freedom to supply services. In fact, the whole system of airline regulation was anti-competitive and thus opposed to the idea of the Treaty of Rome.

Since its regulation was very strict and moreover highly divergent in the original member states, the transport sector was even separately discussed within the Treaty of Rome. Nevertheless, the implementation of a common policy in the transport sector took a long time, especially as regards air transport.[202] Member states had difficulties to arrive at the required agreement. Transport policies of the member states were largely based on intervention on price and capacity rules (including licensing). It appeared that the application of such a system to a single European market was impossible[203] (Van Reeven, 2005).

The common transport policy, which was adopted at European level, is based on market economy orientation allowing great latitude to market participants while state intervention

[200] New York's La Guardia airport offers only short and medium-haul links while flights longer than 1500 miles are operated out of Kennedy airport. Washington's Reagan National Airports is also subject to flight restriction for the benefit of Dulles Airport where all flights longer than 1200 miles were transferred to. (Morrison, 2005)

[201] See e.g. Ehmer, Berster, Basedow and Jung (2000).

[202] For more details on the beginnings of the European Union and the place of transport policy in the Treaty of Rome, see Van Reeven (2005). For more details on the beginnings of a common European air transport policy, see also Button and Stough (2000).

[203] The common transport policy got off the ground from 1985 on with the so-called "inactivity verdict" of the European Court of Justice in the European Parliament's favour as the judgment obliged the Council of Ministers to move more substantially on a common transport policy; with the Single European Act (coming into effect on 1 January 1987) which allowed a more frequent use of majority voting thus facilitating decision-making while previously unanimity was required; with two judgements of the court in 1986 and 1989 (the cases of Asjes and Ahmed Saeed Flugreisen) stating clearly that the general Treaty of Rome provisions also applied to transport and the publication of the European Commission's White Paper on completing the internal market (Van Reeven, 2005). For more information on the adoption of the common transport policy see e.g. Bourqui (2006).

had to be partly harmonised and partly abolished. Even though regulation is sector-specific, liberalisation generally involves uniform and relaxed rules on the access to professions (specifying how to get a certificate of qualification for carrying out transport services) as well as on the access to the market (stating how to get permission to operate as qualified transporter specific transport services). Finally, regulation concerns also the access to infrastructure and includes the liberalisation of complementary services that are necessary to operate transport services (Van Reeven, 2005).

This is also the idea behind the liberalisation of air transport which was realised in three steps (or "packages"), completing a longer integration process in the air transport sector which started already in 1978 even though liberalisation was not the initial objective.[204] Only in 1984, the Commission of the European Communities (1984) published a memorandum[205] on the "progress towards the development of a Community air transport policy" submitting proposals in order to remove restrictions to competition in air transport between member states.

5.2.1. The situation before liberalisation

The European situation differed significantly from that in the USA as air transport between EU member states was regulated by bilateral agreements[206] which were not uniform but had several common characteristics as Button and Stough (2000) point out:

- Market access was heavily restricted due to single designation practice which means that often only one airline from each country had the right to serve a particular route. Therefore, in 1987 only 48 of 988 routes within the EU (i.e. less than 5 %) were flown by more than one air carrier from either side (i.e. multiple designation policy as an exception).
- Another exception was fifth freedom[207] competition as only 88 of 988 routes within the EU (i.e. less than 9 %) allowed is right.
- The capacity offered by each bilateral partner was also restricted. Generally, each state had the right to operate 50 % of the traffic between two countries.

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[204] See Niejahr (1999) about the beginnings of the common European air transport policy which had for objective to create an "efficient, inexpensive network within the Community together with financial soundness for the air carriers, while safeguarding the social interests of airline workers and improving conditions of life for the general public." (Niejahr, 1999, p. 57) The very first liberalisation measure dates from 1983 and concerned air services between regional airports (Directive 83/416/EEC). It led to the opening of the market for these services while air fares should be set, henceforward, following a cost-based approach. However, the directive had only little impact as protective measures were maintained.

[205] COM(84)72 final is also called Civil Aviation Memorandum No. 2. A first memorandum was already published in 1979 but its proposals were rather modest and did not directly address liberalisation.

[206] See Bourqui (2006, pp. 26ff) on bilateral air service agreements and their provisions on traffic rights, on capacity sharing, air routes, designation procedures for air carriers and on substantive ownership and effective control as well as on the approval of air fares.

[207] See Appendix 1 for an overview of freedoms of the air. According to the ICAO, the fifth freedom right is the right or privilege, in respect of scheduled international air services, granted by one state to another state to set down and to take on, in the territory of the first state, traffic coming from or destined to a third state. Thus, it authorises an airline of a third country to carry passengers between two other countries on route with origin/destination in its home country.

- Following these restrictions on the number of airlines and on capacity, revenues were also shared in proportion to the capacity employed (e.g. if the capacity was shared 50/50 between two airlines, revenues were also shared 50/50 even if one airline achieved more than 50 % of the total turnover).
- Fares had to be approved by regulatory authorities of bilateral partners. Consequently, there was no competition of price. The only possibility for competition was on service.
- A country could designate only airlines that were substantially owned and controlled by it or its nationals.
- State aids, that were granted to some partially or wholly government owned airlines, contributed to a distortion of competition.

Nevertheless, comparisons were made between the situation of air transport in Europe prior to liberalisation and that in the USA after deregulation, especially on air fares. Studies showed that the price of certain single tickets was double the US fares for similar distances, while differences for return fares were much smaller.[208] Comparisons between bilateral regulated air routes and routes served by charter carriers showed also fare differentials, which could be explained only for a small part by differences in the two modes of operation (Commission of the European Communities, 1981; Barrett, 1987).

5.2.2. A liberalisation in three packages

The air transport in the European Union was liberalised progressively implementing three packages of measures. These measures followed the proposals made by the Commission of the European Communities (1984) in the 2nd memorandum[209] and modified the existing rules on designating air carriers, allocating capacities and frequencies and approving air fares arising from the former system of bilateral air service agreements between member states.[210]

5.2.2.1. The first package opening access to the single air transport market, relaxing rules on capacity sharing and approval of air fares

The first package, which came in force on the 1 January 1988, expressed the legislator's intention to reduce restrictions to competition by opening the access to the single market in order to develop the sector in the users' interest. It relaxed the established rules on the access to the market, the distribution of capacities as well as pricing. Following the regulations (EEC) No 3975/87 and (EEC) No 3976/87, the Commission applied for the first time the competition rules of the Treaty in this sector. According to decision 87/602/EEC, which

[208] Information was taken from a study of the UK House of Lords according to Button and Stough (2000).

[209] See COM(84)72 final, as well as Button and Stough (2000) and Bourqui (2006) for further explications.

[210] Implementing the proposals of the 2nd memorandum was accelerated by the judgment of the European Court of Justice in the *Nouvelles Frontières* case, the French travel agency had been sued for selling tickets below the officially regulated price (Bourqui, 2006, pp. 48-50). See Bourqui (2006, pp. 89ff) also on a detailed analysis of the liberalisation of the EU air transport market.

involved a certain degree of liberalisation of the third, fourth and, to a lesser extent, of the fifth freedom rights[211], member states could designate several air carriers to serve routes with heavy traffic volume. Moreover, the strict 50/50 capacity sharing rules were relaxed as the capacity offered now could vary within a range of initially set at 55/45 (valid until 30 September 1989) and thereafter of 60/40. Directive 87/601/EEC stipulated approval procedures of air fares. However, approval of fares within certain zones of flexibility was automatic providing some scope for discounts.

5.2.2.2. The second package introducing further of rules on access to the air transport market and on pricing

The second package, effective since the 1 November 1990, established a period of transition in the introduction of the competition. Regulations (EEC) No 2342/90 and (EEC) No 2343/90 replaced the provisions from the first package with more far-reaching measures. Thus, restrictions on the third, fourth and fifth freedom rights were further relaxed. This also applied to air cargo services as a carrier providing air service from its home country to another member state could take freight into a third member state or operate air service from one member state to another before returning to its home country (fifth freedom rights). Therefore, the existing ownership rules, according to which an airline had to be substantially owned by a European state in order to fly from that country, were abolished over a two-year period. Air fare flexibility zones, within which approval was automatic, were also extended allowing a discount of up to 20 % and a so-called "deep discount" of up to 70 % of the standard fare (Button & Stough, 2000). Moreover, a proposed fare could be rejected only if both civil aviation authorities refused its approval.

Nevertheless, both packages had not for objective to abolish existing bilateral service agreements between member states but to loosen certain provisions.

5.2.2.3. The third package completing the liberalisation of air transport

The third package, which came in force on 1 January 1993, represents the final step of the liberalisation of air transport, as it replaced the hitherto existing air service agreements between member states through introducing the fifth, seventh and eighth freedom rights[212]. Nevertheless, consecutive cabotage resulting from the eight freedom right was subject to the

[211] According to the ICAO, the third freedom right is the right or privilege, in respect of scheduled international air services, granted by one state to another state to carry passengers from the home country of the carrier to the territory of the first state. The fourth freedom right is the right or privilege granted by one state to another state to carry passengers to the home country of the carrier from the territory of the first state. (See also Appendix 1.)

[212] The seventh freedom right is the right or privilege granted by one state to another state of transporting passengers or freight between the territory of the first state and any third state, without the need for the service to be connected to or to be an extension of any service to/from the carrier's home country. The eighth freedom right is the right or privilege of transporting cabotage (also called "consecutive cabotage") traffic between two points in the territory of the granting state on a service which originates or terminates in the home country of the foreign carrier or (in connection with the seventh freedom right) outside the territory of the granting state (e.g. a French airline flying from Paris CDG airport to Frankfurt and then to Berlin takes on passengers at Frankfurt).

condition that the number of passengers on this sector did not exceed 50 % of the total in the main flight and thus still subject to some controls on fares and capacity.

In order to further relax freedom rights, Regulation (EEC) No 2407/92 provided for the harmonisation of the economic and, to a lesser extent, the technical requirements for granting operating licences to Community air carriers (a status for EU internal purposes so that there is no more any difference among EU carriers due to foreign ownership). Then, market access and price-setting for these carriers were liberalised through Regulations (EEC) No 2408/92 and (EEC) No 2409/92. Thus, airlines could operate routes without restriction. Only if ticket prices fell too low or rose to high, member states could intervene. The latter two regulations fixed also conditions under which member states (and in certain cases the Commission) can restrict these freedoms in the public interest.

Full cabotage[213] was excluded from liberalisation over a transition period during which a member state could still refuse this privilege on its own territory. Having abolished this last restriction concerning the right of providing cabotage, since the 1 April 1997, the air transport is totally liberalised. This means that from this date forth the market is open to all airlines holding an EU air carrier's licence which can operate any intra-European route without any restrictions on capacity, frequency and pricing. The EU air carrier's licence requires that the majority of the airline's capital is held and effective control over the company at any times is exercised by member states or Community nationals.[214] The technical capabilities and financial capacity of the companies concerned are still sanctioned by means of national certificates based on national regulations.

5.2.2.4. Enlargement of the EU's internal aviation market and the EU's external aviation policy

Already in 2000, the EU concluded a liberal air service agreement with Switzerland on behalf of its member states. In addition, the single market was subsequently extended to Norway and Iceland. Following the enlargement of the European Union on 1 May 2004, the European single air transport market has also been extended to new member states whose existing bilateral agreements with older member states were superseded.

In contrast to intra-European transport, traffic between EU-airports and third countries is still strictly regulated by bilateral air service agreements.[215] These bilateral agreements generally designate the carrier from each side which may operate the services between the two countries, and often impose restrictions in areas such as capacity, frequency and fare levels. In this respect, the liberalisation of the air transport within the EU revealed another problem: A

[213] Full cabotage (also called "stand-alone cabotage") in air transport, corresponding to the ninth freedom right, is the right or privilege granted by one state to another state of transporting cabotage traffic of the granting state on a service operated entirely within the territory of the granting state (e.g. a French airline operates flights within Germany).

[214] Council Regulation (EEC) No 2407/92 of 23 July 1992 on licensing of air carriers

[215] In 2004, about 1 500 bilateral air service agreements were in force between EU member states and third countries (Commission of the European Communities, 2004a, p. 4). See also Bourqui (2006, p. 143ff) on the external aviation policy of the European Union.

large number of bilateral air service agreements between individual member states of the EU and third countries contained provisions which were incompatible with the internal market, such as nationality clauses.[216] For this reason, it was necessary to renegotiate with third countries and to replace these bilateral agreements between individual member states and third countries by bilateral agreements between the EU, i.e. representing all member states, and third countries. More than 500 bilateral agreements had been brought into conformity with EU law by mid-2007, covering nearly 100 partner countries (Commission of the European Communities, 2007, p. 7).

In this context, more liberal elements were introduced in a number of air service agreements, sometimes even leading to open sky agreements, liberalising the air transport between the EU and the third country.

The EU concluded in December 2005 an agreement with Iceland, Norway and further eight neighbouring countries (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the former Yugoslav Republic of Macedonia, Romania, Serbia and Montenegro and the U.N. Mission in Kosovo)[217] on a "European Common Aviation Area" (ECAA) agreement with the purpose of integrating them in EU's internal aviation market which, at the time, consisted of 25 EU Member States as well as Norway and Iceland. According to the ECAA agreement, the eight South-East European partners agreed to the full application of the European Community's aviation law. Once ECAA partners fully implement the EC's aviation law, ECAA airlines will have open access to the enlarged European single market in aviation. The EU underlined that this agreement will not only create new market opportunities in an integrated aviation market of 36 countries but also lead to equally high standards in term of safety and security across Europe, through the uniform application of rules.[218]

The EU Neighbourhood Policy framework has for objective to develop a broader European Common Aviation Area by 2010. Further talks are expected with Switzerland, Turkey and probably the remaining EUROCONTROL members. With the Mediterranean countries are expected Euro-Mediterranean Aviation Agreements with similar content: The EU has signed a first agreement liberalising air transport with Morocco in December 2006.

At the same time, the EU is seeking comprehensive aviation agreements with other major countries.[219] For example, the EU has signed, in April 2007, an open-sky-agreement liberalising progressively air traffic with the USA although for the moment US carriers were benefit from more liberties for serving European airports than EU carriers for serving US

[216] In 2002, the European Court of Justice has decided that some provisions of bilateral air service agreements signed by certain EU member states and third countries that refer to national air carriers were discriminating and consequently against the treaty establishing the European community. For this reason, the European commission has engaged negotiations with third countries with the purpose to eliminate these discriminating provisions.

[217] Bulgaria and Romania joined the European Union on 1 January 2007.

[218] Müller-Jentsch (2007) gives reviews of the status of sector development across the region, the provisions of the ECAA and the reform implications for governments and donors.

[219] These agreements always have two objectives: market opening and regulatory cooperation in matters such as aviation security and safety. According to the Commission of the European Communities (2007, p.9) thus is a completely new model of air transport agreement and therefore it would not be about "open skies" but rather "common skies" since the objective is to establish a framework that not only improves the competitiveness of airlines but also ensures a high degree of safety, security and sustainability for passengers.

destinations.Besides, negotiation are in progress or already have been finished with Canada, Australia, New Zealand, Chile, China and India.

5.2.3. Restrictions to free access to market

The idea of air transport liberalisation consists in conceding more freedom of action and room for manoeuvre to airlines letting them decide which airports to serve as well as frequency of flights, offered capacity, air fares etc. However, this freedom may be restricted if this is justified for example by public service obligations or capacity restrictions.

5.2.3.1. Public service obligations

Public service obligations[220] allow governments to maintain services which are considered to be essential for a harmonious development within their territory even though they are economically unviable from the airline's point of view. Therefore, a member state may impose a public service obligation on scheduled air services to an airport serving e.g. a peripheral region or development region or on a minor route to any regional airport in its territory. Their objective is to guarantee the adequate provision of scheduled air services on those routes as regards continuity, regularity, capacity and pricing – standards that would not have been adopted by airlines if they were considering only their commercial interest.

In this case, the member states have first to publish the public service obligations that will be imposed. In a next step, if no carrier wants to provide the service, the member state may restrict access to the route concerned to a single carrier and decide to grant to that carrier financial aid in exchange for compliance with the obligations. This procedure may ensure the survival of airports that are located in peripheral regions or development regions and must be considered when defining the airport's strategy.

5.2.3.2. Restrictions to free access to airports

Member states may regulate the distribution of traffic between airports within an airport system[221], of course without discrimination by reason of nationality or identity of the air carrier. Moreover, a member state may impose conditions on, limit, or refuse the exercise of traffic rights, if serious congestion and/or environmental problems exist, especially if other modes of transport can deliver satisfactory levels of service. For this reason, public policies may not only restrict access of airlines to airports but also the airport's room for manoeuvre and thus are essential to the strategy on which an airport embarks. In this respect, the airport's capacity to deal with such problems may be essential for current and also for safeguarding future development. For this reason, restrictions due to capacity, whether for technical, political or environmental reasons, will be considered in chapter 9 as they turned out to be one of the most important aspects of airport strategies.

[220] See e.g. Bourqui (2006, pp. 118-120), Dupéron (2000, p. 197ff) and Dobruszkes (2008, p. 41ff).

[221] Such as London and Paris. See Bourqui (2006, p. 120ff).

5.2.4. Consequences of the liberalisation of air transport

A report published by the Commission of the European Communities (1996c) on the first consequences of the implementation of the third package referring to the period of 1993 to 1996 shows only a hesitant adoption of the new freedoms. A greater impact on the development of the intra-EU air transport market could be observed only later. Just like after the deregulation of the US domestic air transport, one could observe the introduction of hub and spoke networks although the former European flag carriers already had to a certain degree concentrated traffics on their respective national bases. However, only since airlines started operating hub and spoke networks, one could observe the spatial and temporal concentration of air traffic due to an organisation of traffics in waves at the hub airports (Burghouwt, Hakfoort, & Van Eck, 2003; Burghouwt & De Wit, 2005; Burghouwt, 2007).[222] The liberalisation of air transport also allowed new carriers to enter the market and in particular led to the emergence of low-cost airlines. It also resulted in the privatisation of a number of former flag carriers and a growing concentration in the airline sector due to mergers, acquisitions, alliances and bankruptcy which already had been observed in the after the deregulation of the US domestic air transport; European carriers also introduced frequent flyer programmes and yield management techniques. In consequence of the liberalisation of air transport, airport slots showed an appreciation and turned out to be a scarce resource since a number of European airports are characterised by shortage in capacity, a point that will be dealt with in chapter 9 while the focus will be, as a start, on the market entry of new carriers, the development of air fares, etc.

5.2.4.1. New carriers and new routes but small use of new freedom rights – limited route competition

During the first three years, the member states issued EU air carrier's licences to about 800 airlines of which 80 are new market entrants providing scheduled air services while 60 ceased operating or were incorporated into other air carriers.

The number of routes rose from 490 to 520 (i.e. +6 %). Nevertheless, almost 64 % of all routes were served by one carrier and further 30 % by two. Only 6 % of all routes were served by more than two airlines (compared to 2 % in January 1993). However, the most routes served by only one carrier are not interesting for the latter due to low traffic levels while others are exposed to competition from neighbouring routes, charter carriers or alternative transport modes. Even though competition increased particularly in some larger markets (such as in Germany, France and Spain), where competition on domestic routes passed from one to two carriers, airlines used only to a limited extent the fifth[223] (30 routes in 1996 compared to

[222] See also Dobruszkes (2007) on the temporal configuration of airline networks at European airports: KLM at Amsterdam (p. 118), Lufthansa at Frankfurt and Munich (p. 120), Alitalia at Milan Malpensa and Rome Fiumicino (p. 124), Iberia at Madrid (p. 128) and Austrian Airlines at Vienna (p. 130).

[223] Airlines such as Finnair, Iberia, Alitalia and Luxair used more extensively the fifth freedom rights. Nevertheless only 4 routes have been operated continuously by the same airline over the period from 1993 to 1996 which is also due to the disadvantages of this type of operation (higher costs, operational constraints) compared to direct services. (Commission of the European Communities, 1996c)

14 in 1993), seventh and eighth freedom rights (20 routes in 1996 compared to 0 in 1993) introduced by the third package during this period. By the way, a hundred of routes (in France, Ireland, Norway, Portugal, Sweden and the United Kingdom) are subject to public service obligations.[224]

5.2.4.2. Decline in air fares, in most parts due to the increase in special offers

As regards air fares, consequences were similar to those observed after the US air transport deregulation. The fare structure got very complex as air carriers introduced numerous different price categories granting diverse discounts while imposing restrictions on the ticket.[225] Besides only a limited number of tickets are available at reduced prices. Nevertheless, the share of passengers benefitting from those promotional and special low tariffs on scheduled flights increased from 60.5 % in 1985 to 70.9 % in 1995. Moreover, about 50 % of all passengers within the EU used non-scheduled flights and thus also benefitted from relatively low fares. Consequently, about 90 to 95 % of all passengers buy tickets at a reduced price. This is also reflected in the yield which decreased by about 20 % between 1991 and 1995.[226] However, this decrease does not only result from liberalisation but can be explained in parts by the overcapacity on the market. Reduced fares are offered by two types of airlines: The large, traditional airlines (the former flag carriers), competing with each other on markets and routes with comparable services and frequencies, offer a large range of tickets and some of them at low prices; other airlines offer very competitive fares for a large number of seats allowing them to compensate for limited services and/or frequencies. Especially low-cost airlines could observe an increase in its traffics and expanded their activity over the last years, thus entering direct competition with the large, traditional carriers on certain routes with high traffic levels.

In contrast, the flexible standard fares remained largely stable and even rose slightly.[227] Studies on the evolution of fares on the Amsterdam/London[228], Brussels/Rome, Madrid/Rome and Madrid/Milan routes between 1992 and 1997 confirms the absence of significant decreases in fares while the price of some tickets (such as for the business class) even increased. (UK Civil Aviation Authority, 1998) As regards flexible standard fares for scheduled flights, notable reductions could be observed, as found also Mandel (1999a), only on routes with more than two competitors, like Barcelona/Madrid, UK/Ireland, Paris/London or certain domestic routes in Germany, in France, in Italy (Milan/Rome), in the UK and routes

[224] Due to the frequent use of Public Service Obligations, the Commission of the European Communities (1996c) announced to observe the recourse to this practice for ensuring that it does not serve as barrier to market entry.

[225] The European Commission distinguishes three fare categories: the most flexible full fares (economy fares without restrictions, business and first-class fares), promotional fares and special fares (i.e. offers for a limited period).

[226] Figure provided by the AEA and cited by the Commission of the European Communities (1996c).

[227] In its report, the Commission of the European Communities (1996c, pp. ii-iii) threatened to take action against excessive fares if necessary.

[228] See also Uittenbogaart (1997).

between Belgium and a number of European destinations (Commission of the European Communities, 1996c).

5.2.4.3. Further consequences: increase in air traffic and route competition but also in commercial concentration and use of smaller aircraft

According to Niejahr (1999), it seems that since the first studies on air transport liberalisation, intra-EU transport has grown further. This concerns mainly small and medium-sized carriers while larger airlines tended to increase their services on intra-EU routes only in isolated cases. The new introduced freedoms are used more often than it was the case at the beginning. The number of routes with more than two competitors also increased. In most member states, the gap between leading airline and its closed competitor narrowed. The trend of increasingly using small aircraft[229] has continued and is reflected in the decrease in the average number of seats, an evolution which results from the increase in frequencies and the rise in hub and spoke operations but may also be due to the growth of alliances contributing to a more efficient use of the fleet (Button & Stough, 2000). However, this represents a problem against the background of capacity shortage at a certain number of airports and also in the light of a growing environmental awareness of the public and increasing environmental constraints imposed by public authorities. Besides, airline alliances represent a problem for the market entry of smaller competitors (Commission of the European Communities, 1996c).

Conclusion: Removal of restrictions on air traffic between EU countries and also some third countries leaving more scope for airports to develop their activity

Prior to the liberalisation of air transport, to the extent to which the airlines' economic decisions were constrained by the bilateral air service agreements and thus by political decisions, the airports' destiny was connected to the airlines' one and the airport business was limited to the operational one. Airports had not much scope for strategic development.

The liberalisation of the air transport within the EU and the subsequent negotiation of more liberal air service agreements with third countries, although being addressed to airlines, extended the scope of actions for airports. In particular the emergence of new carries, such as low-cost airlines, created new opportunities for airports and especially for a number of airports which handled only small traffic volumes in the past. Existing carriers also adapted their business models thus creating new possibilities. This tendency was reinforced by the general growth in air traffics for the benefit of a large number of airports.

[229] See Ehmer (2000) on the competition in passenger air transport with small aircraft.

At the same time, the liberalisation introduced some kind of business risk which did not exist before and which results from changes in airline behaviour and from the emergence of, at least to a certain extent, competition for airlines, air services and passengers/freight.

In this situation, emphasis is placed on the airport's capacity to deal with the other parties involved in air transport, and in particular with airlines. In addition, attention has to be paid to all conditions which allow airports not only to ensure actual development but also to safeguard future development, such as the management of environmental problems or of capacity constraints. By the removal of a very restrictive framework, airports got more room for manoeuvre but were at the same time also forced to play a part in air transport, to be proactive, to define their own strategies... thus emerging as strategic actor in a very dynamic air transport market.

The importance of this development appears in a particular light when considering the characteristics of the airport industry with which deals the sixth chapter.

6. *The airport industry*

With the liberalisation of air transport which resulted in the removal of restrictive air service agreements, airports were pushed in a situation that is characterised by more freedom for developing their activity but also by a higher degree of uncertainty and an increased business risk. In view of this evolution, the economic characteristics of airports are of a particular interest as they may influence the strategies on which airports embark. Commercial activities provide additional financial resources which not only may ensure profitability to shareholders but also contribute to broadening the airport's room for further action. If profitability has got an issue to airports, this is due to the withdrawal of state funding and the arrival of private shareholders. At the same time, changes in the management and organisation of airports contribute also to increasing the airport's freedom of action.

6.1. Economic characteristics of airports

Airports consist in large investments that are characterised by a high degree of asset specificity. They are fixed in their location and use. Possibilities to transfer airport infrastructure to another place or to use it otherwise are very limited. For this reason, they have no value if they become redundant. Airports have a long life expectancy which poses a problem as regards investment and maintenance. As the future is uncertain, investment in airports is quite risky, especially as recent developments give reason to consider that the evolution of air transport over the next decades could be different from the spectacular growth that commercial air transport has known in the past. The development of air transport depends on many factors that cannot be influenced by airport operators. Among these factors figure the increasing oil price – most notably in the medium and long term and especially illustrated by its sharp rise in the first half of 2008 even though the situation has eased since – making air transport more expensive but also a growing environmental awareness wishing to assign air transport a more reasonable place within the transport system in general. This implies the transfer of a part of the air traffic on the railway, the inclusion of air transport in emission trading, at least on a European scale, and the imposition of restrictions on the activity of certain airports.

Airports have more or less strong public goods characteristics.[230] As regards the principle of non-rivalry, it can be observed that there is no rivalry in consumption: It is possible to use an infrastructure several times without modifying it; an additional user does not reduce the utility that another costumer has from using this infrastructure. Concerning the principle of non-excludability, it does not apply to airports and to air transport in general as access can quite easily be controlled and thus individuals can be prevented at reasonable cost from

[230] For more details on public goods see Varian (1992) or Sharkey (1982, p. 45) .

consumption.[231] This is important as it means that airports can charge the use of infrastructure to e.g. the airlines' and passengers'/shippers' account. However, another problem concerns airports: congestion since a number of airports work at the capacity limit and achieve saturation threshold at least during rush hours. At congested airports, consumption gets rival with consequences on the structure and the level of airport charges that may represent an instrument for reallocating capacity. It also attracts notice to the mode of allocating airport slots.

6.1.1. Cost structure characterised by high labour and capital costs

Considering all activities, the airport's cost structure[232] is characterised by high labour costs and high capital charges. On average, about 42 % of total airport expenditure consist in labour costs. According to the degree to which airports are involved in the different activities, they vary in general between 30 % and 65 %. As Doganis (1992) underlines, labour costs are particularly high if an airport is much involved in providing the different services and at the same time does not charge depreciation on fixed assets. On average, capital expenditure represents about 22 % of total airport costs, ranging between 20 % and 35 % for most airports. Nevertheless, due to accountancy practices, at some airports the share of capital costs amounts to only 10 %.[233] Findings of an analysis of the evolution of the cost structure of 19 European airports[234] between 1983 and 2001 carried out by Graham A. (2003, p. 58 Table 3.3 and 3.4) are in line with these results. In 2001, labour and capital costs represented on average 33 % and 24 % of total airport expenditure respectively. Nevertheless, the distribution of airport costs varies at individual airports reflecting according to Graham A. (2003) differences in the functions carried out by airport operators. Whereas labour costs are below average at airports like Oslo, London Heathrow, Basel-Mulhouse, Amsterdam, Brussels and Zurich (between 21 % and 24 %) which do not fulfil so many functions, they are of high importance at airports like Rome, Dusseldorf, Frankfurt, Milan and Vienna which provide themselves handling services. From 1983 to 2001, the share of labour costs has decreased which can be explained in part by a growing tendency for airport operators to outsource certain activities

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[231] The number of access points to air transport is limited facilitating the control of access for planes or passengers/freight, contrary to certain infrastructure where excluding users is practically or economically impossible, i.e. difficult or expensive, especially as too many access points exist. As regards passengers, almost all air transport is commercial and the validity of ticket is checked before entering the airport's area reserved for passengers. Access is also controlled for freight and of course for aircraft.

[232] Note that there is little uniformity in the treatment of costs making it difficult to compare costs between airports, even within a limited geographical area like Europe. The following figures refer to results published by the Transport Studies Group, Polytechnic of Central London, and refer to a study of about 25 Western European airports realised in the 1980s where authors tried to reproduce the airports' accounts on a common cost basis (Doganis, 1992, p. 45).

[233] These results were confirmed by Wolf (2003, p. 35) who examined the cost structure of German airports according to different activities in 1997. He found that at airports with high traffic volume operational services were labour intensive (45 - 60 % of operational expenditure) and characterised by high capital expenditure (15-25 % of operational expenditure).

[234] Including Amsterdam, Basel-Mulhouse, Birmingham, Brussels, Copenhagen, Dusseldorf, Frankfurt, Geneva, Glasgow, Milan, London Gatwick, London Heathrow, Manchester, Marseille, Paris, Rome, Oslo, Vienna and Zürich.

and in some cases by a higher productivity of labour. Moreover, at some airports the increasing depreciation on fixed assets can be explained by additional investment in airport infrastructure and a better consideration of capital charges due to changes in the accounting system following the transfer of some airports from public sector to more commercial practices.

As regards the different types of activities, operational services, ramp and terminal handling as well as commercial services are all labour intensive but there are differences in reversibility of costs. While technical installations for operational services represent largely irreversible costs as they are adapted to a high degree to local requirements (e.g. baggage sorting and transportation systems), ramp and terminal handling do not necessitate site-specific investment in fixed assets. Special vehicles are used but, as they are mobile, they can be easily transferred to other airports if necessary. Commercial activities necessitate small irreversible costs as the surfaces can be used for other activities (Wolf, 2003, p. 38).

Finally, the airport cost structure does not only depend on the services which are provided by the airport itself but also on the type of traffic and the operation mode. For instance, international passengers do not have the same needs as domestic passengers: In general, international passengers need more terminal space e.g. for going through customs and immigration. On average, they have also more baggage to be handled. On the other hand, international passengers tend to spend more money on commercial activities, like catering and retailing. If a hub airport organises its traffic in waves (also referred to as banks), this is very attractive for airlines and passengers but particularly cost intensive for the airport as it necessitates a higher capacity reserve and more coordination than an evenly spread traffic. Airports relying on holiday destinations may also have higher costs as traffic is concentrated on a few months leaving capacity unused the rest of the year. On the other hand, some airports provide terminals which are dedicated to low-cost or charter traffic. These special terminals have only basic facilities (e.g. no airbridges) allowing the airport to charge less as costs are low (Graham A. , 2003, p. 60).

6.1.2. Significant economies of scale but decreasing as traffic grows

As regards capacity, airport operations are characterised by significant economies of scale as a result of high fixed costs. Consequently, the average cost per unit of traffic declines as airport traffic increases.[235] Quinet (1998) summarised that productivity effects concern terminals, runways, and even air traffic lanes: As regards terminals, it can be observed that until 20 million passengers, at equal capacity used, total costs do not increase as rapidly as traffic, and, at a given terminal size, operation expenses grow slower than traffic; strong

[235] Wolf (2003, p. 27) notes that detailed analysis on the cost structures of airports does not exist. The most cited studies in literature indicate only that the airport activity as a whole is characterised by economies of scale, without differentiating between several services provided by airports. For this reason, it is unknown in which fields of airport activity economies of scale and economies of scope exist. However, the cited studies, even though referring to the airport activity as a whole, give an insight into the question if an effective competition between different airports is conceivable in the long term.

productivity effects can be observed as regards runways and air traffic lanes[236] which are also characterised by high fixed costs. However, the question is if from a certain output level maybe production costs remain unchanged or even start to rise...

Distinguishing between airport costs that are related to the terminal building thus being a function of passenger flows and those associated with the runways system thus depending on the number of processed aircraft, empirical evidence suggests the existence of economies of scale in landing operations, i.e. the cost per unit of traffic declines if the traffic increases, whereas handling passengers inside the terminal is characterised by decreasing returns to scale since the required time to process a passenger through a terminal grows with airport size. Hence, the optimal dimension of an airport would depend upon a delicate equilibrium between both elements (Walters, 1978).

According to Doganis (1992, pp. 48-49) early studies of British airports indicated a fall in unit costs as traffic increases, in particular up to 1 or 1.5 million passengers, but they stabilise at around 3 million passengers although, according to these older studies, there is no evidence for any significant internal diseconomies of scale in the long term leading to growing unit costs as airports achieve a certain traffic level. Nevertheless, congestion may cause a rise in unit costs in the short term. Also, there may be external costs relating to noise or congestion in surface transport around the airport that are growing as airport traffic increases leading to external diseconomies of scale.

Economies of scale have been largely discussed in literature and results confirm the idea that airport infrastructure is characterised by strong economies of scale but they seem to decrease as traffic goes beyond a certain level. Quinet (1998) summarises results from different publications, such as of Keeler (1973), Doganis and Thompson (1975) and Tolafari, Ashford and Caves (1990) and of own works (Quinet, 1992): Keeler (1973) and Doganis and Thompson (1975) observed constant returns to scale. While Doganis and Thompson (1975) used a Cobb-Douglas function, Tolafari, Ashford and Caves (1990) estimated a translog function for studying costs of British airports. For this purpose, they considered separately operation expenses and total costs (corresponding to optimised infrastructure). Whereas operation expenses allowed to calculate short run marginal and average costs, total costs led to long term marginal and average costs. The authors concluded that short run marginal costs were much lower than average costs (in proportion of 1 to 2 times lower which means that short run marginal costs were contained between half the short run average cost and the short run average cost.) This difference can be explained to some extent by the fact that infrastructure is in general oversized and thus real capacity is greater than optimal capacity. This may result from indivisibilities. However, if capacity was optimal, there would be still large economies of scale (in the region of 1.4). Studies being realised on the basis of French statistics confirmed this aspect and revealed economies of scale that decrease as the size of the airport grows and are about 1.1 (Quinet, 1992).

Wolf (2003) concluded from two studies realised by Doganis et al., the first one on 18 British airports for 1969/1970 (Doganis & Thompson, 1973, p. 53ff), the second one on 25 European

[236] For more details on economics of air traffic management see Quinet (1998, pp. 148-149).

airports for 1994 (Doganis, Lobbenberg, & Graham, 1995, p. 44ff) that economies of scale play only a small role for intramodal competition between airports from a traffic volume of 5 to 10 million WLU p.a. In fact, Doganis and Thompson (1973) observed that total average costs of the airport activity were decreasing until an output of about 1.5 to 2.5 million WLU and were characterised by strong economies of scale. However, if traffic volume was higher, only little economies of scale or no return to scale could be observed. Given the technical progress realised in the meantime, figures observed in the first study can be considered as absolute minimum level. In the second study (Doganis, Lobbenberg, & Graham, 1995, p. 44ff) airports were classified according to three regions (Southern Europe, United Kingdom/Ireland and Northern Europe). The first two groups were characterised by strong economies of scale up to 5 million WLU. As regards the third group, a significant correlation between average costs and traffic volume could not be observed as differences in costs were too large. However, as airports within this group were relatively big, differences in traffic volume had only little importance.

In conclusion, most studies indicate that airports are characterised by economies of scale but they tend to decrease as airport traffic grows so that bigger airports may operate at constant returns to scale. At the same time, some research suggests that airports which get very large will see their average costs start to rise as the operation of the airport system gets more complex and more costly and necessitates e.g. more coordination. Airports being likely to be characterised by increasing, rather than decreasing long-run costs at quite moderate levels of output was argued by Starkie and Thompson (1985) to be related to the likely outcome of the complex way in which airports grow in size from a central core. "[E]conometric evidence is now beginning to emerge that lends some support to the general proposition that major airports can experience diseconomies of scale" (Starkie, 2001, p. 124). This results e.g. from studies made by Gillen and Lall (1997) and Pels (2000) who concentrated on measuring efficiency[237] of airports and thus examined also returns to scale . While Gillen and Lall (1997) referred to US airports, Pels (2000) examined European airports. Nevertheless, both authors drew similar conclusions. Using the estimates of the stochastic frontier model, Pels (2000)[238] concluded that the "average"[239] airport is working under constant returns to scale when handling aircraft movements and increasing returns to scale as regards the number of passengers. The scale elasticity is decreasing in the number of passengers which means that on average smaller airports are operating under strong returns to scale while larger airports are operating under weak returns of scale. This relation is rather strong when considering the

[237] In order to create performance measures, Gillen and Lall (1997) and Pels (2000) referred to the production frontier which can be determined by two methods: data envelopment analysis and stochastic frontier analysis. Both methods use a set of inputs (like the number of runways, parking positions, terminal surface, etc.) and outputs (such as the number of aircraft handled or of passengers transferring through the airport). Their advantage consists in not considering prices. Gillen and Lall (1997) point out that data envelopment analysis been used for determining productivity in schools, university and government institutions as their outputs are not easily or clearly defined. Besides, this approach is useful if natural prices are lacking. For more information about data envelopment analysis and stochastic frontier analysis see Pels (2000, p. 29 ff) and Pels, Nijkamp and Rietveld (2001; 2003b) as both methods were applied to European airports. Gillen and Lall (1997) applied data envelopment analysis to US airports.

[238] Results from stochastic frontier analysis were also published in an article (Pels, Nijkamp, & Rietveld, 2003b).

[239] The "average" airport is an airport operating at mean input levels.

number of passengers, but rather weak when considering aircraft movements. Using data envelopment analysis (Pels, 2000)[240], results were similar. However, there could be observed two exceptions: The relation between airport size measured in aircraft movements and returns to scale seemed to be much stronger. Moreover, some large airports even operate under decreasing returns to scale (in passengers). This would mean that there may exist some kind of optimal size of airport in economic terms but as yet the evidence is far from conclusive.

6.1.3. Indivisibilities arising from infrastructure characteristics

Airports are characterised by "indivisibilities" related to the specific features of infrastructure as investment in airport capacity has to be done in large discrete steps leading to fixed-step costs.[241] This is the case of the construction of runways, and to a lesser extent also of terminals, where investment cannot be divided in small units. At least in the short term, demand for traffic will be too low in comparison to the increased capacity. For this reason, short-run costs are often higher than long-run cost.

The following figure 15 illustrates the relationship between short- and long-run unit costs. LRAC indicates the long-run average cost curve that is decreasing and envelops the short-run cost curves to which the LRAC curve is tangential. SRC represents short-run average cost curves depending on the investment which has to be done in large discrete steps. Thus, SRC^1 corresponds to short-run costs in the situation where only one terminal and one runway exist: As traffic increases, short-run costs decrease until they reach C^1 corresponding to traffic Q^1 which indicates the SRC^1 curve's minimum. If no investment was done, short-run costs would start rising along SRC^1 curve as traffic goes beyond Q^1. If a second terminal is built, short-run costs will follow the $SRAC^2$ curve. In this case, short-run cost for the traffic Q^2 will increase sharply from C^1 to C^2. However, as traffic grows, they will decrease until the SRC^2 curve's minimum is achieved. Q^3 indicates traffic for which SRC^1 is equal to SRC^2. This means that if investment was delayed until traffic reaches Q^3, there would not be any rise in short-run average costs. But of course, in the meantime, short-run cost would have grown along the SRC^1 curve as traffic congestion increases. As traffic exceeds Q^3, unit costs will decrease following SRC^2 curve. In this case, unit cost would not only decline. Moreover, they would reach a level which is lower than the minimum cost in the situation prior to investment.

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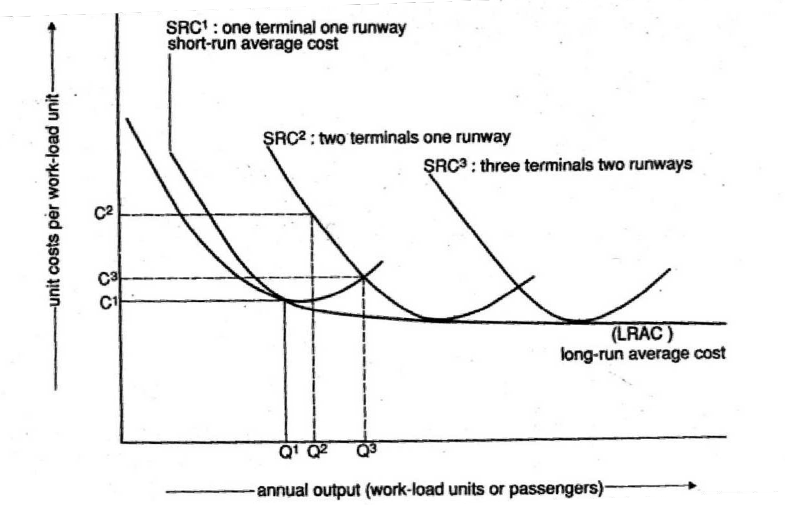
[240] Results from data envelopment analysis were also published as an article (Pels, Nijkamp, & Rietveld, 2001).

[241] According to literature, indivisibilities can also result from stochastic economies of scale as the total production volume allows the firm to handle random incidents. For example, a firm working in different markets can reduce its reserve capacity if it can expect that peak demand in one market can be offset against a fall in demand in another market (Fritsch, Wein, & Ewers, 1996, p. 124f). In transport, another important effect ("*Verkehrshomogenitätseffekt*" in German) results from a higher homogeneity in traffic flows (Urbatzka, 1991). It occurs if the extension of transport infrastructure allows the separation of different types of traffic with different speeds leading to a disproportionate increase in the forward capacity of infrastructure.

Figure 15: Relationship between short- and long-run average costs of airports



Source: Doganis (1992, p. 52 Figure 3.4).

Consequently, it is advisable for airports to delay investments in infrastructure as long as possible. Moreover, they should try to select investments in order to enlarge capacity in the smallest possible steps (Doganis, 1992, pp. 48-53).

Another consequence is that the investment in airport infrastructure expansion has to be justified by a sufficiently important expected traffic growth. This implies a kind of threshold in the airport activity that has to be achieved in order to realise good performance having thus consequences on airport strategies. As investment has to be done in large discrete steps, expansion will create in most cases automatically over-capacity, especially for runways and for a lesser extent also for terminals.[242] Therefore, often it may be clear from the start that the airport will be oversized compared to traffic forecasts. If an airport does not operate at full capacity, marginal costs caused by an additional plane are relatively low whereas the costs of infrastructure can be distributed to a bigger number of units leading to decreasing average costs. These short-run economies of density[243] arise thus from decreasing average costs thanks to a better use of existing capacity inciting the airport to develop strategies in order to attract more airlines and passengers/freight generating additional traffic. Consequently, they have an influence on pricing policies and contracts with airlines for the creation or the continuation of air services.

6.1.4. Natural monopoly

In a large part of literature airports are considered to be natural monopolies requiring a specific regulation.[244] Providing evidence is difficult, especially if airports are considered to

[242] Moreover, capacity is often built in order to meet traffic demand at peak times.

[243] For more information on economics of density see e.g. Button (1993a) and Curien (2005).

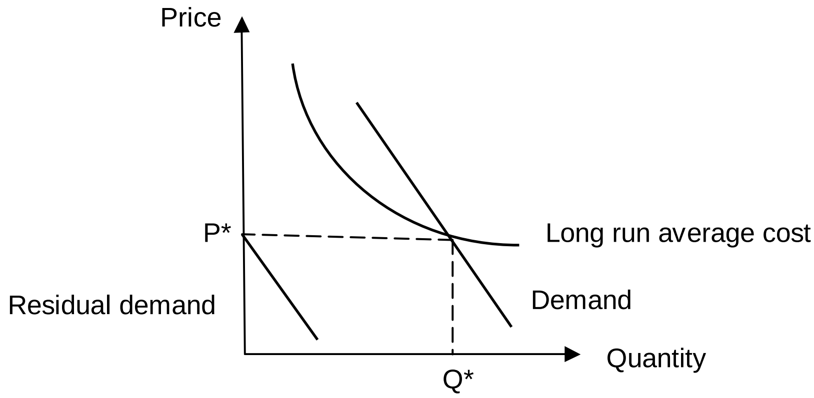
[244] See Wolf (2003, p.23) referring to different authors. It is important to note that in the case of natural monopoly, increased competition would not improve efficiency and raise social welfare. According to Sharkey (1982, p. 142ff), there are five principal objectives that may justify the regulation in a natural monopoly market: protection of buyers from a too high price and improvement of consumer welfare and economic efficiency;

be multi-output firms. It is often impossible to recognise easily if a given cost function is or is not subadditive (Baumol, Panzar, & Willig, Contestable markets and the theory of industry structure, 1988, p. 170). Therefore and following Sharkey (1982, p. 55) who pointed out that it "is not monopoly but the absence of competition that imposes a cost on society"[245], recent works (Wolf, 2003) focus on the question if airports can profit from their position and take advantage from market power. Thus, after a short introduction into the theory of natural monopoly, the theory of contestable market will be briefly presented before concluding with some remarks on the potential for competition.

6.1.4.1. A short introduction to the theory of natural monopoly

Natural monopoly is a particular case of monopoly that is characterised by a subbadditive[246] cost function. In this case, one single producer can supply the socially optimal quantity of output at the lowest possible total cost. This is the case in figure 16 which indicates that the demand curve intersects the long run average curve in the region of increasing returns to scale. If the residual demand curve that is facing a potential entrant is situated everywhere below the long run average cost function, the market entry is unprofitable as well as socially inefficient. Therefore, the natural monopoly is said to be sustainable.[247]

Figure 16: The natural monopoly



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protection of the natural monopoly from opportunistic behaviour on the part of customers or other firms and from competition if the natural monopoly is said to be unsustainable; promotion of stability in an unstable market; delineation of market boundaries that separate a natural monopoly from a closely related markets; prevention of collusion among incumbent firms or certain behavioural abuses, e.g. predatory pricing.

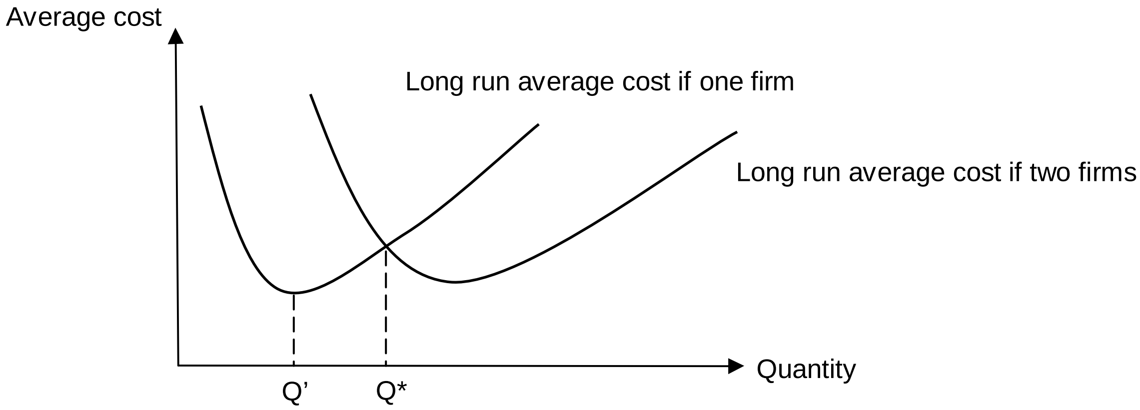
[245] "Under ideal competition, natural monopoly is consistent with maximum social welfare, as long as a single firm is as efficient as a multiple firm alternative" (Sharkey, 1982, p. 55).

[246] A cost function C is said to be subadditive at q and the market is said to be a natural monopoly if a single firm is more efficient than a multifirm market. This is the case if $C(q) < C(q^1) + \dots + C(q^n)$ for any possible disaggregation of an output vector q with $q^1, \dots, q^n$ summing to q and assuming that all firms in the market have the same cost function C (Sharkey, 1982, p. 2; Baumol, Panzar, & Willig, 1988, p. 170).

[247] In contrast, the natural monopoly is called unsustainable if entry is profitable even though it is socially inefficient. In the second case, the appropriate public policy consists in legal restrictions to entry. Discussion about natural monopoly normally refers to sustainable natural monopoly. For more details on the sustainability of natural monopoly, see Sharkey (1982, pp. 84-110).

In the single product case, however, the socially efficient industry structure has one firm even if economies of scale have been exhausted as long as the cost function is subadditive at the relevant output level (as illustrated by figure 17).[248] Hence, economies of scale are a sufficient condition for natural monopoly but not necessary.

Figure 17: Average costs for one firm and two firms



Source: Curien (2005, p. 43).

In the multiproduct case, according to Sharkey (1982) a cost function is subadditive if a single firm can jointly produce output bundles more cheaply than if the bundles were produced separately or if they were produced by two or more firms. In this case, economies of scale are no longer sufficient for natural monopoly. In fact, economies of joint production are needed (economies of scope[249], cost complementarity, trans-ray convexity[250]). Nevertheless, Baumol, Panzar and Willig (1988, p. 170) underlined that "there exist no conditions necessary *and* sufficient for subadditivity that are analytically simpler than the definition". Economies of scope may not be sufficient if returns to scale are decreasing. Economies of scale and economies of scope together are not sufficient as if economies of scope are weak it may be

[248] This means that an industry is not a natural monopoly based on this definition if the output reaches a level where the cost function is not subaddtitive. Figure 17 illustrates a cost function that is subadditive up to Q*: A single firm can produce any output less than Q* more cheaply than two firms with each supplying some fraction of Q*, even though economies of scale are exhausted at output level Q'. If, however, the demand function touches the long run average cost curve at an output level exceeding Q*, the industry is not a natural monopoly (Sharkey, 1982, pp. 4-5).

[249] Economies of scope are cost savings resulting from the simultaneous production of several different outputs in a single enterprise in comparison to their separate production by several specialised firms (Baumol, Panzar, & Willig, 1988, pp. 71-75). They are derived from technological complementarities in the production or distribution of goods and services. See also Baumol, Panzar and Willig (1988, pp. 75-79) for the origin of economies of scope.

[250] See Baumol, Panzar and Willig (1988, pp. 79-83) for more details. In short, the concept of trans-ray convexity refers to any cross section of the cost hypersurface connecting points on the output axes and allows to compare the costs of operation of specialised firms with the costs of firms producing a weighted average of the outputs on the axes. If a cost function is trans-ray convex, joint production of a certain output by one firm is cheaper than the separate production of the output by specialised firms or its joint production by several firms.

advantageous to split up production. However, cost complementarity and trans-ray convexity are sufficient for subadditivity.[251]

In the case of natural monopoly, only one firm will enter the pertinent market (or markets). If there are already more firms in the market (or markets), one of them can eliminate its competitors in the long term and reach a monopoly position by taking advantage of the decrease in costs resulting from an increase in output and sell at less than the competitors' price.

6.1.4.2. A short introduction to the contestable market theory

However, the existence of a natural monopoly does not imply that the monopolist automatically can abuse its monopoly position which would require regulation in order to assure that the monopolist behaves such as he would in competition.[252] The scope of supply depends on the mobility of demand and the contestability of pertinent markets by potential entrants. If a natural monopoly is perfectly contestable[253], due to the pressure exerted by the presence of potential entrants, the supplier does not have any scope of supply. In order to achieve sustainability, even the natural monopolist has to operate in an efficient manner (Baumol, Panzar, & Willig, Contestable markets and the theory of industry structure, 1988, p. 6). Therefore regulation is not necessary.[254]

The contestability of a market depends on barriers to market entry which are determined by different factors (Wolf, 2003, pp. 25-27):

- the amount of irreversible costs (sunk costs) to be invested by a new entrant on the market
- possibilities of potential competitors to conclude long term contracts with consumers already before entering the market in order to guarantee the investment's amortisation
- possibilities of access to necessary resources for potential competitors
- possibilities of response to the entry of competitors for the incumbent supplier
- importance of competition of substitution
- legal barriers to market entry.

6.1.4.3. Conclusion on competition potential

As regards on the potential for competition, the discussion has not yet led to a clear position... If airports need specific regulation because they might take advantage of market power or if

[251] See Sharkey (1982, pp. 62-72) and Baumol, Panzar and Willig (1988, pp. 171-186) for mathematical demonstration.

[252] Regulation is aimed at guaranteeing that the monopolist produces the socially optimal quantity at the socially optimal price.

[253] A market is perfectly contestable if it is "accessible to potential entrants and has the following two properties: First, the potential entrants can, without restriction, serve the same market demands and use the same productive techniques as those available to the incumbent firms… Second, the potential entrants evaluate the profitability of entry at the incumbent firms' per-entry prices" (Baumol, Panzar, & Willig, 1988, p. 5).

[254] Wolf (2003, p. 25) underlined that in this case regulation would even be economically disadvantageous as it has a cost.

there is some potential for competition depend on different factors and thus on the precise situation.

The natural and legal restrictions to competition for the different services provided by airports (i.e. operational, handling and commercial activities) were examined by Wolf (2003, pp. 42-81) for the purpose of evaluating the potential for competition in the German airport system. As regards the provision of the infrastructure (operational services and facilities), natural restrictions to competition result from long term economies of scale and short term economies of density, from the price elasticity of demand, the mobility of demand, from intramodal and intermodal competition as well as from potential competition. Legal restrictions to the provision of infrastructure come from barriers to competition resulting from legal aspects of infrastructure planning and operation, from the allocation of scarce capacity of infrastructure, the capacity situation and the regulation of access to infrastructure but also from air transport policy. The occurrence of the different factors depends on the airport and the context into which it is embedded.

Pels, Nijkamp and Rietveld (2003b) underlined that one cannot say that airports do not have market power, but it does not seem to be economies of scale that lead to natural monopoly. These results also suggest that larger airports may not be natural monopolies. Some large airports even operate under decreasing returns to scale. This corresponds to Starkie (2001) who pointed out that airport monopoly would not arise from the usual economies of scale in long-run production functions but rather from the fixity of “locational” inputs (i.e. good sites and centrality). However, the complementarity between demand for flights and demand for commercial activities (demand for goods in the airport shops, for services from banks and restaurants as well as for rented property), associated with locational rents, may incite airports to not exploit their market power.

Moreover, the airport’s market power is often much smaller with respect to low-cost airlines which have no specific interest in a particular geographic market and focus on low airport charges (including fee discounts and incentives) and therefore may easily switch airports (Barrett, 2004b; Starkie, 2008).

6.2. Revenues from the airport business: a wide range of activities including aeronautical and non-aeronautical services

Airports are complex structures providing a wide range of services. As they constitute the nodes in the air transport network, their main objective is to “provide all infrastructure needed to enable passengers and freight to transfer from surface to air modes of transport and to allow airlines to take-off and land” (Graham A. , 2003, p. 1). The management of the basic airport infrastructure (including runways, taxiways, apron space, gates, passenger and freight terminals, and ground transport interchanges) is one of the airport’s priorities as they contribute to the service level and thus influence the airport’s attractiveness. Nevertheless, Doganis (1992, p. 7) pointed out that for historical, legal and commercial reasons the range of activities provided by the airport owner or manager varies, not only between countries but often also between different airports in the same country. Consequently, the airport business can include a wide range of activities or only a small part of what goes on at the airport with airlines and third party service providers being more or less implicated in the airport business.

Generally, three types of services can be distinguished: operational services and facilities, handling services and commercial activities (Doganis, 1992, pp. 7-10). Operational and handling services are also referred to as aeronautical activities, while commercial activities are considered to be non-aeronautical:

- *Operational services and facilities* include air traffic control services facilitating the approach and landing of aircraft, meteorological services, telecommunications, police and security, fire and ambulance services as well as runway and building maintenance. As these activities contribute to safety, they are considered to be essential to the airport business.
- *Handling services* cover a wide range of activities including those being related to the aircraft itself (like cleaning, provision of power, loading/unloading of the baggage/freight hold, also called ramp handing) but also traffic related services (like the processing of passengers, baggage or freight through terminals and onto the aircraft, also called terminal handling.
- *Commercial activities* involve usually shops, restaurants, bars, banks, leisure services, car rental and parking services, hotel accommodation, conference centres, and communication facilities being located within the terminal buildings as well as on airport land. Some airports offer even cinemas and discotheques.

Airports generate revenues from aeronautical as well as from non-aeronautical activities (Doganis, 1992, pp. 53-58; Graham A. , 2003, p. 56).

Aeronautical revenues are directly related to operation and landing of aircraft, passengers and freight. According to Doganis (1992, p. 53), they include aircraft-landing fees, passenger-service charges, charges for air-traffic-control (if provided by the airport authority), aircraft parking and hangarage fees, charges related to the handling and cleaning of the aircraft.

Contrary to aeronautical revenues, *non-aeronautical revenues* are generated from "non-aircraft-related commercial activities in the terminal/s and on airport land" (Doganis, 1992, p. 53). Consequently, they are composed of rents from office space and check-in desks; income from shopping concessions since only a few airports are involved in direct sales; car parking fees; recharges to tenants for services such as gas, electricity, water; revenue from catering, whether provided by the airport or a concessionary; other non-aeronautical revenue, including consultancy, visitor and business services, property development. According to an ACI survey, the breakdown of non-aeronautical revenues is as follows: 22 % retailing, 19 % property, 18 % car parking, 6 % car rental, 2 % advertising and 33 % others in 2006 but the revenue structure depends on the geographical region (Graham A. , 2008, pp. 9-10).

The distinction between both categories is not always clear. It results from the different degrees to which airports are involved in the provision of aeronautical activities and has to be taken into account when comparing revenues of different airports. Especially, fuel charges and revenues from handling are concerned by this classification problem. Even though being essential to aviation and directly related to operating aircraft, fuel charges are normally considered as concession revenues since airports charge rent for land and other facilities used by aviation-fuel companies. Revenues from handling of aircraft or of passengers, baggage and freight are considered to be aeronautical if the airport itself furnishes handling services but as non-aeronautical or commercial if handling agents offer these services.

6.2.1. Aeronautical charges

Despite the increasing importance of commercial revenues, a number of airports continue to generate more than 50 % of their overall revenue from aeronautical charges. Traditionally, aeronautical charges[255] had a relatively simple structure: most revenue was generated by a weight-based landing charge; a passenger fee usually paid on departure depended on the number of passengers. This is still the case at a number of airports whereas others developed more complex charging and more market based approaches to aeronautical charges reflecting the increasingly commercial and competitive context within which airports operate as well as the consideration of environmental issues, capacity constraints and security requirements (Graham A. , 2003, p. 98). Traditionally, airport charges were not based on the costs that individual users imposed to the airports but on average-cost pricing and the ability to pay, the latter resulting in higher charges for long-haul or international services at a number of airports. The similarity in the charging structure around the world is due to recommendations of ICAO and IATA that were adopted by most countries.[256] Only, the introduction of rebates for short-haul or domestic flights at many airports does not correspond to ICAO and IATA recommendations.

6.2.1.1. Structure of aeronautical charges

Aircraft landing fees

Aircraft landing fees are charged per aircraft on arrival and usually depend on the maximum take-off weight (MTOW) or the maximum authorised (or ramp) weight (MAM).[257] Different methods exist for calculating the landing fee on the basis of the aircraft weight. The simplest is a fixed rate per tonne or other weight unit, independently of the total weight. It benefits to smaller aircraft since tonnage tends to increase faster than aircraft capacity or payload and to airlines with a high load factor or seating capacities. This method is used at large number of airports. Other airports apply a fixed rate per tonne which however decreases or increases for larger aircraft. Some airports base their landing fees on a variable rate which successively decreases or increases as the aircraft weight rises.

[255] This part heavily relies on Doganis (1992, pp. 62-69) and Graham A. (2003, pp. 99-104).

[256] See Doganis (1992, p. 69-75) for more details on traditional pricing policies and ICAO's and IATA's position on airport charges.

[257] Doganis (1992, p. 64) underlined that landing charges are based on the maximum landing weight (MLW) at some US airports.

In addition, a number of airports have established a complex and diverse system of surcharges and rebates on the basic landing fee according to flight distance, type of flight or night landings. Thus, at certain airports, a reduction may be applied for domestic or short-haul flights. Night landings may be subject to surcharges at airports that are not operating on a 24-hour basis if an airline wants to take off or land during the shut-down period and even some airports which operate the night may impose an additional fee for covering the costs of e.g. runway lights. More recently, a number of airports introduced noise-related surcharges or discounts in order to favour quieter aircraft. In return, surcharges related to aircraft emissions are exceptions. Finally, few airports apply a movement related charge for the benefit of large aircraft. In particular, London Heathrow and Gatwick airports established a fixed runway charge at peak times which may be more appropriate at congested airports. Some airports introduced minimum landing fees in order to deal with congestion.

Aircraft parking

Parking has to be paid beyond the free-parking period covered by the landing fee, which is generally two to six hours. Parking on the airport's apron, taxiways or hangars has to be paid, unless the aircraft is parked on apron space or maintenance areas which are leased to an airline or belong to it.

Passenger charges

Passenger charges are mostly paid on departure; only few airports charge on the basis of arriving passengers. This charge can be paid directly by the passenger to the airport authority (via a collection desk in the check-in area) or it is collected by the airline on behalf of the airport when the passenger buys his ticket or checks in and then remitted to the airport. Finally, it can also be paid by the airline which will include it in the ticket price but not indicate separately.

At most airports, these charges are lower for domestic passengers since the costs associated with this type of passengers are lower. In addition, some airports distinguish between domestic, EU and non-EU passengers while others charge lower fees for transfer passengers or even may suspend the fee in certain circumstances. These reductions may be justified on cost grounds as transfer passengers e.g. do not need surface access, check-in, security and immigration facilities. However, they still require baggage handling or specific facilities for a rapid transfer between gates. Some airports charge higher passenger fees at peak hours or in the summer time.

Security charges

Security charges are designed for covering security services. As the security services may be provided by the airport's own employees, or by private company under contract to the airport, the airline or a government agency, different systems exists for financing security measures: At some airports security charges have to be paid for by the government via general taxation or via a special government departure tax; At some airports, the airport operator finances directly security costs and therefore imposes a special security charge or may include it in the passenger fee.

Other charges and government taxes

In addition, airports may choose to price separately certain facilities or services instead of including them in landing or passenger fees such a *lightning charge, air bridge fees, cargo charges, fire-fighting, storage facility* and *hangar use*. This also applies to other services like *ramp handling, apron buses, aircraft cleaning* and *ground power* which may be result in specific, individual fees or are summarised in one or two charges that cover everything. *Ground handling fees* may be charged by the airport operator if he provides this service itself rather than leaving it to handling agents or airlines. *Fuel charges* have to be paid to fuel companies which usually are independent from airport operators.[258]

Finally, at some airports, *government taxes* have to be paid by passengers for contributing to financing certain concerns such as tourism, economic development or help to national transport links. Government taxes may also include security services.

6.2.1.2. Level of aeronautical charges

Comparisons between airports are difficult as charging structures vary largely. For this reason, comparisons usually refer to a certain aircraft type. The example[259] of a Boeing 737-800 on an international route underlines the large differences in airport charges to be paid at 24 airports from around the world in 2002. Considering aircraft related charges which include landing fees, air traffic control and air bridge charges, if they exist and passenger related charges which refer to passenger fees and security charges, charges range from 300 EUR at Dubai airport to more than 5000 EUR at New York Newark, Moscow Sheremetyevo, Kansai and Athens airport. If considering also government taxes, charges at New York Newark airport are above 10 000 EUR and Los Angeles International airport ranks second with 7000 EUR.

6.2.1.3. Proportion of aeronautical charges in the airlines' total operating costs

According to IACA statistics, airport charges worldwide represent about 4 % of total airline operating costs and have almost remained unchanged since 1978 (ACI Europe, 2003, p. 3). However, behind this figure hides a diversity of situations: Airport charges represent a much larger proportion for airlines focusing on short-haul routes as they pay aeronautical fees more frequently or for charter airlines. In 1988/1989, airport charges corresponded to only 1.6 % of

[258] Graham A. (2003, p. 103) noted that handling and fuel charges are rarely communicated since they usually result from negotiations and depend on various factors.

[259] Example take from a study realised by Cranfield University and cited by Graham A. (2003, p. 104-105).

total operating cost for Delta and United Airlines, 2.1 % for Northwest, 2.5 % for KLM, 2.7 % for Qantas, 4.1 % for Egyptair, 5.4 % for Air France, 6.1 % for British Airways , 9.1 % for Austrian Airways but 15.7 % for British Midland and 19.8 % for Air UK as well as between 14.6 % and 17.7 % for charter airlines Monarch, Dan Air, Britannia and Air Europe (Doganis, 1992, p. 63).

Due to competition and falling yields that characterise the airline business, carriers implemented cost saving measures which usually referred to internal costs. At the same time, airlines placed emphasis on external costs, such as airport charges and demanded airports to adopt cost-cutting and efficiency saving measures themselves rather than increasing their charges (Doganis, The Airline Business in the Twenty-first Century, 2001). Despite the attention paid to airport charges, their share in the airlines' total operating costs remains relatively small for a number of airports, in particular when operating rather long-haul flights since they pay fees less frequently (around 4 % for British Airways in contrast to 8 % for British Midland which operated domestic and European services and 13 - 14 % for Brymon and British Regional which focus on short-haul and mostly domestic services). In contrast, they are the most significant for charter and low-cost airlines due to their cost structure which is different from "traditional" full service carriers. Moreover, low-cost carriers operate mainly short haul flights and thus pay more frequently airport charges. In 2000, the share of landing and passenger charges in total operating costs varied from about 8 - 9 % for Easyjet and Go, up to 18 - 20 % for Britannia and Airtours (Graham A. , 2003, p. 107).[260] The relatively small proportion of landing and passenger fees for Easyjet and Go, two low-cost operators, is due to fee discounts they get at certain airports.[261] Other publications, such as Poungias (2003, p. 7), mentioned similar figures for low-cost airlines: 9 - 12 % of their operating costs are due to aeronautical charges.

6.2.2. Commercial activities as object of specialised strategies broadening at the same time the airports' room for further action and strategies

Of course, airports generate revenues from aeronautical activities. It is more surprising to see to which extent commercial activities contribute to airport revenues.

6.2.2.1. Growing importance of commercial activities

In 1989, Western European airports generated about 56 % of their total income from aeronautical charges[262] and 44 % from commercial or non-aeronautical activities (Doganis,

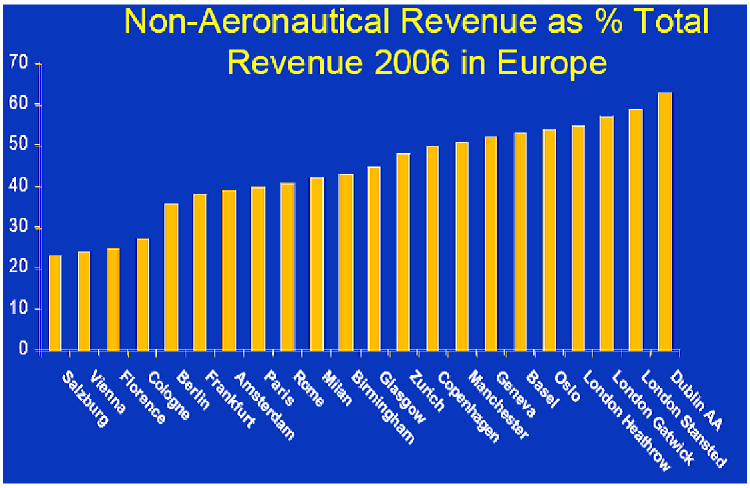
[260] Figures refer only to landing and passenger fees. For this reason, airport charges represent a larger proportion than the figures may suggest. Note that in general accurate figures for the comparisons for airport charges are not available since airlines do not include passenger fees in airport charges and often airport charges may combined with other items.

[261] See Graham A. (2003, p. 108-110) for more details on incentive schemes and discounts at certain airports for the establishment of new air routes.

[262] Including 13 % of total income from handling which hides the fact that many airports do not provide any handling services (which means that they are considered to be commercial revenues as they are furnished by concessionaries) while for some airports (like Frankfurt, Rome, Vienna or Milan) handling services represent 35

1992, pp. 53-55). An ACI survey among European airports from 2001 arrived at similar figures: half the airports' revenues came from non-aeronautical sources (Graham A. , 2003, p. 58). Graham A. analysed the evolution of revenue structure of 19 European airports[263] between 1983 and 2001. Until 1998 the share of aeronautical revenues decreased from almost 59 % to 52 % while at the same time the part of non-aeronautical revenues increased from 41 % to 48 %. For some airports, the growth of commercial revenues is considerable. Thus, at Copenhagen and Geneva airport, commercial revenues rose respectively from 41 to 54 % and from 40 to 51 %. According to the author, this evolution reflects not only the pressure from airlines and regulatory authorities to limit increases in airport charges but also the growing interest for commercial activities. According to a more recent ACI survey, the proportion of non-aeronautical revenues seems to remain constant with a share of 48 % in the airports' total revenue in 2006 (Graham A. , 2008, p. 3). However, its share depends on the geographical region as well as on the size of the airport.[264] Figure 18 shows the corresponding figures for a selection of 22 European airports.

Figure 18: Non-aeronautical revenue as % of total revenue 2006 in Europe



Source: Graham A. (2008, p.6), figures taken from annual reports.

As regards airport size and revenues, studies indicate a common relationship between both: Small airports are highly dependent on aeronautical revenues, relying only on some rental income; bigger airports have an important share of total income resulting from commercial activities. Revenue analysis, as illustrated by figure 19, for Western European airports in 1989 showed that the expansion of shopping, catering and car-parking facilities and sales contributes to a great extent to the increase in income while other commercial revenues (like rents and recharges to tenants for services provides) tend to stabilise at around 15 to 20 % of total income. Nevertheless, at a traffic of around 9 to 10 million passengers, commercial

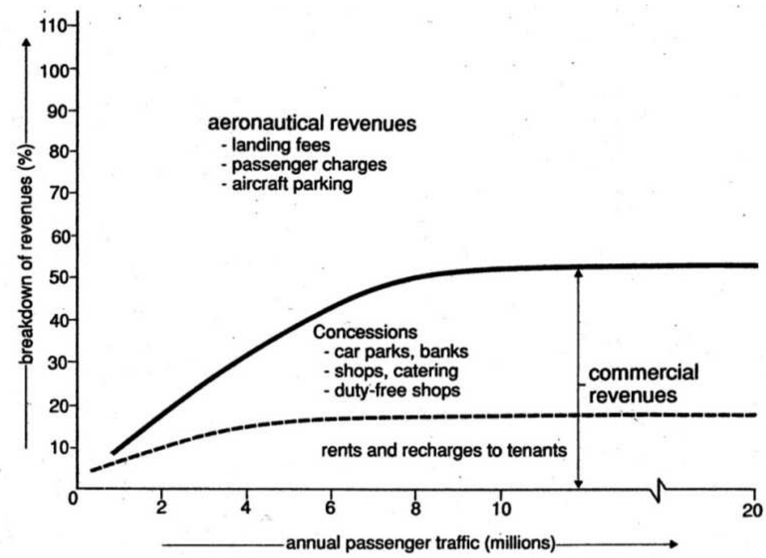
% to 50 % of their total revenues as these airports are largely involved in the provision of handling services. (Doganis, 1992, p. 54)

[263] Including Amsterdam, Basel-Mulhouse, Birmingham, Brussels, Copenhagen, Dusseldorf, Frankfurt, Geneva, Glasgow, Milan, London Gatwick, London Heathrow, Manchester, Marseille, Paris, Rome, Oslo, Vienna and Zürich (Graham A. , 2003, p. 58).

[264] See Graham A. (2008) for more details.

revenues represent between 50 to 60 % of total income and their share stabilises at this level even if traffic continues to grow (Doganis, 1992, pp. 55-56). For comparison, middle-sized and larger-sized airports in the United States generate even 75 to 80 % of total income from commercial activities.[265]

Figure 19: Revenue split as traffic grows among most European airports



Source: Doganis (1992), p. 56. Figure 3.6.

This means for airports that a growth in traffic does not only lead to an increase in aeronautical revenues but allows also to generate additional income from commercial activities. This is particularly interesting for smaller airports as until a certain threshold (of something like 9 to 10 million passengers per year) additional income from commercial activities grows even more rapidly than aeronautical revenues.

As airport charges are often regulated either by institutional statute (e.g. by ICAO rules) or by public authorities (national or regional governments) and subject to pressure from airlines, airports have few possibilities to influence aeronautical revenues unless they generate more traffic. On the contrary, airports have more freedom to develop commercial activities and to fix prices for them. Moreover, commercial activities are much more profitable than aviation operation. Thus, if one would analyse the contribution of commercial activities to profit and not to revenue then the share of commercial activities would be even more important (Oum, Zhang, & Zhang, 2004, p. 219). However, airports rather communicate the origin of revenue but not of profit.[266] Therefore analysis concentrates mostly on revenue.

[265] Figures refer to 1989-1990. This difference can be explained in parts by the interdiction for US airports until 1991 to charge a per capita passenger fee. Thus, aeronautical revenues consist almost entirely in aircraft-landing fees (Doganis, 1992, p. 57).

[266] According to Oum, Zhang and Zhang (2004), Jones, Viehoff and Marks (1993) indicated that the operating margin of concession activities at BAA's three airports in London (Heathrow, Gatwick and Stansted) was of 64

6.2.2.2. *Consequences of a growing market for commercial facilities*

Commercial activities represent an additional source of revenues for airports. For this reason, airports developed strategies in order to reinforce and broaden these activities. This explains the increased interest in the users of commercial facilities, especially in passengers. For a long time airports had neglected passengers as there is no direct contractual relationship between them; passengers were rather considered as the airlines' customers. With the growing interest in commercial activities, passengers have attracted the airports' attention. Commercial activities got an element to consider when configuring or redesigning the layout of airport facilities. Because of complementarities between aeronautical services and concession revenues, the latter were also integrated into pricing models. Hence, airports embarked on commercial strategies in order to develop these activities and took action in order to realise their objectives.

Rising interest in users of commercial facilities

The increasing interest in commercial activities is reflected in numerous surveys conducted on the use of commercial facilities and studies made in this field which allowed e.g. to identify different types of passengers (Graham A. , 2003) and of airport shoppers[267] (Geuens, Vantomme, & Brengman, 2003) as well as to estimate the relation between commercial expenditure and passenger waiting time (Torres, Dominguez, Valdés, & Aza, 2005).

Graham A. (2003, pp. 142-146) distinguished five types of passengers: leisure passengers, business travellers, transfer passengers, other costumer groups as well as meeters and greeters even if spending and shopping behaviour will also be influenced by factors like nationality, age, occupation and socio-economic group.

With the growth low-cost traffic, the profile of leisure passengers has changed: They became particularly good users of catering services and car parking. Average spending of long-haul leisure passengers is higher than of short-haul leisure passengers.

Business travellers may spend on average more on a purchase but they shop less frequently, a tendency being reinforced by the creation of business lounges. However, business travellers tend to use banks, car rental, meeting and conference facilities, and airport hotels.

Transfer passengers do not use certain facilities being important for terminating passengers, but they make some retail purchases. The airports' difficult task consists in maximising commercial revenues from transfer passengers while maximising the airports' efficiency as a hub by providing swift connections. Even if most transfer passengers do not spend much time at the hub as connecting flights are mostly organised in waves allowing to minimise waiting

% in 1990-1991 compared to -7 % for aeronautical operations. However, lower profit margins can also be affected by methods used for cost allocation or cross subsidy from commercial to aeronautical services.

[267] Geuens, Vantomme and Brengman (2003) based their argument on a survey on passengers at Brussels airport. They identified shopping motivations and distinguished three types of shoppers: mood shoppers, apathetic shoppers and shopping lovers. The authors indicate that mood shoppers can exclusively be found in an airport environment because their motivation to shop results from the airport atmosphere but also from boredom while waiting. Conclusions are essential to elaborating marketing strategies for airport shops.

time, some passengers stay longer at the airport. Thus, various airports have developed airside facilities and services which can be used also by local passengers such as swimming pools or saunas (e.g. Singapore Changi airport), casinos (Amsterdam airport) or fitness and health centres (e.g. Vienna airport).[268] Of course, most airports have business facilities like meeting rooms, secretarial support, Internet access, etc.

In recent years, airports have realised that the airport as business and commercial centre can be very attractive to other consumer groups than passengers, too. In particular, staff working at the airport or local residents may use commercial facilities at the airport. Graham A. (2003) cites Frankfurt airport as one of the first airports to implement the shopping centre concept for its landside shops and Amsterdam airport[269] that opened in 1995 a 5400 square metres shopping centre (40 shops) that is well connected to public transport and is accessible by car. However, as regards attracting local residents, the airport's strategy depends much on the conditions for surface access to the airport. If access to the airport is already difficult as congestion is frequent (as it is the case of Paris CDG airport[270] for example), airports may prefer not to attract too many other persons than travellers.

Catering services, florists, gift shops may be interesting for meeters and greeters who are collecting friends, relatives or business partners but also for other visitors.[271] Actually, airports are still fascinating for visitors and airports can profit from by offering tours, exhibitions or access to viewing airport facilities against payment.[272] They can have also serve public relations. Once again, the airport's strategy depends much on conditions for surface access to the airport and it may be preferable not to attract additional public beyond passengers.

As regards expenditure in the commercial area of an airport, Torres, Dominguez, Valdés and Aza (2005) estimated their relationship with passenger waiting time to board according to two trip purposes (leisure, business).[273] It is not surprising to see that consumption by passengers rises with time spent at the airport. Moreover, consumption behaviour varies between both types of passengers: When waiting time is less than 45 minutes, business travellers spent more than tourists. For a waiting time between 45 to 170 minutes, leisure passengers spend more but consumption stabilises at about two hours waiting time. Above 170 minutes, business travellers spend more money. However when examining purchasers separately from persons who do not buy, the authors observed that expenditure is independent from waiting

[268] For these examples and more see Graham (1999, p. 143).

[269] According to Gray (1998), 70 % of customers are not passengers.

[270] For example, the terminal 1 of Paris CDG airport is configured in order to allow passengers to check-in baggage just behind the entry to the terminal and to enter rapidly the area reserved for passengers with valid ticket. Commercial facilities exist of course but they are largely in the reserved area. There are only some catering facilities at the arrival level. Besides, some facilities (especially pharmacy, post office, bank, newspaper & book shop, catering) are accessible for the public but at a lower level.

[271] According to Graham (1999), following Middecke (2000), about 7 million meeters and greeters and 8 million other visitors came to the Frankfurt airport in 1999 in addition to 46 million passengers and 60 000 employees.

[272] Munich airport created, in addition to a viewing terrace, a visitors park for aviation fans with historic aircraft, exhibitions, cinema with films about aviation and the airport, catering and shops which developed to one of the most popular day-trip destinations.

[273] Results are based on survey on passengers at a medium-sized Spanish airport.

time whether business travellers or tourists are considered, even if tourists spend on average more than business travellers. This means that actually more passengers profit from commercial facilities when waiting time increases. Note also that for both passenger types car parking represents about a third and catering 25 % of total expenditure.

Graham A. (2003)[274] pointed out that even if airports are unique locations for shopping or commercial facilities, passengers are going to the airport to catch a flight rather than to shop. For this reason, "passengers will be far less familiar with the airport shopping environment [...] and this, coupled with a fear of missing the flight, may impose a sense of anxiety on the passengers" (Graham A. , 2003, p. 142). This may explain why passengers are different from "normal" visitors of a shopping centre.[275]

Studies on the layout of airport facilities

The growing interest in commercial activities led also to studies on the optimal layout of airport facilities allowing to increase commercial revenue while ensuring the efficiency of the airport passenger processing system. For example, Hsu and Chao (2005) developed a model for allocating terminal space in order to maximise revenues from leasing commercial concession addressing to big international airports being characterised by high passenger volumes.[276] For that purpose, the authors examined relationships among concession revenue, passenger service level and space allocation for public facilities and commercial activities. A certain passenger processing level allowing passenger to finish all procedures more efficiently and to have more time available for consumption has to be guaranteed and necessitates therefore a certain space for public facilities. At the same time, airports are interested in expanding commercial facilities in order to generate more concession revenues which are depending on store revenue.

Models on pricing strategies

Other works concentrate on models for optimal pricing such as a model developed by Zhang and Zhang (1997) where concession and aeronautical operations of an airport are considered together with an overall break-even constraint. According to this model, "the optimum solution may require a subsidy from concession to aeronautical operations. However, such a cross-subsidy may or may not restore marginal-cost pricing on aeronautical operations. On the other hand, social welfare can be higher when an airport is allowed to make profits in concession operations than when marginal-cost pricing is imposed on concession operations." Recent works on transport economics insisted on demand complementarities between aeronautical services and concession activities inciting profit-maximising airports to reduce

[274] See Graham (1999, pp. 149-158) for more details on the different approaches to the provision of commercial facilities and several ways in which they can be provided (like commercial contracts and tenders).

[275] This is also underlined by Crawford and Melewar (2004) who pointed out that passengers experience feelings of anxiety, stress and excitement. For this reason, passengers may react in an unusual way. Taking into account these differences allows retailer to maximize profits (e.g. emphasis on impulse purchasing).

[276] The model results from statistics referring to Chiang Kai-Shek International Airport.

airport charges and thus monopoly airports to not abuse its monopoly power (Oum, Zhang, & Zhang, 2004).[277]

Influence on the airport-airline relationship

Moreover, the growing interest in commercial activities may also influence airport-airline interactions. According to Francis, Fidato and Humphreys (2003) the growth in demand for non-aeronautical services resulting from an increase in traffic may justify the decision to handle low-cost flights or to give subsidies on the creation of new air services.[278]

6.2.2.3. Diversification of non-aeronautical activities as reaction to the abolition of tax- and duty-free sales to travellers between EU member states

As regards EU-airports, 1999 was characterised by a fall in the share of commercial revenues to around 44 % in total income which resulted from the abolition of tax- and duty-free sales to travellers on intra-EU journeys as from 30 June 1999.[279] Consequences arising from this measure were particularly serious for airports having much intra-European traffic.

At most airports, a tendency towards a diversification of non-aeronautical activities and consequently their reinforcement within the range of services provided by airports could be observed. An analysis of the strategic responses of airports to the abolition of duty free showed that airports had already taken measures before 1999 in order to compensate the expected loss in commercial income (Freathy & O'Connell, 2000, pp. 638-640). Thus, airports took action in order to strengthen their position as important airport for airlines and travellers as traffic growth contributes not only to an increase in aeronautical but also in commercial revenues, e.g. by improving passenger processing through the terminal. Moreover, airports developed the commercial offer, and also landside facilities, by assigning more space to sales, differentiating the range of products and services as well as by introducing for example 24-hour trading and customer loyalty schemes. These measures are directed to passengers but also to a non-travelling public.

Furthermore, Freathy and O’Connell (2000) underlined three tendencies that existed already and had in fact been reinforced by the greater involvement of the private sector in the airport activity but were developing increasingly under the pressure of the forthcoming abolition of duty free: Airports were strengthening cooperation and joint ventures with overseas partners

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[277] See also e.g. Kim and Shin (2001) on how to maximise revenues from commercial concession.

[278] Note that these practices have been subject to large discussions and finally the European Commission set rules for aids aiming at encouraging air carriers to serve an airport or to operate new air services.

[279] In consequence of the creation of the single European market, movements of goods and passengers between EU member states are no longer considered as exports or imports and thus liable to excise duties and VAT. The European Commission already conceded a seven and a half year transition period to airports in order to allow them to find alternative revenues for compensating loss from abolition of duty free sales on intra EU-flights which represented about 40 % of total duty free sales (Freathy & O'Connell, 2000, p. 638). The EU enlargements of 1 May 2004 and of 1 January 2007 removed entitlement to sell tax- and duty-free goods to persons travelling to the concerned new EU Member States.

in order to develop competencies in airport management in general and in retailing in particular.[280] Some airports sell their expertise, their competencies in airport management to other airports (for consultancy in redesigning, refurbishing existing airports or the construction of new infrastructure). But they also developed interests outside of the air industry (such as property management, shopping facilities, and hotels).

Since the abolition of duty free, airports tried also to increase revenues from aeronautical activities, e.g. by increasing airport charges or reducing discounts for airlines. As regards commercial activities, Freathy and O'Connell (2000, pp. 640-644) identified a number of common approaches across the sector even if implemented strategies vary largely. These approaches include the reconfiguration relationships between airports retailers and suppliers, the reassessment of the product portfolio and the allocation of range space, the creation of the Travel Value and *"Espace Voyageur"* ("Passenger zone" in English) concepts allowing to differentiate the airport retailing from the domestic market in order to create additional value for customers.[281]

6.2.2.4. Implications for airport strategies: commercial activities in the focus of appropriate strategies and starting point for further action and strategies

The airport's choice as regards the management and operation of aeronautical and non-aeronautical activities is an important element of its strategy as it affects the level of service provided by the airport. In turn, the level of service has an effect on the airport's attractiveness for airlines and passengers/shippers.

Moreover, commercial activities provide additional financial resources and thus expand the airport's room for manoeuvre. An airport, which has at its disposal a high income from commercial activities, depends less on loans and aeronautical charges and may have more freedom when fixing prices for services provided or negotiating the financing of new investments. This applies to bigger airports but also to smaller ones even if their possibilities to generate income from commercial activities are more restricted.

Furthermore, especially big airports try to transfer their knowledge and competencies as regards the operation of such an infrastructure, from both aeronautical and commercial points of view to airports and other infrastructure operators by developing cooperation, joint ventures and consultancy or management contracts.

On the one hand, commercial activities got into the focus of appropriate strategies with the purpose of developing these activities and reflect the growing participation of the private

[280] Freathy and O'Connell (2000, p. 640) cited as an example Aer Rianta which operates three Irish airports and has major shareholding in Birmingham and Dusseldorf airport as well as retail interests in Russia, Ukraine, Bahrain, Damascus, Beirut, Cyprus and Beijing. Since then, the interest in Birmingham airport was sold (September 2007) but Aer Rianta developed retailing activities in Europe (Moscow airport Sheremetyevo, Domodedovo and Vnukovo, St. Petersburg Pulkovo, Kyiv Boryspil, Pristina, Larnaca and Paphos airports) but also in North America, in the Middle East and in North Africa. See http://www.ari.ie/?section=261&tid=1, accessed on 15 May 2010.

[281] For more information see Freathy and O'Connell (2000) as well as Freathy (2004).

sector in the airport business. On the other hand, commercial activities with the corresponding additional income give airports more room for manoeuvre allowing them to redefine airport strategies.

6.3. Airports undergoing a large restructuring process

Since the liberalisation of air transport within the European Union, the whole transport system has undergone fundamental changes. Airports also have gone through a large restructuring process over the last years. This restructuring process, whether it takes place at the institutional level or concerns the organisation of the airport activity, strengthens the role of the airport management and makes the relations between the airport management and the other parties involved in the air transport more complex.

6.3.1. A wide range of different legal structures, ownership patterns and management forms

The institutional restructuring of airports has taken different forms. Formerly, most airports have been under public ownership. In this respect, two levels of public ownership can be distinguished: *national or federal public ownership* where the airport is usually managed by a government department and *regional ownership* which is characterised by co-ownership arrangements between state, municipal and local entities. Historically, national or federal ownership was the case e.g. in Greece, in Sweden, in the Czech Republic or in Hungary while regional ownership concerned countries like Great Britain (for airports not operated by BAA) or France (Kapur, 1995, p. 10)[282]. Usually, airports are under regional ownership in order to promote regional economic development. But "many regional airport authorities have experienced the heavy-handed bureaucracy of the Federal government through management and operational intervention" (Kapur, 1995, p. 13).

6.3.1.1. Privatisation approaches: introduction of commercial practices

Since the 1980s, more and more governments have sought to introduce commercial practices[283] and the private sector into the airport activity. Different privatisation approaches exist, starting from corporatization with the partial or total sale of the airport's capital (including BOO and BBO concessions[284]), but also management contracts or concessions (including BOT, BOOT, and LOD schemes and wraparound addition).

[282] See Kapur (1995) for more information on worldwide ownership structures.

[283] Graham (1999) refers to the introduction of commercial practices as "commercialisation of airports", i.e. the development of the airports' commercial character under the increasing influence of management and business philosophies coming from other economic sectors. It marks the first step of large-scale changes the airport industry is going through. It is followed by an extensive restructuring process leading to a wide range of legal structures, ownership and management forms.

[284] *BOO (Build-Own-Operate)* and *BBO (Buy-Build-Operate) concessions* both lead to full privatisation. In the first case, public authorities grant a concession to a private firm which finances, builds, and operates a facility.

Corporatisation with the possibility to sell a part of the capital

In Europe, it can be observed that this restructuring process is often composed of two steps. A first step may consist in changing the legal status of the airport operating company. The latter is converted into a company of civil law, like e.g. a limited liability company or a (public) limited company. Thus, the airport gets a private company from a legal point of view even if its capital stays under public control. This process is also called *corporatization* and allows to run an airport according to commercial practice. Established in 1966, British Airport Authority (BAA) was the first national airport authority of this type. Other examples are Aer Rianta Cpt. of Ireland (now known as the Dublin Airport Authority plc), which was set up in 1988 and Aeropuertos Espanoles y Navegacion Aérea of Spain (AENA). In a second step, a part of the capital may be sold. In the most cases, *public authorities* stay *majority shareholders* (e.g. Frankfurt and Paris airports)[285]. Their total divesture is rare as public authorities often prefer to conserve at least a *minority participation* (e.g. Vienna, Zurich, Copenhagen and Naples airports)[286]. Therefore, in Europe only few cases of total privatisation exist. The first airport operators that have been privatised completely were British Airport Authority (BAA)[287] in 1987 and Belfast International Airport in 1994.

Management contracts, concessions and long-term lease agreements

Another possibility to introduce the private sector into the airport activity is awarding a management contract, a concession or a long-term lease for the operation of the airport. In general, the airport operator does not own the airport infrastructure which stays public property.[288] Moreover, the contract period is often limited in order to change the airport operator by its expiration. The different contracts vary by sharing the risk (commercial, technical and financial) between the contracting parties.

In a *management contract* the airport authority decides to delegate all or a part of the airport business to a specialised operator for a limited period of time and under specific conditions,

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The grantee is paid by revenues from the operation of the facility. As in a BOOT (Build-Own-Operate-Transfer) concession, the private firm takes the property title of the facility during the concession period but with the difference of retaining it even after its end. In the second case, an underdeveloped or deteriorated facility is purchased from public authorities through a concession contract. The concession grantee upgrades this facility. The private firm retains the property title after the end of the concession period. One example for this kind of open end concession is London City airport (Kapur, 1995, p. 21).

[285] The Federal State of Hesse and the City of Frankfurt (through its public utility company) hold together the majority of the company's capital, with 31.52 % and 20.13 % respectively. As regards Aéroports de Paris, the French government has a 52.4 % participation in its capital.

[286] Flughafen Wien AG has two public shareholders: the Province of Lower Austria and the City of Vienna holding 20 % of the company's capital respectively. One third plus one share of Flughafen Zurich AG belongs to the Canton of Zurich and further 5 % to the City of Zurich. The Danish State has a 39.2 % stake in the capital of Copenhagen airports. In Naples airport the privatised BAA holds a 65 % stake but the City and the Province of Naples kept 12.5 % each one.

[287] For more details on BAA privatisation, see e.g. Kapur (1995, p. 21) and (Humphreys, 1999).

[288] An exception are BOO (Build-Own-Operate) and BBO (Buy-Build-Operate) concessions both leading to full privatisation as the concession grantee does not transfer the infrastructure to the concession grantor at the end of the concession period and thus stays its owner (Kapur, 1995, p. 21).

including performance criteria, economic incentives, maintenance and infrastructure commitments. The management contract can differ according to the type of services managed, the level of autonomy in day-to-day operations, and economic incentives. In some cases, management contracts may include equity participation by the private company.

In the case of *BOT (Build-Operate-Transfer)*, public authorities grant a long-term concession to finance and build or modernise a specific facility to a private firm which also operates the infrastructure and obtains revenue from this operation. BOT concessions concern mostly one or more runways or terminals or the whole airport activity during a fixed period, in general 10 to 50 years. The private operator takes the commercial risk. The infrastructure is turned over to the grantor at the end of the concession period. BOT concessions provide access to private capital markets. The project risk is transferred to the private sector and public authorities also benefit from its skills and experiences.

In a *BOOT (Build-Own-Operate-Transfer) concession*, unlike a BOT concession, the private firm takes the property title of the facility during the concession period. Nevertheless, at its end, the concession grantor gains ownership of the infrastructure. BOOT schemes typically are used when loan guarantees are required. An example of BOOT is the construction and operation of the new Athens International airport which opened in 2001.

If the facility already exists, a long-term *LDO (Lease-Develop-Operate) concession* is granted to a private firm which commits to upgrading and expanding the facility and to manage it. In return, public authorities, that hold the property rights of the facility throughout the concession period, receive lease payments on the assets.

A *wraparound addition* allows the expansion of an existing publicly-owned facility by a private firm through a concession agreement according to which the private firm holds title and operates the addition. This kind of concession is used e.g. for the expansion of existing passenger terminal areas. It allows carriers to vertically integrate operations, especially at airport hubs (e.g. British Airways at Birmingham International airport). Therefore, the carriers' influence may rise while competition at the airport may decrease.

Presently, there exists a wide range of different statuses at the European level: from public service entities to totally privatised companies, from the airport operator owning its infrastructure to the airport operator whose activity is based on a concession or a management contract.

6.3.1.2. Review of the European airport ownership structures[289]

The following short review illustrates the variety of situations at European airports. It seems that the optimal solution for the operation and management of an airport, if it exists, has not yet been identified but every new decision can be based on the experience already gained.

[289] All information on the ownership structures of European airports is taken from their annual reports or websites (updated in May/June 2010).

In **Great Britain**, airports were under national or local ownership until 1986.[290] The Airports Act of 1986[291] allowed the privatisation of British Airport Authority (BAA), which was transformed in plc, whereas larger municipal airports were transformed into corporations. In 1992/1993, a policy of reducing the national debt forbade the municipalities to borrow money in order to develop their airports, what obliged them to turn to the private sector. The result is a fragmentation of statuses. In 1998, the government gave publicly-owned airports the freedom to borrow money from the private sector in order to finance airport expansion (Strang, 1998), removing thus a major incentive for airport privatisation, as at that time public airports were allowed to access to external financing comparably to privately-owned airports, and making probably the pattern of airport ownership in the UK less dynamic in the future (Humphreys, 1999).

BAA[292], which was acquired by a Ferrovial-led consortium[293] in June 2006 and delisted from the London Stock Exchange two months later, owns and manages two **airports of London**: **Heathrow and Stansted**. Four other British airports are also owned and managed by BAA: **Edinburgh, Glasgow, Aberdeen** and **Southampton.** Concessions for these six airports were granted for an unlimited time. Initially, BAA also owned and managed London Gatwick airport. On 21 October 2009, BAA announced that it had agreed to sell its 100 % interest in Gatwick Airport Limited to a consortium led by Global Infrastructure Partners (which is controlled by Credit Suisse and General Electric) for approximately £ 1.5 billion. This decision took place after the publication of a report by the British competition authorities in August 2008 where they recommended the sale of two of BAA's three airports serving London and of one in Scotland. Already in an interim report of April 2008, they found that BAA's common ownership of airports "may not be serving well the interests of either airlines or passengers" (Saltmarsh, 2008). Global Infrastructure Partner already acquired 100 % of **London City Airport** jointly with AIG Financial Products in late 2006. In October 2008, Global Infrastructure Partners acquired the 50 % ownership in London City Airport that it did not already own. After giving effect to the sale of a portion of this incremental ownership, GIP now owns a 75 % interest in London City Airport.

[290] With the exception of Southampton airport that was privately owned (Humphreys, 1999). See Humphreys (1999) also for more information about historical patterns of ownership as changes in recent years, especially through the Airports Act 1986.

[291] The Airports Act 1986 was supplemented by the Airports (Northern Ireland) Order 1994.

[292] The government kept a single share (also called golden share), and 25% of the company's capital was reserved for employees. A 15 % restriction was imposed to individual participation in order to avoid capital concentration. This restriction was removed following a ruling by the European Court of Justice considering that this restriction impeded the free movement of capital within the EU (Starkie, 2008, p. 7). Initially, foreign capital participation was also limited, although it reaches some 10%. In June 2006, a consortium headed by the Ferrovial group acquired BAA.

[293] The Ferrovial-led consortium bought BAA Limited (formerly BAA plc), through ADI (Airport Development and Investment Ltd). The immediate parent company, ADI, is the single owner of BAA Ltd. The ultimate parent of ADI is FGP Topco Limited, a company belonging to Ferrovial Infraestructuras, S.A. (56.7 %), Lernamara, S.L. (5.3 %) (Grupo Ferrovial company); Britannia Airport Partners L.P. (29.0 %) (a Caisse de dépôt et placement du Québec group company); and Baker Street Investment Pte Ltd (10 %). The ultimate parent entity of the majority shareholder Ferrovial Infraestructuras, S.A. is Grupo Ferrovial, S.A. (Spain) (BAA, 2008, p. 52).

The four British airports of **Manchester, East Midlands, Bournemouth** and **Humberside** Manchester are operated by Manchester Airports Group (MAG), which is publicly owned by the ten local authorities of Greater Manchester (with the Council of the City of Manchester holding 55%)[294] and is privately managed on their behalf.

Birmingham International airport belongs to a syndicate of municipalities (7 West Midlands district councils) with 49 % and to Ontario Teachers' Pension Plan and Australia's Victorian Funds Management Corporation holding together 48.25 % of the company's capital, while the remaining 2.75 % take the form of an employee share trust. Until September 2007, Aer Rianta International and Macquarie Airports Group had each one a 24.125 % participation in the airport but they sold their combined shareholding.[295] Macquarie airports[296] also withdrew from **Bristol airport** where it had a 35.5 % stake but it agreed to sell its stake to Ontario Teachers' Pension Plan on 16 September 2009. A concession for the management and operation of Bristol airport for an unlimited period had been granted to South West Airports Limited, a joint venture holding company 100 % privately owned: 50 % by Macquarie European Infrastructure Fund 1 (MEIF 1), with approximately 49 % held by Ontario Teachers' Pension Plan, and the remainder held by MAp.[297] Besides, MAp has, together with Macquarie European Infrastructure Fund 3 (MEIF 3), an interest in **Newcastle airport** through the airport of Copenhagen which has a 49 % stake in public-private partnership managing Newcastle airport (the remaining 51 % belonging to 7 northern-England local authorities). **Plymouth City Airport** Limited was purchased in 2000 by Sutton Harbour Holdings plc and is operated on the basis of a 150 year lease. (Sutton Harbour Holdings plc, 2008)

London Luton Airport remains publicly owned by Luton Borough Council but is operated, managed and developed through a concession by a private consortium, London Luton Airport Operations Ltd, for a period of 30 years according to a public-private partnership deal signed in August 1998. TBI plc became the majority shareholder in London Luton Airport Operations Ltd in March 2001 when they increased their shareholding by buying shares from Barclays Private Equity and Barclays UK Infrastructure Fund. In January 2005, TBI plc was

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[294] The remaining 45 % are shared between the Borough Councils of Bolton, the Borough Council of Bury, the Oldham Borough Council, the Rochdale Borough Council, the Council of the City of Salford, the Metropolitan Borough Council of Stockport, the Tameside Metropolitan Borough Council, the Trafford Borough Council, and the Wigan Borough Council holding each one a 5 % participation in Manchester Airports Group (http://www.manchesterairport.co.uk, accessed on 15 April 2010).

[295] In 1995, the 7 West Midlands district councils started negotiation with Aer Rianta for a participation in a restructured airport company operating Birmingham International airport. At the end of 2001, Macquarie Airports Group Ltd. joined Birmingham International airport leading to the following shareholder structure: Aer Rianta and Macquarie Airports Group holding each one 24.125 %, the 7 West Midlands district councils 49 % and an Employee Share Trust 2.75 %. Aer Rianta and Macquarie Airports Group divested its participation in Birmingham International airport in September 2007 (Dublin Airport Authority plc, 2008, pp. 7, 9, 31; Macquarie Airports, 2008a, p. 49).

[296] Macquarie Airports was renamed in MAp. Moreover, it is not anymore associated with Macquarie Group which however still has a 50 % participation in Bristol airport via Macquarie European Infrastructure Fund 1 (MEIF 1). Note that MAp hold 1 % in the capital of Bristol airport.

[297] Ferrovial sold its 50 % stake in Bristol airport in December 2006 and thus withdrew from Bristol airport (Grupo Ferrovial, 2007, p. 97). Ontario Teachers' Pension Plan has been a shareholder since 2002.

taken over by Abertis airports[298], a company owned by Abertis Infrastructure (90 %) and Aena Internacional (10 %). In addition, Abertis airports, a Spanish infrastructure constructor, owns **Cardiff International** and **Belfast International airport** in **Northern Ireland**. The second airport of Belfast, **Belfast City airport**, is managed by a consortium consisting of ABN Amro Global Infrastructure and Faros Infrastructure Partners LCC, which are shareholders of Belfast City Airport Limited, through an unlimited concession.[299]

In **Ireland,** the Dublin Airport Authority plc (DAA) was created as State owned company by the State Airports Act in 2004 and overtook the operation and development of **Cork, Dublin and Shannon airports**[300] from Aer Rianta Cpt., the former national airport authority. Air Rianta International (ARI), created by Aer Rianta, is a wholly owned subsidiary of DAA and continues to manage the group's overseas interests.

Netherlands and Belgium

Amsterdam Schiphol airport is operated by Schiphol Group which has an operating licence for the airport. Schiphol Group belongs to four shareholders, including the Dutch government (69.77 %), the Municipalities of Amsterdam and Rotterdam holding 20.3 % and 2.2 % respectively as well as Aéroports de Paris S.A. which has an 8 % participation. Its listing on the Stock Exchange had been examined at a time and the majority of the capital would have stayed in public hands... Instead, Schiphol Group and Aéroports de Paris decided to take both an 8 % stake in the other company. The Schiphol Group owns the regional **airports of Rotterdam** and **Lelystadt** and has a 51 % participation in **Eindhoven airport**.

Maastricht Aachen airport was the first Dutch airport to be privatised in 2004. The airport is owned by OMDV BV, in which Omniport Holding Ltd[301], a British company specialised in the operation and management of regional airports, has a 100 % participation.

Brussels airport is operated by the Brussels Airports Company (BAC), called Brussels International Airport Company (BIAC) until it was renamed in October 2006. BAC is the limited company to which the Belgian State has awarded via Royal Decree a licence to operate the airport for an unlimited time. The airport owns the airport infrastructure and acquired also the airport land in December 2001. BIAC has been partially privatised in December 2004 when 70 % of the company's shares were acquired by an Australian consortium led by Macquarie Airports, the Belgian state holding a 30 % participation. In

[298] Abertis airports was set up in 2005 and groups together the abertis' shareholdings in the airport sector. Abertis got into airport management through the takeover of 100 % of the shares of TBI plc in January 2005, through a base company belonging to Abertis Infrastructure (90 %) and Aena International (10%).

[299] Ferrovial announced on 6 September 2008 the sale of its 100 % interest in Belfast City Airport Limited to ABN Amro Global Infrastructure and Faros Infrastructure Partners LCC (Grupo Ferrovial, 2009). The concession has an unlimited duration according to Ferrovial's annual report 2007 (Grupo Ferrovial, 2008, p. 80) whereas it is restricted to the period from 2003 to 2114 in the annual report 2005 and of 113 year in the annual report 2006 (Grupo Ferrovial, 2006, p. 24; Grupo Ferrovial, 2007, p. 36).

[300] The State Airports Act also established new airport authorities at Shannon and Cork airports: the Shannon Airport Authority plc and the Cork Airport Authority plc have separate boards of directors and have been authorised under the Act to prepare business plans that may in time lead to their full separation from the DAA.

[301] Omniport Holding Ltd holds also 80.1 % of the British Norwich airport.

October 2007, the Belgian State sold a further 5 % participation in the company's capital to the consortium led by Macquarie Airports reducing its own share to 25 %.[302] Since then, Macquarie Airports was renamed in MAp. Moreover, it is not longer associated with Macquarie Group which however still has a participation in Brussels airport: 13.3 % via Macquarie European Infrastructure Fund 1 (MEIF 1) and 34.7 % via Macquarie European Infrastructure Fund 3 (MEIF 3), in addition to 52.0 % held by MAp.

Liege Airport S.A. and Brussels South **Charleroi Airport** S.A. were established in 1990 and 1991 respectively, in view of the upcoming transfer of the management and operation of these regional airports from the Belgian State to the Walloon Region which decided to grant it to limited companies under commercial law on its behalf. The SLF (Liège Financing Company)[303] and the SOWAER (Walloon Regional Airports Company)[304], both belonging to the Walloon Region, hold 50 % and 25 % respectively in the Liege airport company's capital. Moreover, ADPM (ADP Management, a subsidiary of Aéroports de Paris) has a 25 % participation in its capital since 1999. The concession awarded to the Liege Airport company has a duration of 50 years. The Brussels South Charleroi Airport company has three major public shareholders: SOWAER, R.W. Loco SOGEPA (Walloon Company of management and participations)[305] and S.A. Sambrinvest with 48.89 %, 27.65 % and 19.15 % respectively.

France

In **France**, **Paris CDG and Orly airports** are operated by Aéroports de Paris S.A. (ADP). According to the Airports Law[306] of 20 April 2005, ADP was transformed into corporation in July 2005. One year later, in June 2006, the public authorities proceeded to an initial public offering. However, the State will remain majority shareholder. As at 31 December 2009, the national government holds 52.4 % of ADP's capital while 21.1 % are owned by diverse institutional shareholders, 8.3 % by private shareholders, 8.0 % by the French Strategic Investment Fund[307] and 2.1 % by employees. The remaining 8.0 % belong to Schipol Group which operates Amsterdam airport. ADP's listing at the Stock Exchange has been justified by the need for additional financing for important investments to come, such as the modernisation of terminal 1, the new terminal 2, the arrival of the Airbus 380 and real-estate development).

As regards **large regional airports of national interest** (which are the airports of Nice, Lyon, Marseille, Toulouse, Strasbourg and Montpellier as well as the airports of the French overseas departments), the Airports Law of 2005 stipulates the transfer of their management and operation through long-term concessions to airport companies under commercial law with

[302] It seems that the Belgian State had reserved this 5 % share in order to allow regional authorities to acquire a participation what they did not do.

[303] Société Liégeoise de Financement.

[304] Société Wallonne des Aéroports.

[305] Société Wallonne de Gestion et de Participations.

[306] *Loi n° 2005-357 relative aux aéroports du 20 avril 2005 et son décret d'application n° 2005-828 du 20 juillet 2005.*

[307] *Fond Stratégique d'Investissement.*

the State, the Chambers of Commerce and Industry (CCI) as well as local authorities being shareholders. While the State will grant the management of these regional airports to the newly established airport companies, it will keep the ownership of land and infrastructure. The airport companies will be gradually opened to private investors as the State considered withdrawing progressively from its 60 % participation already from 2009 on.[308] Nevertheless, these airport companies will stay by the majority publicly-owned until 2013. The Airports Law leads thus to the corporatisation of regional airports which were formerly managed by the local CCIs.[309] Moreover, the concessions granted by the State were in general of a short duration (three to ten years) whereas the new airport companies' concessions will be of a duration of up to 40 years.

The operation and management of the airports of Lyon, Toulouse, Bordeaux and Nice h ad already been transferred to airport companies. The SASU Aéroports de Lyon (in which the State has a 60 % interest whereas 25 % belong to the CCI of Lyon and 15 % are evenly shared between the Greater Lyon, the General Council[310] of the Rhône and the Regional Council[311] of the Rhône-Alps) got functional in March 2007 when the State transferred the concession for operating the **airports of Lyon-Saint Exupéry and Lyon-Bron** from the CCI to the new company. The duration of this concession, which would have ended in 2011, has been prolonged until the 31st December 2047 (Aéroports de Lyon, 2007). At the end of March 2007, the management of the **airport of Toulouse-Blagnac** has been transferred to the SA Aéroport Toulouse-Blagnac in which the State has also a 60 % participation, the CCI of Toulouse holding 25 % and three local authorities (The Greater Toulouse, the General Council of the Haute-Garonne and the Regional Council of the Midi-Pyrénées) sharing the remaining 15 % of the company's capital. The concession has been awarded by the State until the 31st December 2046 (Aéroport Toulouse-Blagnac, 2007). **Bordeaux airport** company was the third to be established in May 2007 with the State holding 60 % of its capital, the CCI of Bordeaux 25 % and different local authorities together 15 %.[312] Its concession has been granted by the State for a period of 30 years. Finally, **Nice airport** is the fourth regional airport of which the management was transferred to an airport company.[313] The State holds 60 % of its capital[314], the CCI of Nice 25 % whereas three regional authorities (the Region, the Department and the community of agglomeration[315] of Nice Côte d'Azur) share evenly the

[308] For all other airports, the responsibility will return to local authorities.

[309] Besides, this is still the case of those regional airports of which the management has not yet been transferred to airport companies. It is also the case of all airports not being subject to the Airports Law of 2005.

[310] Each *"département"* is administered by a general council (*"conseil général"* in French).

[311] The regional council (*"conseil régional"* in French) is the elected assembly of a French region.

[312] The local authorities having a participation in the airport company managing Bordeaux airport are the Regional Council of Aquitaine and the Urban Community of Bordeaux holding each one 3.75 %, the General Council of Gironde with 3 % and the Municipalities of Bordeaux and Merignac having 3 % and 1.5 % respectively of its capital. (http://www.bordeaux.aeroport.fr, accessed on 15 June 2008)

[313] The company was presented on 25th July 2008.

[314] The Principality of Monaco can participate in the company's capital when the State will divest its interests.

[315] The agglomeration community (*"communauté d'agglomération"* in French) is a metropolitan government structure in France situated between the community of communes (*"communauté des communes"* in French), which represents a federation of municipalities, and the urban community (*"communauté urbaine"* in French) being composed of a commune and its suburbs.

remaining 15 %. The concession granted by the State is of 36 years and thus will be valid until 20044.

Marseille-Provence airport is also concerned by the Airports Law of 2005 but it is still managed by the CCI Marseille-Provence having a concession that has been renewed in 1987 for a duration of 30 years.

Beauvais airport, which is subject to the Airports Law of 2005, is owned by the mixed syndicate of the airport Beauvais-Tillé. It decided in February 2008 to renew for a duration of 15 years the delegation of the management of the airport to the CCI of the Oise, with which is from now on associated Veolia Transport.[316]

Germany

In **Germany,** airports are in general corporations with a majority participation of public authorities. The only exception is **Düsseldorf airport:** Flughafen Düsseldorf GmbH is owned evenly by the State Capital City of Düsseldorf (50 %) and **A**irport Partners GmbH (50 %). Airport Partners is a limited liability company belonging to Hochtief AirPort GmbH[317] (40 %), Hochtief AirPort Capital KGaA[318] (20 %) and Aer Rianta International (40 %), a wholly owned subsidiary of Dublin Airport Authority plc.

Thus, **Frankfurt airport** has the status of a public limited company, Fraport AG, with a 31.52 % participation of the Federal State of Hesse, 20.13 % held by the City of Frankfurt through *"Stadtwerke Frankfurt am Main"*, its public utility company and 9.93 % belonging to Lufthansa (as at 28 February 2010). The remaining shares are held by private partners, like Artio Global Investors, Taube Hodson Stonex Partners Limited and Morgan Stanley. The Federal Government divested its participation in the airport in 2007.[319]

The commitment of Lufthansa in the construction of the new air terminal of the **airport of Munich**, which started operations in June 2003, constitutes in Germany the first participation of an airline in the operation of an airport but, contrary to Fraport AG, Flughafen München GmbH is 100 % publicly-owned (51 % Free State of Bavaria, 26 % Federal Republic of Germany and 23 % State Capital City Munich).

The **airport of Cologne/Bonn,** (Flughafen Köln-Bonn GmbH) is 100 % publicly-owned, too. Shareholders are the Federal Government and the Federal State of North Rhine Westphalia holding each one 30.94 %, the City of Cologne with 31.12 %, the City of Bonn with 6.06 % as well as the Rheinisch Bergisch district and Rhein-Sieg district with 0.35 % and 0.59 % respectively.

[316] See www.aeroportbeauvais.com, 15/06/2008.

[317] Hochtief AirPort is a subsidiary of the German Hochtief AG, a construction services provider.

[318] Hochtief AirPort Capital was founded by Hochtief AirPort together with Hastings Funds Management Ltd.(Australia), Caisse de dépôt et placement du Québec (Canada) and KfW IPEX-Bank (Germany) in 2005.

[319] The Federal government sold its 18.16 % participation in Fraport AG in two steps: a first block of shares in October 2005 (the stake having been resumed by Lufthansa) and the remaining shares in March 2007 (Fraport AG, 2008, pp. 45,101).

As regards **Hamburg airport,** Flughafen Hamburg GmbH has a public majority shareholder (the Free and Hanseatic City Hamburg with 51 %) but a 49 % participation belongs to Hochtief Airport GmbH and Hochtief Airport Capital (holding 34.8 % and 14.2 % respectively).

The two **Berlin airports Tegel and Schönefeld** are owned and operated by a limited liability company in which participate the Federal States of Brandenburg and Berlin with 37 % each one and the Federal government with 26 %. Tempelhof was closed on 30 October 2008 and Tegel will cease operations in 2011 when the new Berlin Brandenburg International airport (BBI) will be opened on the Schönefeld site.

Austria and Switzerland

Vienna airport in **Austria** is a corporation: Flughafen Wien AG, a public limited company with 20 % belonging to the Province of Lower Austria, 20 % to the City of Vienna and 10 % to an employee share trust while 50 % of shares are owned by diverse shareholders.

In **Switzerland**, **Zurich airport** is operated by Flughafen Zürich AG, which is also known under the name of Unique. Until 2000, the airport was operated by the Canton of Zurich. In 1999, the latter gave a go-ahead for privatising the airport; a decision which was confirmed by referendum. Consequently, a new airport law became effective in 2000 leading to the merger between the civil aviation authority and Flughafen-Immobilien Gesellschaft to form Flughafen Zürich AG. The same year, Flughafen Zürich AG has been listed on the Stock Exchange but the Canton of Zurich holds one third plus one share and the City of Zurich another 5 % of its capital. In 2001, the company has been awarded a concession by the Swiss Federation to operate the airport for 50 years (until 2051). **Geneva International Airport** is a public corporation since 1994.

Spain and Portugal

In **Spain**, Aeropuertos Españoles y Navegación Aérea (AENA) is a state-owned enterprise under the control of the Ministry for Development. AENA operates 47 Spanish airports and participates, through AENA International, in the ownership and/or management of foreign airports but it also involved in air navigation. On 1st August 2008, the Spanish government announced the partial privatisation (up to 30 %). For this reason, the government plans to split air traffic services from airport management as the former will be kept in state hands while only the latter will be part-privatised.[320] A decision on the future shareholders has not yet been taken but the Spanish government affirmed in May 2010 that it wanted accelerate the process.

[320]According to the government, regional authorities may use this opportunity to participate in AENA. Moreover, the Spanish construction firm FCC seems to be interested in AENA, while Abertis said it was studying the situation. Other possible bidders include Hochtief but also airport companies like Fraport and Schiphol group or the Canadian pension funds such as Caisse de dépôt et placement du Quebec, CPP Investment Board and the Ontario Teachers' Pension Plan as well as Macquarie Infrastructure Group. (Airwise News, http://news.airwise.com/story/view/1217626229.html, accessed on 3 August 2008).

Aeroportos de Portugal SA (ANA) operates and manages six Portuguese airports: **Lisbon, Porto, Ponta Delgade, Santa Maria, Horta and Flores airports**. The Portuguese State is majority shareholder with a participation of 68.111 % while Parpublica Participacoes Publicas holds 31.889 %. ANA has a group relationship with ANAM which has a concession to manage **Madeira airports**, with NAER, the handling operator in Portuguese airports.

Italy

In **Italy**, **Naples International airport** is managed by GE.S.A.C. SpA. It was the first Italian airport to be partially privatised in 1997 when BAA Italia, which is wholly owned by BAA, entered as majority shareholder (70 % at that time). BAA holds currently 65 % of the company's capital while the City of Naples and the Province of Naples have each one a 12.5 % participation (Interporto Campania and SEA SpA each one having 5 %). The current concession has been granted for 40 years and will be valid until 2043. Aeroporti di Roma (ADR) has been created in 1974 in order to manage both airports of Rome (**Rome Fiumicina and Rome Ciampino airports**) under concession. Gemina S.p.A. holds 95.8% of ADR's capital, local entities 3%, and others 1.2 %.[321] In March 2010, Changi Airports International has acquired a 5 % stake in Gemina S.p.A.[322] **Milan airports Linate** and **Malpensa** are managed by SEA, a joint stock company belonging to the Municipality of Milan with 84.56 % of shares while 14.56 % are held by ASAM and 0.88 % by diverse public and private shareholders.

Greece

The **Greek airport system** is under public ownership, with the new **Athens airport** making an exception. Athens International Airport S.A. was established in 1996 and is a public-private partnership between the Greek state holding 55 % and a private consortium led by the German operator Hochtief AirPort (Hochtief AirPort GmbH 26.7 % and Hochtief AirPort Capital 13.3 %). The company has a BOOT concession for 30 years.

Denmark, Sweden, Finland and Norway

Copenhagen Airports A/S owns and operates Copenhagen airport. It has been listed on the Stock Exchange since 1994 when the Danish government, the only shareholder, decided to sell 25 % of its shares to private investors. Another 24 % and 17 % of its shares were sold in 1996 and 2000 respectively.[323] On 31st December 2009, the Danish government held 39.2 % of shares, Copenhagen Airports Denmark ApS (CAD) 53.7 % and NA International S.à.r.l. (NAISA) 3.9 % while the remaining shares belong to Danish and foreign private and institutional investors (including employees). CAD is 50/50 owned by MAp and Macquarie

[321] In September 2007, Macquarie Airports divested its interests in Aeroporti di Roma (45 %) but also in Birmingham airport.

[322] http://www.changiairport.com/our-business/about-changi-airport/milestones, accessed on 25 May 2010.

[323] Both sales have been accompanied by an increase in the share capital in the form of employee shares.

European Infrastructure Fund 3 (MEIF3); NAISA is owned by MAp. Consequently MAp owns 30.8 % of the shares in CPH via indirect and direct ownership. Since 1990, Copenhagen Airports owns and operates also the airports at **Kastrup and Roskilde**.

LFV (Luftfartsverket until the beginning of 2007) is a state enterprise which operates and develops 16 **Swedish** airports, among them **Göteborg Landvetter, Malmö as well as Stockholm-Arlanda** and **Stockholm-Bromma**. As regards Stockholm-Bromma airport which totalised 1.8 million passengers in 2007 (compared to 17.9 million passengers at Stockholm-Arlanda airport), LFV signed with the City of Stockholm an agreement in 2007 on continued aviation operations at Stockholm-Bromma Airport until the end of 2038. **Stockholm Skavsta airport**, a former military airport, had been operated by the Municipality of Nykoping since its conversion into civil airport 1984. In 1998, 90 % of the airport's capital was sold to TBI plc, the British airport operator that had been overtook by a company belonging to Abertis and AENA International.

25 **Finish** airports, such as **Helsinki-Vantaa airport**, are operated by Finavia, a state-owned corporation.

Oslo Lufthavn AS (OSL) owns and operates **Oslo Airport Gardermoen** the main airport of **Norway**. The company was established in 1992 as a public limited company and is a wholly-owned subsidiary of Avionor AS, the former Norwegian Air Traffic and Airport Management. It was also involved in the planning and construction of the airport at Gardermoen. On 1st January 1997, OSL took responsibility for the operation of the existing airport at Fornebu until its closing in 1998 when the new Oslo airport Gardermoen was opened.

6.3.2. Restructuring process leading to an internalisation of airport companies and the opening towards new partners

This restructuring process led to the arrival of airport companies interacting at an international level and running an increasing number of airports. Among them figure traditional airport operators like ADP, Fraport or BAA, the latter itself had been taken over by Ferrovial, a Spanish civil engineering company, in June 2006. In parallel, new actors emerge in the airport management, like investment banks (e.g. Macquarie), pension funds (e.g. Caisse de dépôt et de placement du Quebec, Ontario Teachers' Pension Plan) or infrastructure building companies (e.g. Hochtief, Ferrovial, Abertis). Graham A. (2003) refers to this development as globalisation of airports which constitutes a third step in the evolution of the airport sector, following the commercialisation and restructuring of airports.

6.3.2.1. Internationalisation of airport operators

The internationalisation of airport companies reflects a movement towards an opening of airports outside their own sites/locations and even outside their countries of origin. This opening can take two basic forms: an equity participation in another airport company and/or a contract for the partial or total management of an airport.[324] This opening of airports outside their own sites/locations has been reinforced by a greater involvement of the private sector in the airport activity and the setting of commercial objectives for airport companies. At the same time, it reflects a new idea that airport operators have of their own business. Traditionally, airports were focused on themselves: As nodal infrastructure, they considered themselves as rather isolated entities and did not perceive themselves as being in relation with other airports, neither in a relation of cooperation nor in a relation of competition.

For some years, a number of European airports have acquired shares in other airports, especially in foreign airports. These equity participations are often accompanied by management contracts. In other cases, management contracts are closed, even if they do not include equity participation. Among these airports figure ADP, Fraport and BAA but also AENA or smaller airport companies like Zurich, Vienna or Copenhagen airports.

Aéroports de Paris

On 1st December 2008, ADP and **Schiphol Group** announced that they had signed a long-term industrial cooperation agreement and acquired an 8 % stake in each other's share capital so as to reinforce their cooperation. This cooperation is in line with the dual-hub strategy of Air France-KLM[325] allowing the airports to optimise important investments and to improve operational processes for airlines and passengers.

Moreover, ADP has participations in five countries: Belgium, Jordan, Saudi-Arabia, Guinea, Mexico and the Republic of Mauritius. These participations are accompanied by management, consultancy and/or operating contracts. Participations outside of France as well as management contracts are administrated by ADP Management, a 100 % subsidiary of ADP.[326]

Since 1999, ADP holds 25.6 % of the capital of the company operating **Liege airport**. Moreover, ADP Management and the airport signed a partnership agreement for a duration of 15 years in 1999. ADP is associated with a Cypriote constructing company (J&P/J&P Avax) and three investment funds in AIG[327], the company which has been granted the development and operation of the **Queen Alia International Airport at Amman** through a 25 years concession in May 2007. Jordan Airport Management, a 100 % subsidiary of ADP

[324] See Freathy and O'Connell (2000) and also chapter 6.2.2.3 for more information on the diversification of airport activities.

[325] The dual-hub strategy had been explained by Pierre-Henri Gourgeon (Air France-KLM, 2005). It is based on shuttle flights between Paris CDG and Amsterdam airports (15 flights per day, up to one flight every 30 minutes during peak hours) and the opening of the markets of Air France and KLM to each other thanks to the development of routes between French regions and Amsterdam airport and a common frequent flyer programme. The dual hub strategy consists in concentrating thin long-haul routes on one hub and leaving more choice with respect to schedules and fares to passengers on routes with high demand, so they can combine both airlines and their respective hubs when buying a round-trip ticket.

[326] Information mainly taken from the Documents de référence published by Aéroports de Paris (2006; 2007; 2008; Document de référence 2008, 2009).

[327] ADP holds 9.5 % of AIG's capital while 19 % belong to J&P/J&P Avax and 71.5 % to ADIC, NOOR and EDGO, three Arab investment funds.

Management, operates the existing terminal since November 2007. For the operation and maintenance of this terminal, Jordan Airport Management and ADP Management signed a 25 years contract with AIG. ADP participates with Saudi Binladen Group (SBG) in a consortium which was awarded in February 2007 the renovation, extension and exploitation of the Hajj terminal at **King Abdulaziz International Airport at Jeddah**. A BTO (Build, Transfer, and Operate) concession for 20 years had been signed between SBG and the Civil Aviation Authority in February 2007. Then, SGB transferred all rights and duties relating to this concession to a subsidiary which has concluded an operation and maintenance contract with Ports Project Management and Development Company (PPMDC) which belongs to ADP Managament (5 %) and SBG (95 %). Moreover, PPMDC concluded a contract on technical assistance of 5 years with ADP Management for the terminal's operation. As regards **Conakry airport in Guinea**, ADP holds 29 % in SOGEAC, the company operating the airport, since 1994. Moreover, ADP has concluded a contract on technical assistance of one year (renewable) from the 1st January 2007 on. ADP holds 25.5 % in SETA, Servicios de Technología Aeroportuaria, whereas the remaining 74.5 % belong to Aeroinvest, a subsidiary of the Mexican group ICA. SETA has a 16.7 % participation the holding company of the GACN, the operator of **13 airports in the North and the Centre of Mexico**. Further 36.05 % of GACN's capital is held directly by Aeroinvest which committed to voting like SETA at annual general meetings. Moreover, SETA has concluded a contract on technical assistance and technology transfer with GACN.[328] Finally, ADP Management holds 10 % in ATOL (Airport Terminal Operations Limited) which has been granted a 15 year concession for the construction and operation of the new passenger terminal at the **Sir Seewoosagur Ramgoolam International airport** in the Republic of Mauritius. This new terminal shall be open in 2012 and will replace the older one. In addition, ADP Management has signed a contract with ATOL on assistance with the construction of the terminal and its bringing into service and management. This contract has been signed in August 2008 and will expire in 2015.

Moreover, ADP holds contracts on management and technical assistance with other airports. ADP has a contract with CAMS, the company operating the international **airports of Phnom Penh and Siem Rap in Cambodia** on behalf of SCA[329], the concession grantee. This contract had been concluded initially for three years from 1st January 2005 and then be renewed two times for one year. Since December 2004, ADP is involved in the management of five touristic regional airports in **Egypt**: **Sharm El-Sheikh, Hurgada, Luxor, Assouan and Abou Simbel** airports. This contract has been concluded for a period of 6 years.[330] ADP

[328] GACN, Grupo Aeroportuario de Centro Norte, was listed on the Stock Exchange in 2006 when the government decided to divest 48 % of the company's capital.

[329] SCA's principal shareholder is the French company Vinci.

[330] In 2004, Egyptian authorities decided to delegate the management of Cairo International airport and five regional airports to an international airport operator. Two separate tenders were launched and both won by Fraport. As according to the bidding rules a company could not be awarded both projects, Fraport preferred the Cairo airport contract. Thus, the contract for the regional airports was signed by ADP. (http://www.atwonline.com/magazine/article.html?articleID=1555, accessed on 15 May 2010)

operates also the private **Marsa Alam International Airport**[331]. Following a first contract on technical assistance with the airport authority EGSA-Alger in the context of the opening of the new terminal at **Alger International airport** at the beginning of 2006, ADP signed in 2006 a 4-year management contract which may be renewed for one year.

Fraport

Another example illustrating the opening of airport operators towards other infrastructure is Fraport, the company operating Frankfurt airport. Fraport is also in involved in the management of other airports, through participations and/or management contracts, mostly abroad.[332]

Fraport was majority shareholder in the Flughafen Frankfurt-Hahn GmbH, operating **Hahn airport**. As from January 2009, Fraport transferred its 65 % participation in the airport to the State of Rhineland-Palatinate thus disengaging itself from the loss-making airport. This decision was based on divergences on the future development of Hahn airport. In particular, Fraport wanted to introduce an additional tax per passenger in order to prevent losses but Ryanair, the major airline, was strictly opposed to this project threatening to leave the airport. Nevertheless, both airports affirmed to continue to collaborate closely. In return, Fraport keeps its 30 % participation in Flughafen Hannover-Langenhagen GmbH, operating **Hannover airport**. Outside of Germany, Fraport holds 60 % of the capital of Fraport Twin Star Airport Management AD which signed in September 2006 a 35-year concession for the modernization, extension and operation of **Varna and Bourgas airports in Bulgaria**. Moreover, Fraport holds 51 % in Fraport IC Ictas Antalya Airport Terminal Investment and Management Inc. which holds a concession for the management and the operation of **Antalya International Airport** until 2024. Fraport already operates the airport's international terminal 1 and started the operation of the domestic terminal in September 2007. A second international terminal will open in 2009. Lima Airport Partners S.R.L. is another subsidiary of Fraport which holds 70.01 % of its capital. Already in February 2001, Fraport took over, together with Bechtel Enterprise International Inc. und Cosapi S.A., the management and operation of **Jorge Chavez International airport Lima** through a 30-year BOT concession (with an option for further 10 years). Fraport's 100 % subsidiary, Fraport Saudi Arabia for Airport Management and Development Company Services Limited, started the operation, management and development of **King Abdulaziz International Airport Jeddah** and **King Khaled International Airport Riyadh** in June 2008 according to a 6-year contract. Fraport holds a 10 % stake in Delhi International Airport Private Limited which operates, manages and develops **Indira Gandhi International Airport at Delhi** through a 30-year concession (with a renewal option for 30 years). Together with its partners, Fraport has been granted a

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[331] A 40-year BOT concession for the airport has been awarded to EMAK Marsa Alam for Management & Operation of Airports SAE, a subsidiary of the M.A. Al-Kharafi Group of Kuwait by the Egyptian Civil Aviation Authority. The airport was opened in 2001 and is operated by ADP under a separate agreement. (http://www.marsa-alam-airport.com/identitymain.html, accessed on 15 May 2010)

[332] Information from the airport's website: http://www.fraport.de/cms/fraport_worldwide/rubrik/13/13385. toechter_beteiligungen.htm, accessed on 15 May 2005.

25-year contract for the operation of the future **Dakar Airport in Senegal**. The airport's cornerstone was laid in April 2007. Moreover, Fraport holds since February 2005 a 8-year management contract with the **Cairo Airport** Company (with the option to be renewed two times for one year). Fraport has a 50 % participation in Frankfurt Airport Consulting Service Co. Ltd., a company providing consulting services and personnel training to **Chinese airports.** Moreover, Fraport holds through Fraport Asia Ltd. a 24.5 % participation in **Xi'an Xianyang International Airport** Co., Ltd. which owns and operated parts of the airport's infrastructure (including terminals, parking areas and other facilities) and is also responsible for airside operations. Finally, Fraport holds 37.5 % in Northern Capital Gateway LLC which has been granted a 30 year concession (effective from 29 April 2010) for the modernisation, extension and operation of the **St. Petersburg Pulkovo airport**.

BAA

BAA had stakes or management contracts in 11 airports outside of Great Britain but decided to keep only its 65 % participation in Naples airports.

BAA was part of a consortium which acquired a 75 % stake in the management company which was granted a 25-year concession to run and develop the two major airports in Oman (**Seeb International (Muscat)** and **Salalah airports**) in January 2002. This stake was returned to the Omani government in 2004 as a financial closure on the terms of privatisation could not be achieved (BAA, 2005, p. 22).

Some changes have arisen from BAA's takeover by Ferrovial. Thus, BAA divested its stakes in six Australian airports (10 % in **Alice Springs,** in **Darwin**, in **Tennant Creek airports**, 19.8 % in **Launceston** and **Melbourne airports**, as well as 15 % in **Perth airport)** in 2007. Most of these airports had been managed by BAA through a 50-year lease starting from 1997 or 1998 on. A 75 % (minus one share) participation in the **Budapest airport** operating company, which had been acquired in December 2005, was also sold in 2007. Moreover, BAA terminated a management contract at **Indianapolis Airport** in 2007 (BAA, 2008, pp. 33, 36).

AENA

AENA International participates in the ownership and/or management of foreign airports through **TBI plc**, a British airport operator which had been taken over by a company in which AENA International holds 10 % and Abertis 90 %. Moreover, Aena Internacional has also a 33.33 % participation in Aeropuerto Mexicanos del Pacífico (AMP), a strategic partner of the Grupo Aeroportuario Pacífico de México (GAP)[333] which operates **12 airports in Mexico**. AMP has a 17.4% participation in GAP and holds a management and technology transfer contract. Moreover, AENA International is involved in the management of three **Colombian**

[333] GAP, which operates 12 Mexican airports, had been wholly owned by the Mexican government until February 2006 when 85 % of the company' capital had been sold on the Stock Exchange.

airports where it is a shareholder of the different concession companies and acts as operating partner.[334]

Copenhagen, Vienna and Zurich airports

The internationalization of airport operators does not only concern the biggest European airports but also smaller ones, such as Copenhagen, Vienna and Zurich airports.

Copenhagen airport holds a 49 % stake in **Newcastle International Airport** Ltd. (NIAL). Moreover, Copenhagen airport has a 3.75 % participation in ASUR (via a 49 % stake in ITA to which belong 7.65 % in ASUR's capital). ASUR holds the right to operate and expand **nine airports in south-eastern Mexico** for a 50 year concession period until 2048 (Copenhagen Airports A/S, 2010, p. 28).

Vienna airport holds 25.15 % in **Flughafen Friedrichshafen** GmbH since 2007. It has a 40 % participation in **Malta International Airport** through a consortium and holds directly 10 % of its capital. Vienna airport has a 66 % stake in **Košice airport** through KSC Holding a.s. (KSCH) which is owned by Flughafen Wien group (Flughafen Wien AG, 2010, p. 97).

Up to 29 December 2009 **Zurich airport** held a 17 % stake in the airport operator **Bangalore International Airports Ltd. in India (BIAL)** which owns and operates the airport. Following the sale of 12 % of its holding in BIAL, the remaining 5 % participation enables Zurich airport to continue to be represented in BIAL's Board of Directors. Zurich airport retains responsibility for the operation of the airport on the basis of an operating, management and service level agreement. This agreement had been signed for 10 years. Together with Gestión e Ingeniería IDC S.A. of Chile, Zurich airport is also involved, through participations and/or management contracts, in the operation and management of regional airports in Colombia, Venezuela, Chile, Honduras and Curaçao (Flughafen Zürich AG, 2008).

6.3.2.2. Emergence of new partners in the airport business

In parallel to large airport companies operating several airports, new enterprises specialising in the airport management emerge. Among these "new" companies figure investment banks (e.g. Macquarie), pension funds (e.g. Caisse de dépôt et de placement du Quebec) or infrastructure building companies (e.g. Abertis, Ferrovial, Hochtief).

MAp and the Macquarie European Infrastructure Funds

MAp (previously Macquarie Airports) belonged to the Australian Macquarie Group (formerly Macquarie Bank) which provides banking, financial, advisory and investment services but is not longer associated with Macquarie Group. MAp was spun off to boost its value and have better control over its strategic direction. As at December 2009, MAp is listed on the

[334] Information taken from AENA's website: http://www.aena.es/csee/Satellite?Language=EN_GB&MO=1&SMO=2&Section=3&SiteName=Aena&c=Page&cid=1205751304578&pagename=subHome, accessed on 15 May 2010.

Australian Securities Exchange (ASX). Macquarie Group continues to invest in the airport sector via its Macquarie European Infrastructure Funds 1 and 3.[335]

Thus, *MAp* holds stakes in Brussels, Copenhagen and Sydney airports as well as in ASUR. Its participation in **Brussels airport** amounts to 52.0 % whereas 13.3 % are held by Macquarie European Infrastructure Fund 1 (MEIF 1) and 34.7 % by Macquarie European Infrastructure Fund 3 (MEIF 3). MAp has a total effective interest of 30.75 % in **Copenhagen airports** via Copenhagen Airports Denmark ApS (53.7 %), which is 50/50 owned by MAp and Macquarie European Infrastructure Fund 3 (MEIF 3), and NAISA (3.9 %), a wholly owned MAp subsidiary. Moreover, MAp[336] has a total effective interest of 74.0 % in **Sydney Airport** which was sold by the Federal Government to the Southern Cross Airports Corporation Holdings Ltd. in June 2002. Finally, MAp has also an 8 % share in ASUR which holds the right to operate and expand **nine airports in south-eastern Mexico** for a 50 year concession period until 2048. MAp has a further 7.9 % economic interest through a series of swap agreements.[337]

The *Macquarie European Infrastructure Fund 1 (MEIF 1)* holds, in addition to its participation in **Brussels airport**, 50 % in **Bristol airport**. Another approximately 49 % are held by Ontario Teachers' Pension Plan and the remainder by MAp.

The *Macquarie European Infrastructure Fund 3 (MEIF 3)* has participations in **Brussels** and **Copenhagen airports**.

Abertis airports

Abertis airports was set up in 2005 and groups together the abertis' shareholdings in the airport sector. Abertis, a Spanish infrastructure manager operating also motorways, car parks, logistics parks and telecommunication infrastructure, got into airport management through the takeover of 100 % of the shares of TBI plc in January 2005, through a base company belonging to Abertis Infrastructure (90 %) and Aena International (10%). The British company TBI owns three airports (**Cardiff International and Belfast International airport in the UK, 90 % of Stockholm Skavsta airport in Sweden**) and was granted concessions to manage five other international airports: **London Luton airport in the UK**, **Orlando Sanford** airport in the USA and **La Paz, Santa Cruz and Cochabamba airports in Bolivia**. Besides, TBI has management contracts on behalf of local governments or authorities at five US airports: **Hartsfield-Jackson Atlanta**, **Bob Hope airport** in Burbank (California), **Middle Georgia Regional airport** and **Macon Downtown airport** (Georgia) and **Raleigh-Durham International airport** (North Carolina).[338]

[335] See on the websites of MAp (http://www.mapairports.com.au/map-airports/) and Macquarie Group (http://www.macquarie.com/eu/infra/meif1.htm ; http://www.macquarie.com/eu/infra/meif3.htm), all accessed on 25 May 2010. See also MAp (2010).

[336] The various funds managed by MAp own 82.93 % in the capital of Sydney airport. (http://www.sydneyairport.com.au/SACL/Ownership.html, accessed on 15 May 2010)

[337] Initially, Macquarie Airports had also participations in Birmingham airport and Aeroporti di Roma but divested them in 2007.

[338] See http://www.tbiairports.aero/, accessed on 20 May 2010.

Ferrovial

Ferrovial is a Spanish building company which was founded as railroad construction company. It also manages and operates infrastructure such as motorways, car parks and airports. Under its leadership, a consortium acquired BAA in June 2006. Thus, Ferrovial is involved in the operation and management of all airports in which BAA has a stake: Heathrow and Stansted airports in London, Southampton airport in the South of England, Glasgow, Edinburgh and Aberdeen airports in Scotland as well as Naples airport in Italy. London Gatwick airport belonged to BAA until late 2009 when BAA sold its 100 % interest in the airport to a consortium led by Global Infrastructure Partners after the publication of a report by the British competition authorities in August 2008. Already in 2008, Ferrovial had sold its 100 % stake in Belfast City in order to focus on the airports belonging to BAA.

Hochtief AirPort

Hochtief AirPort GmbH is a subsidiary of Hochtief Concessions AG which belongs to the German construction services provider Hochtief AG. In 2005, Hochtief AirPort founded together with the Australian Hastings Funds Management Ltd., the Canadian Caisse de dépôt et placement du Québec and the German KfW IPEX-Bank a company specialised in investments in the airport sector: Hochtief AirPort Capital GmbH & Co. KGaA[339]. The latter participates with Hochtief AirPort in the capital of four airports: Düsseldorf, Hamburg, Athens and Sydney airport. Moreover, Hochtief AirPort holds participations in Tirana and Budapest airports.[340]

Hochtief's participation in **Düsseldorf airport** started in 1997 when the company won the bidding for the first partial privatisation of a German airport. Hochtief AirPort and Hochtief AirPort Capital hold together 30 % of the company's capital (20 % and 10 % respectively) while 20 % belong to Aer Rianta International and 50 % stay in the hands of the City of Düsseldorf. **Hamburg airport** is the second German airport in which Hochtief AirPort and Hochtief AirPort Capital together have a 49 % stake (34.8 % and 14.2 % respectively) while the City of Hamburg holds 51 % of its capital. Hochtief has been shareholder of Hamburg airport since 2000. **Athens International Airport** was constructed and is operated through a 30-year BOOT concession. Hochtief has a 40 % stake in the company (26.7 % Hochtief AirPort and 13.3 % Hochtief AirPort Capital) while 55 % belong to the Greek and another 5 % to a private investor. According to Hochtief, the Greek government is planning on selling a part of its stake but details are not yet known. Hochtief has also a 12.11 % stake (5.61 % Hochtief AirPort and 6.50 % Hochtief AirPort Capital) in the Southern Cross Airports Corporation Holdings Ltd., a consortium in which participate also MAp (82.93 %)[341] as well

[339] KGaA (the abbreviation of *"Kommanditgesellschaft Aktien"* in German) is a legal form of a company and signifies "association limited by shares". It can be compared to the German public limited company.

[340] See Hochtief AirPort (2008) as well as its website: http://www.hochtief-concessions.com/concessions_en /34.jhtml, accessed on 15 May 2010.

[341] Considering various funds managed by MAp.

as Ontario Teachers' Pension Plan (4.96 %), and to which **Sydney Airports Corporation Ltd**. was sold when it was totally privatised in June 2002.

In 2005, Hochtief AirPort acquired a 47 % share in **Tirana International Airport** which is operated, modernised and expanded under a 20-year BOOT concession. DEG Deutsche Investitions- und Entwicklungsgesellschaft and Albanian-American Enterprise Fund participate with 31.7 % and 21.3 % respectively in the company's capital. The last acquisition concerns **Budapest airport** which is operated and managed through a concession that is valid until 2080. In 2007, Hochtief and its partners acquired 75 % (minus one vote) of the capital of Budapest airport from BAA, the previous owner. Thus, Hochtief AirPort holds 37.25 % of the company's capital, its partners 37.75 % (with 13.625 % Caisse de dépôt et placement du Québec, 13.625 % Malton (a subsidiary of GIC), 7.5 % GSIP and 3 % KfW IPEX-Bank) while the Hungarian State retains 25 %.

6.3.3. Objectives of the restructuring process and its consequences

The introduction of the private sector in airport management has often been justified by an improved efficiency as publicly-owned airports (and especially those owned by government departments) are considered to be inefficient.[342] Inefficiency may be due to political interference in the appointment of management, improper commercial structures, operational inefficiency resulting from overstaffing and limited commercial orientation, inadequate maintenance, budget constraints as priorities for government investments change, the lack of responsiveness to user needs, and inadequate economic and environmental regulations (Kapur, 1995, p. 14).

More efficiency due to the introduction of market-oriented incentives

The different models for privatising airports (ranging from private ownership through equity divesture to management contracts and concession agreements) allow to introduce more or less market-oriented incentives to airport operation and management. Market-orientation results from the process of competitive contracting when public authorities organise biddings for a concession agreement, a lease or management contract and/or shares in the airport company in the case of its partial or total privatisation. Different situations are possible as the equity participation can concern an airport owning the infrastructure and/or the land just as well as it may hold a concession, a lease or management contract. In the case of a concession, a lease or management contract, pressure arises also from renewal and renegotiation of the

[342] The effects of ownership on firms' productive efficiency have been largely discusses in economic and management literatures. According to the agency theory and the strategic management, ownership has an effect on firm performances as different owners set different goals and are sensitive to diverse incentives. Thus, government-owned firms are considered to be less productively efficient than privately-owned ones. Nevertheless, neither empirical nor theoretical evidence presented in literature is conclusive. Especially in the case of mixed ownership, problems arise when evaluating its relationship with the firms' performance. Furthermore, literature on corporate governance suggests that different ownership arrangements imply distinct patterns of authority, responsibility and economic incentives that have an influence on the quality of managerial performance (Oum, Adler, & Yu, 2006b, pp. 110-111).

contract or concession agreement at its expiration. The degree of market-orientation may also depend on profit incentives that can be fixed in the contract and from the distribution of the share of risk between the contracting parties. In any case, the different privatisation approaches encourage and motivate managerial initiative while reducing government influence as airport operations are subject to pressures of the marketplace (Sander, 2004).

According to Sander (2004), this movement towards a growing participation of the private sector, replaces the old, non-profit, public-service model of infrastructure management through a new commercial model. The whole idea that airport companies have of themselves changes as under the former model the tasks of an airport's management are to allow aircraft to take off and land, to move passengers and freight in and out of the airport and, if possible, to cover operating costs[343] while under the latter management is expected to realise a profit and to distribute dividends to shareholders as return on investment. Thus, "the commercial model's entrepreneurial management style seeks to maximise all possible revenue sources, subject to applicable regulatory constraints; meet the needs of all customers, both public and private; cover all costs, as measured by generally accepted accounting principles (GAAP), as efficiently as possible; pay taxes; and achieve a return on the capital investment" (Sander, 2004).

Higher financial and managerial autonomy although public authorities continue to finance infrastructure

While airports owned by the federal government depend on the latter, corporations (whether partially or totally privatised or even 100 % publicly-owned) have a higher financial and managerial autonomy. This applies also to airports depending on regional governments. An increased financial and managerial autonomy for airport managers is an important aspect of the restructuring process as it contributes to a rise in revenues, a fall in costs, and a gain in operational efficiency. According to Kapur (1995, p. 32), operating costs are 10 % to 25 % higher for government department airports compared to other airports. Besides, a higher autonomy may also reduce bureaucracy that affects airport operations.

Moreover, corporations but also airports under regional government have easier access to capital markets for generating financing for investments whereas airports managed by a federal government department have no access or only indirectly to external finance encouraging subsidies and cross-subsidies. Kapur (1995, pp. 32-33) underlined that the granting of subsidies and cross-subsidies depends to a large extent on the ownership structure. Apart from those 100 % privately-owned, all airports receive some form of direct government subsidy even if these contributions have fallen over the last years since changes in management and ownership structure have improved the access to private capital.[344] Indirect subsidies relate to the use, payment and valuation of airport lands and assets as the

[343] Sander (2004, p. 3) noted that operating costs are often "diluted or obscured through combinations with other public-sector operating funds such as maintenance and staffing". As observed in chapter 6.1.1, there is little uniformity in the treatment of costs making it difficult to compare costs between airports.

[344] The most common form of direct subsidy is the investment grant which is paid by national/regional governments to finance investments in infrastructure (Kapur, 1995, p. 32).

government may not calculate with the true market value of land in cases of rent or sale of an airport. Other forms of indirect subsidies consist in debt guarantees and tax exemptions for airport bonds, both lowering capital costs for airports. Airports owned by public corporations or joint public-private ventures are more likely to have implicit government guarantees for airport debt and thus may benefit from higher credit ratings while this is not the case of many regionally and all privately owned airports. Indirect subsidies may also include tax exemptions on airport profits and property taxes.

Being entirely subsidised, profit incentives do not exist for airports managed by federal government (neither for airports under regional government as their mission consists often in promoting a regional system). In contrast, profit targets are defined for public corporations. Increased profit incentives exist for partially privatised airports as they need private funds for infrastructure projects, but dual ownership may create additional inefficiencies. Totally privatised airports aim at maximising profits for shareholders and are thus characterised by the best overall financial performance (Kapur, 1995, pp. 31-36).

6.3.3.1. The effects of ownership structures on service quality and airport performance

Efficiency is often brought up when introducing the private sector in airport management, whether through a management contract, a concession agreement or the sale of participations in the airport company. For this reason, the effects of privatisation, corporatization and changes in ownership forms on service quality and airport performance have been studied.

Sander (2004) pointed out that studies had shown that privatised airports have a significantly higher level of passenger responsiveness and general profitability than government-owned airports. In some cases, managerial autonomy is relatively high (e.g. Hungary), while in others cases, it’s relatively low (as in the privatisation approaches applied in France and Canada), which include some degree of public-sector governance.

Using market orientation as an indicator of service quality[345], Advani and Borins (2001) analysed data for 201 airports worldwide concluding that private ownership and expected privatisation[346] lead to higher levels of passenger and airline market orientation than public ownership. Competition (for transfer traffic but also for origin-destination traffic) has also a positive and significant effect on passenger and airline market orientation. In turn, market orientation can affect performance as Halpern and Pagliari (2007a) observed.

[345] Market orientation is used as an indicator of service quality as it measures how responsive organisations are to their customers. As regards airports, two forms of market orientation exist: passenger and airline market orientation. Passenger market orientation includes statements about the realisation of passenger surveys, the provision of well-publicised means to complain about problems, the transmission of passenger preferences expressed to airport workers to senior management, the communication throughout the organisation of passengers preferences and complaints made to senior management, the immediate access of airline representatives to airport management, quick response to passenger preferences and complaints, the consideration of passenger flows for staffing levels and of passenger preferences when approaching potential retail tenants. Airline market orientation is based on comparable statements (Advani & Borins, 2001, pp. 93-95).

[346] Advani and Borins (2001) referred to an article published by Eckel, Eckel and Singal (1997) according to which the mere expectation of privatisation produces many of the same results than an actual privatisation.

Studies on market orientation of airports were completed by Halpern and Pagliari (2007b) who were interested in another aspect of airport governance. In order to analyse the effect of operating an airport independently or as part of regional or national airport system on its market orientation[347], they concentrated on airports in Europe's peripheral areas which are still largely under public ownership of national, regional or local authorities (and thus debate is not private vs. public ownership). Results show that independently operated airports are characterised by significantly higher levels of market orientation than airports operated as part of a system. Independent governance structures have a significant positive effect on market orientation as do market opportunities (market growth and potential) and a competitive environment.

Many studies on airport performance have been published but in general they neglect the institutional framework. Exceptions are the works of Parker (1999) and Yokomi (2005) but they concentrated on BAA; moreover, they arrived at contradictory conclusions.[348] Thus, Oum, Adler and Yu (2006a; 2006b)[349] examined the relationship between different ownership structures and productive efficiency and profitability.[350] As regards US airports, there could not be observed any difference between airports owned/operated by city/state government departments and those with a private majority ownership. This result is not surprising as airlines and other private companies are to a large extent involved in the airport activity. Airlines routinely contribute to financing the expansion or modernisation of facilities. In return, airlines get long-term leases giving them strategic control of airports. In a competitive environment, airlines exert pressure on airports to improve efficiency. Besides, private companies provide many day-to-day operations and services in which the airport is less involved.[351] Similarly, there is no difference in productive efficiency between airports operated by airport authorities and those with a private majority. Results suggest that airport authorities have sufficient freedom to operate airports in a business-like manner. Ownership does not necessarily reflect the way an airport is operated; the latter seems to be more important to efficiency.

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[347] Halpern and Pagliari (2007b) asked 84 airport managers to respond to 17 propositions that allow to measure the airport's market orientation. Control variables (like airport size, market opportunities, airport capacity, market turbulence, competitive intensity, provision of public services and the importance of charter and low-cost services) were created in order to verify that the relationship between governance structures and market orientation is causal.

[348] Whereas Parker (1999) did not observe any improvement in efficiency, Yokomi (2005) pointed out that almost all airports under BAA increased their technical efficiency after privatisation. Note that the former calculated the Total Factor Productivity while the latter used the Malmquist TFP index method.

[349] According to Oum, Adler and Yu (2006a; 2006b), the only study by then on the effects of airports' governance on efficiency was realised by Airola and Craig (2001) but it concentrated on US airports being characterised by ownership structures that are different from those found among European airports. Thus, they distinguished between city-operated airports and airport-authority-operated airports.

[350] Data referred to 2001-2003 for major airports in Asia-Pacific, Europe and North-America. A variable factor productivity measure (ratio of total aggregate output over aggregate variable input) was used as the performance indicator. See Oum, Adler and Yu (2006a; 2006b) for reasons for this decision.

[351] See De Neufville (1999) and Carney and Mew (2003) for more information on US airports. Because of the way US airports are operated, despite being under public ownership, De Neufville (1999) considered that they figure among the most "privatised" airports in the world.

Contrary to initial expectations, there is strong evidence that 100 % publicly-owned airports (by a single government) are significantly more efficient than airports owned and managed by a mixed enterprise with a government majority. They are also more efficient than airports owned by multiple governments (national, regional, local governments). Airports with a private majority based in Europe and Oceania realised higher profit margins than airports under other ownership forms, despite charging lower aeronautical fees. Oum, Adler and Yun (2006a; 2006b) concluded that airports rather tend to reinforce their profitability by diversifying their business and strengthening commercial and other non-aeronautical activities than abusing of its power for charging monopoly prices. However, there may not be a significant difference between airports under private majority ownership and those operated by a corporation under a single government, once differences in the operational environment within which these airports operate are controlled. Moreover, airports with majority private ownership (even with 100 % private ownership) do not achieve significantly higher efficiency than 100 % publicly-owned US airports.

Following these results, Oum, Adler and Yu (2006a; 2006b) suggested that three measures may improve operational efficiency: greater competition in the long run (e.g. through open skies agreements) will incite airports to improve efficiency as airlines and passengers will face a wide choice; removing bureaucracy and duplication of administrative processes between corporatized airport management and governmental administrative procedures; giving airport managers more freedom and complete authority to restructure operations and conduct business.

6.3.3.2. Tensions resulting from the risk of short term profit seeking

In practice, the advantages from the introduction of market-oriented incentives may be eclipsed by the negative effects of privatisation due to a focus on short-term profit seeking that may be disadvantageous for airport users and other parties involved in the airport business. Therefore, regulation is necessary.

Conflicts of interest conflicts arising from the focus on earnings

The conflict of interest arising from the necessity to generate substantial revenues providing for profitability to shareholders and financial resources for future investments becomes apparent in a number of fields.

One example is the layout of airport facilities designed in order to allow passengers to finish all procedures more efficiently; therefore, a certain space for public facilities is needed what reduces necessarily the space available for commercial facilities. Another issue is the organisation of transfers with short distances allowing passengers to get their connecting flights quickly for the purpose of reducing inconvenience of transfers for passengers vs. guiding them through large shopping halls in order to incite them to spend money. Conflicts may also arise with respect to landside access: Should the airport invest in the development of car parks and keep parking fees high or improve access by public transport although the latter generates less profit?

Finally, the number of strikes that may be observed among sub-suppliers of airport services (such as baggage handling, security or cleaning companies) bear witness to deteriorating working conditions due to increasing demands on employees.

Privatisation requires regulation on economic and environmental issues

The regulation of airports has got an important issue since the introduction of the private sector and the commercialisation of airports (Graham A. , 2003) which has lead to tensions between the environmental and commercial strategies of airport operators (Humphreys, 1999). Thus, despite the tendency to at least partially privatise airports and/or to award concessions for their operation and management to private entities, which tend to manage them as private companies, public authorities preserve a particular responsibility that includes and goes beyond their traditional role of setting safety standards and controlling their adherence. Moreover, it is at the level of the European Union that the key elements of the general policy of transport are elaborated. The EU member states participate in it but keep a certain scope of interpretation for their transposition in national law.

By way of example, the Airports Act, leading to the privatisation of BAA, stipulated also its regulation in order to prevent abuse of monopoly power. The UK Civil Aviation Authority was appointed as regulator, but the Monopolies and Mergers Commission and the Office of Fair Trading could review BAA activities, too. After its transformation in a public limited corporation and in view of the sale of almost 30 % of its capital, ADP signed together with the French State, in February 2006, a first contract[352] for economic regulation for the period of 2006 to 2010, including upper limits for the evolution of aeronautical charges, investment plan, and quality objectives (Aéroports de Paris, 2008).

At the same time, a transparent regulation constitutes an important element for potential investors. This is highlighted by Macquarie Airports (2008b, p. 1) which underlined that airports are attractive to private investors for four reasons: One can expect “long term growth with a high degree of resilience, high operating margins, robust earnings growth via strong commercial opportunities and [a] trend towards transparent regulation”.

Regulation, whether on economic issues (like subsidies, slot allocation, airport charges) or environmental one (like night flight restrictions), got a major point, in particular in the light of growing environmental concerns which have still increased with the introduction of the private sector.

[352] According to articles L. 224-2 and R. 224-4 of the civil aviation code.

Conclusion: Commercial activities and privatisation tendencies in the light of the economic characteristics of the airport industry and with a large impact on the airport business

The sixth chapter focused on the economic characteristics of the airport industry as well as on the increase in commercial activities and the far-reaching restructuring process, two major developments that the airport industry has gone through since the liberalisation of air transport. The properties of airport infrastructure have an influence on airport strategies. Moreover, their consideration allows to understand the importance of commercial activities and of privatisation tendencies but also the latter's consequences on the airport business.

In the new competitive context into which airports have been pushed since the liberalisation, associated with the privatisation tendencies that could be observed in the industry, much attention has been drawn to the economic characteristic of airports and in particular to the question if airports may take advantage from market power which would necessitate comprehensive regulation. The question is if airports constitute natural monopolies but adducing evidence is rather difficult in practice. For this reason, a number of economists turned to the theory of contestable markets: If an airport is working in a perfectly contestable market, due to the pressure from potential competitors, regulation would not be necessary even if it is natural monopoly... and thus the answer to the question if airports are natural monopolies would become less important. As regards the potential for competition, the discussion has not yet led to a clear position. It seems to depend on different factors and thus on the precise situation. Recent developments like the increase in high-speed railway transportation and the arrival of low-cost airlines rather favour competition.

As regards the revenues from the airport activity, airport charges are a delicate issue: They may represent a quite large share in the operating costs of airlines (such as low-cost/charter carriers but also airlines with a focus on short-haul routes); due to increased competition and falling yield, most airlines already implemented cost-cutting measures so they expect the same from airports. While pressure is on airport charges, commercial activities allow airports to generate substantial revenues providing for profitability to shareholders and financial resources for future investments thus broadening the airport's scope for development.

At the same time, short-term profit seeking may lead to tensions resulting from conflicts of interests between the airport operator and other parties, e.g. airport users, service providers and residents, even though the pursuit of improved efficiency with positive effects on service quality, passenger and airline market orientation and airport performance generally justify privatisation. Another reason is the, at least partial, withdrawal of state funding although public authorities continue to finance infrastructure in most cases. Therefore, privatisation is generally very partial with infrastructure remaining publicly financed and the private operator dealing only with the small, visible part of the system. Finally, ongoing privatisation tendencies lead to an internationalisation of airport companies and the emergence of new actors. It is just this restructuring process, despite creating a wide range of legal statuses, ownership patterns and management forms, which brought airport operators to change the whole idea that they had of themselves...

Conclusion of part 2: Emergence of the airport as a new strategic actor with an increased financial and managerial autonomy in an environment which leaves more room for manoeuvre but is also characterised by a higher degree of uncertainty, an increased business risk and tensions with other parties involved in air transport

The second part focused on the new potentialities for developing the airport activity. They arise mainly from the liberalisation of air transport, which pushed airports in a context where they have more freedom for developing their activity but also have to deal with a higher degree of uncertainty and an increased business risk, as well as from changes in the airport business, in particular with the increase in commercial activities and privatisation tendencies leading to a higher financial and managerial autonomy. It is within this context that the airport has emerged as a new strategic actor.

The characteristics of the airport infrastructure have an influence on airport strategies. They also explain the importance of commercial activities and privatisation tendencies but also the latter's consequences on the airport business.

Due to high and fixed-step costs of airport infrastructure, airports are incited to develop strategies for attracting additional traffic which may include incentives or discounts on airport charges to airlines as well as negotiations of contract terms with the carriers in order to get the airline's commitment to the airport. This may also include allowances that the airport accepts to make for an airline or the airport's commitment to the airline e.g. by engaging to airline specific investments. Since airport charges are a delicate issue in the relations with airlines, the focus turned towards commercial activities which allow airports to generate substantial revenues providing for profitability to shareholders and financial resources for future investments. Thus, commercial revenues may broaden the airport's scope for development.

The large restructuring process that many airports have undergone over the last years led to a wide range of legal statuses, ownership patterns and management forms. Associated with changes in the economic and political framework, airports have acquired a strategic and tactical autonomy that was not at their disposal before; their modes of functioning and decision-making have evolved although public shareholders retain influence and privatisation remains very partial.

This tendency towards the public and the private sector coming closer, as the former, rather clear distinction between both has disappeared, is actually affecting most economic activities (Johnson, Scholes, Whittington, & Fréry, 2005, pp. 33-34). While the private sector has known important reforms as regards its regulation and its corporate governance but also due to the growing pressure to take into account ecological and ethical considerations, financial objectives and performance indicators have become increasingly important for public organisations. Due to budgetary constraints and the, at least partial, withdrawal of state funding, public organisations saw their mode of functioning getting closer to that of private enterprises. This tendency affects strategies set by public organisations, which analyse their ‘markets’, develop new competencies, in particular in management, enter into alliances or partnerships and proceed to restructuring and even private participation. This is also what happened to the airport industry which takes decisions concerning the development of its activity (e.g. market segments, investments in airport infrastructure) and the relations between with airlines, airports, residents, local authorities, the operators of other transport modes etc. These decisions are strategic as they determine the overall direction of the airport and “its ultimate viability in light of the predictable, the unpredictable, and the unknowable changes that may occur in its [...] environments” (Mintzberg & Quinn, 1991, p. 5).

In this respect, the entrance of Lufthansa in the capital of Fraport in 2005 (almost 10 %) and the cross ownership of shares (in the amount of 8 % stake in the other’s share capital) realised between Aéroports de Paris and the Schiphol Group put a new light on the whole discussion about the restructuring process that the airport industry has undergone. These decisions are particularly strategic: Lufthansa and Fraport reinforce their commitment to each other and put a new light on the airport-airline relationship. At least among European airports, the participation of an airline in an airport operator’s share capital is a new issue. The exchange of shares between Aéroports de Paris and the Schiphol Group is intended to reinforce their commitment to a long-term agreement on industrial cooperation concluded between both airports, a cooperation which is in line with the dual-hub strategy of Air France-KLM and should allow both airports to optimise important investments and to improve operational processes for airlines and passengers.

Finally, the restructuring process that has affected a large number of airports did not only change the whole idea that airport companies may have of themselves. Moreover, the arrival of private shareholders and the emergence of new actors in the airport business (such as investment funds, banks, infrastructure building companies) but also the internationalisation of airport operators may result in even more profound transformations in the long term. Just like in road, railway, maritime or inland waterway transportation, most people working in the airport industry feel very closely connected to their mode of transport. Thus, the arrival of new actors may contribute to changes in mentalities which could open the view of the outside world and give a boost to intermodal transport projects or stronger cooperation with partner outside the airport industry. At the same time, one can observe that privatisation also creates tensions due to conflicts of interest between the airport operator and the other parties involved, such as airport users, services providers and residents.

In contrast to the second part which focused on the new potentialities for developing the airport activity, the third part places emphasis on the spatial and territorial context into which airports are embedded, the latter representing opportunities as well as constraints.

PART 3

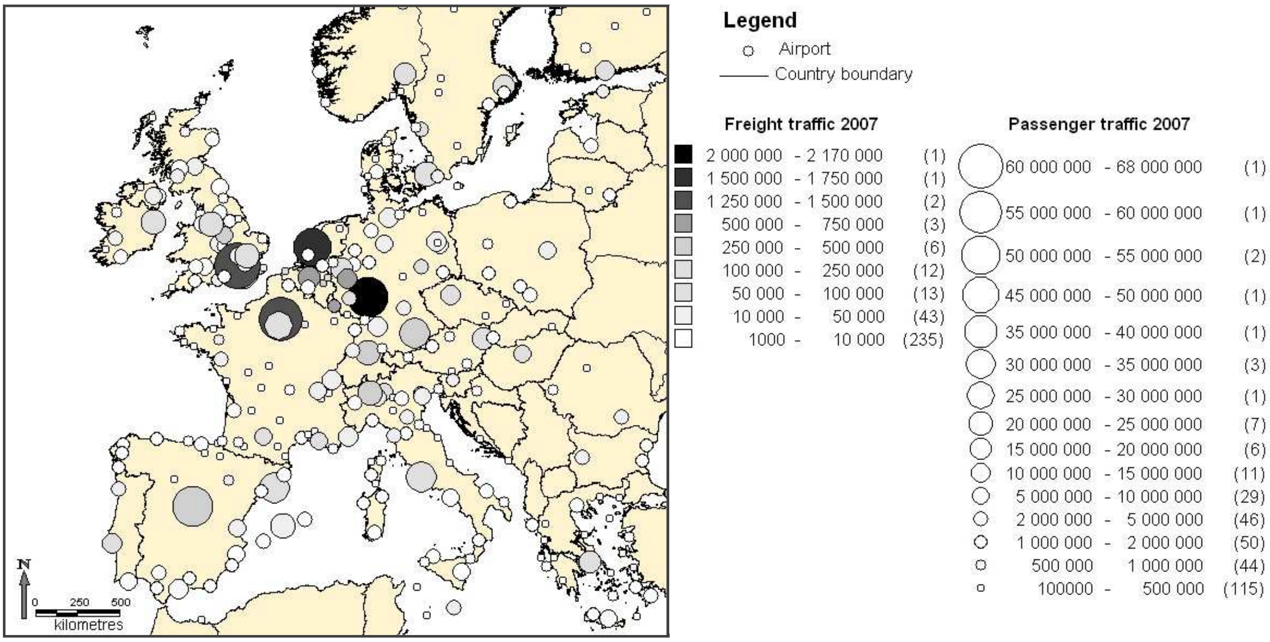
THE SPATIAL AND TERRITORIAL EMBEDDEDNESS OF THE AIRPORT

Introduction

The question of the spatial and territorial embeddedness of airports emerges from two observations: The first one refers to the distribution of airports in Europe when taking into account only their passenger and cargo throughput; the second one is related to the type of airport that can be identified.

To start with, figure 20 represents the passenger and freight traffic of about 300 European airports in 2007.[353] It includes all airports with more than 100 000 passengers carried and/or more than 1000 tons of freight loaded and unloaded. Whereas the passenger traffic is represented by the size of the circle, its colour indicates the freight traffic volume of the respective airport.

Figure 20: Passenger and freight traffic at European airports in 2007



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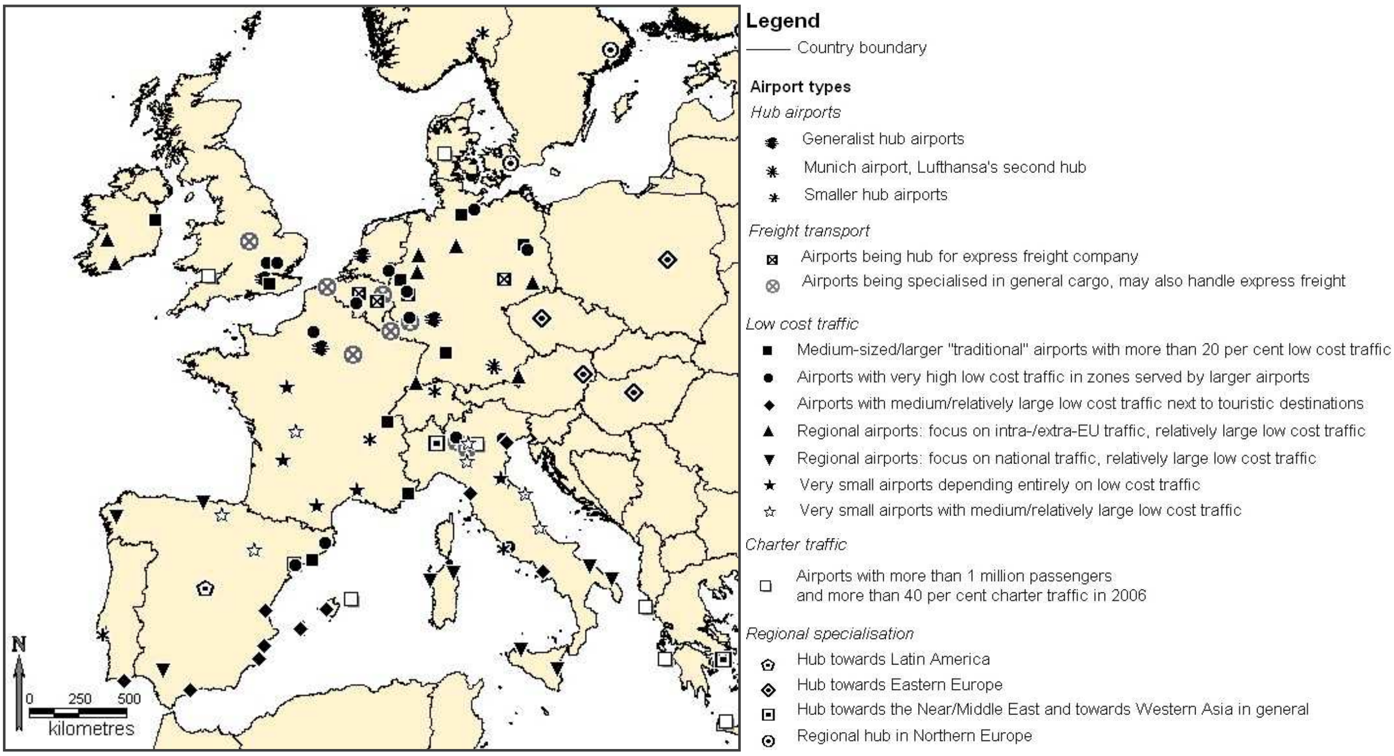
First, it can be observed that **the distribution of airports is not uniform in Europe.** Freight traffic is even more concentrated than passenger traffic. As regards air cargo, the most important airports are Frankfurt, Amsterdam, London Heathrow and Paris CDG airport which are Europe’s four generalist hub airports. This results also from the strong link between freight and passenger traffic as about half of air freight is transported on board of scheduled passenger air services. Besides, some airports handle relatively large freight volumes without figuring among the busiest passenger airports.

Secondly, one notes that **airports have developed different profiles according to certain specialisations** as illustrated by figure 21. Actually, since the liberalisation of air transport,

[353] See Appendix 12 on passenger and freight traffic at European airports in 2007.

different market segments have emerged in air transport: One can distinguish between air services operated by traditional full-service carriers, charter and low-cost airlines in passenger transport and between general cargo and freight express carriers in goods transport. The increasing differentiation of air services is followed by a differentiation of airport strategies leading to airports which may concentrate on certain market segments or on the contrary establish themselves as generalist airports. Figure 21 shows the result of this evolution in 2006. On observes that the distribution of airports with a certain profile across Europe is not uniform either.

Figure 21: Airport taxonomy



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Since there is a link between the general traffic volume of an airport and the socio-economic characteristics of the surrounding area, another question arises: It refers to the link between the spatial and territorial context into which an airport is embedded and the airport's profile as illustrated by figure 21. Supposedly, a bidirectional link between territory and airport type exists: On the one hand, the territory which is affected by the airport depends on the different market segments served by the airport and thus on the airport's profile; on the other hand, the territory influences the airport's potential to develop certain traffics. Thus, the airport's catchment area, which is defined as the territory where the existing and potential traffic lies, does not correspond any more to one national territory but different catchment areas emerge from different market segments.

For this reason, the third part proposes an analysis of the territory in order to better understand the potentialities and constraints resulting from the airports' location. To begin with, chapter 7 reminds the characteristics of the European territory as regards its demography, the distribution of economic activities and the attractiveness of certain destinations for tourism. It provides the basis for a detailed analysis of the spatial and territorial context into which the different airport types are embedded. The results will be presented in chapter 8 which also draws an airport taxonomy based on the different specialisations, the latter being associated to the airports' locations. From this analysis emerges a picture of the landscape of European airports revealing a structure which is not due to accident but is largely conditioned by a given territorial context, including the position with respect to other airports and their respective profile.

Nevertheless, some airports perform better or worse which is may be due to the airport's capacity to deal with a number of issues which have an influence on the airport's development and depend, more or less, on the airport's location. For this reason, they are considered within this third part: the airlines' requirements for the choice of an airport (chapter 9.1), the growing public interest in airports due to their impact on economic growth but also to their nuisances (chapter 9.2) and the management of scarce capacity whether restrictions to the airport activity result from technical reasons due to runway or terminal capacity or from political and environmental reasons, such as in the case of night curfews (chapter 9.3). The airport's way of dealing with these difficulties may allow him to pursue current and to safeguard future development.

7. *Strong disparities following a centre-periphery pattern at European level as regards demography and economic activity, tourism destinations*

In Europe, strong disparities as regards the distribution of the economic activity have been observed. Vandermotten and Marissal (2000) draw up an economic typology of the European regions. It confirms a centre-periphery pattern[354], distinguishing decision-taking spaces that are also particularly important for air transport demand. Data refer to 1990 but the structures brought out remain still valid, unless Ireland maybe. Cattan, Pumain, Rozenblat and Saint-Julien (1999) analysed the exchanges between European cities and the system of cities emerging from these interdependencies. Drawing inspiration from these works, this chapter gives a more general review of the distribution of population, economic activity and tourism destinations before concentrating on the analysis of the particular context into which certain airports are embedded.

7.1. Demography

In a first step, the population will be considered, including the share of foreign nationals in the population.

7.1.1. Population of working age

To begin with, figure 22 shows the distribution of the European population. Only persons of working age (15-64 years) are considered as they are in general more mobile than children or retired persons and thus more often travel by air.[355]

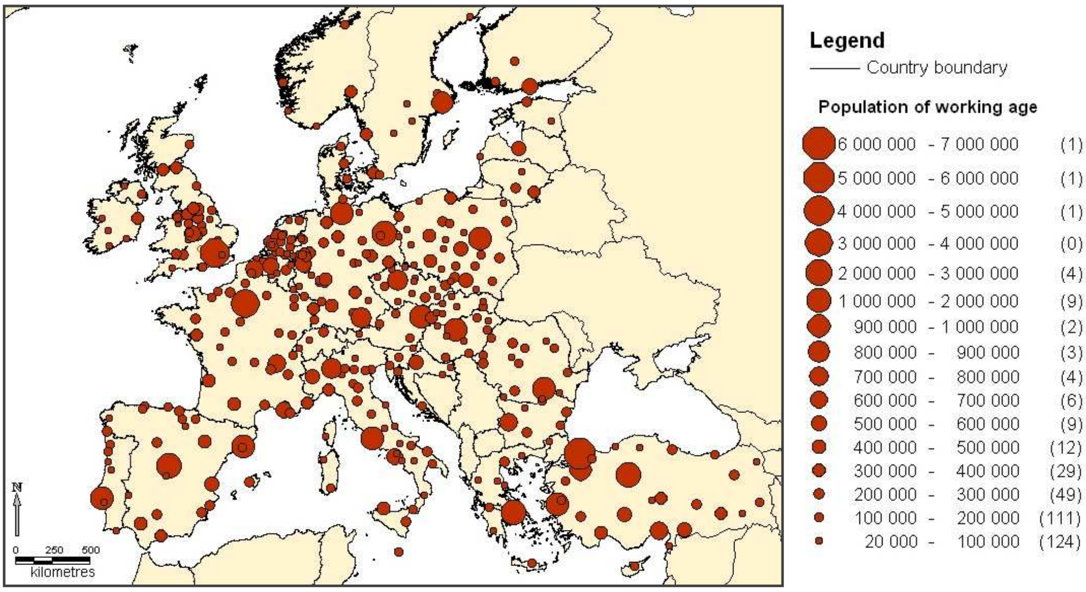
One can distinguish a relatively densely populated area covering London (5.2 million inhabitants), the north of France, Belgium, the Netherlands, Luxembourg and the German areas along the frontier with these countries including Greater Paris (4.25 million inhabitants of working age) but also a big number of large and middle-sized cities. Berlin, Madrid and Greater Athens have each one more than 2 million inhabitants. In addition, a number of capitals have more than 1 million inhabitants, including Greater Lisbon, Rome and Vienna but also a Bucharest, Warsaw, and Budapest located in Central and Eastern Europe.

[354] Vandermotten and Marissal (2000) distinguish the centre, intermediary zones and the periphery. The centre is composed of metropolitan zones, zones that are central but not metropolitan and subcentral zones. The metropolitan zones refer to the principal metropolitan zones such as London, the Randstad Holland (including Amsterdam, Rotterdam, The Hague and Utrecht and the surrounding areas), Paris, Vienna, Brussels, Hamburg, Frankfurt, Munich, Milan, Berlin but also Madrid, to pericentral metropolises such as the Scandinavian capitals, Edinburg and Rome as well as to peripheral metropolitan zones (Lisbon, Naples, Athens).

[355] Figures refer to the "Kernel" for Helsinki, Stockholm, Paris, Athens and Lisbon, i.e. the administrative borders being too small the surrounding areas were included in order to form a "Greater Helsinki", "Greater Stockholm" etc. for the purpose of facilitating the comparison with London. The Kernel data were not available for Copenhagen. See Appendix 5 on the number of inhabitants for Urban Audit towns and cities.

Moreover, Hamburg and Barcelona figure among cities above 1 million inhabitants of working age.

Figure 22: Population of working age



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Considering Turkey too, Istanbul becomes the most populated city in Europe (6.8 million inhabitants). Moreover, two other Turkish cites are very big: Ankara and Izmir with respectively 2.35 million and 1.7 million inhabitants.

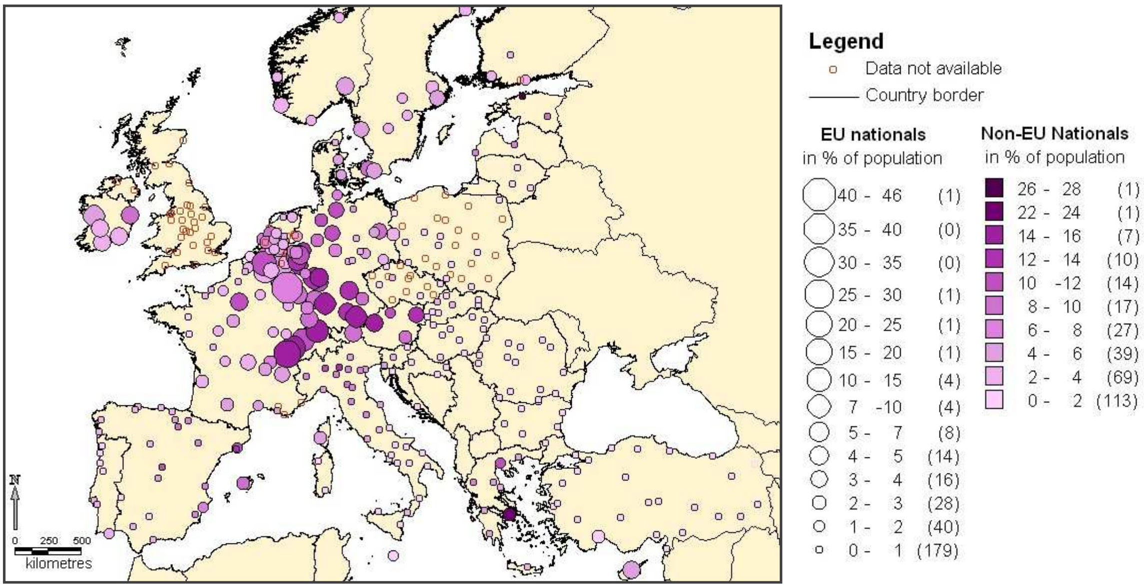
7.1.2. Residents having another nationality (EU or non-EU)

Another factor influencing air transport demand is the cities' linkage to foreign countries. The proportion of residents having another nationality may be considered as an indicator. In this respect, two types of foreigners may be distinguished: nationals of another EU Member State (i.e. EU nationals) and non-EU nationals.[356]

As regards the proportion of persons having another EU nationality (figure 23), they represent a large proportion of inhabitants of cities that are located in the zone covering Luxembourg (46 %), Belgium (15 % Brussels, 12 % Liege, 10 % Charleroi), Switzerland (28 % in Geneva, 22 % in Lausanne, 15 % Zurich, 11.5 % Bern) and the adjoining parts of Germany (Cologne/Bonn/Düsseldorf and surroundings, Frankfurt/Main and surroundings, Stuttgart, Karlsruhe, Augsburg, and Munich with respectively 5 % to 9 %). EU nationals represent also a relatively important proportion (4 % to 5 %) in the Western part of Austria, in Paris, Stockholm, Oslo, Malmoe, Cyprus, and in Ireland.

[356] Figures refer to the administrative borders of the cities, except for Helsinki where data is only available for the "Kernel" which corresponds to "Greater Helsinki". Figures are missing for some cities, in particular for the whole UK (including London). See Appendix 5 on the proportion of foreign nationals for Urban Audit towns and cities.

Figure 23: Proportion of residents who are nationals of another EU Member State or non-EU nationals



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In comparison with EU nationals, non-EU nationals seem to be less concentrated as they represent respectively more than 10 % of the population of 36 cities and more than 5 % of the population of further 60 cities. These cities are spread all over Europe, but the already cited zone with a large proportion of EU nationals is also characterised by a large proportion of non-EU nationals. However, these figures may be influenced by divergences as regards naturalisation policies in the different EU member states.

7.2. Economic activity

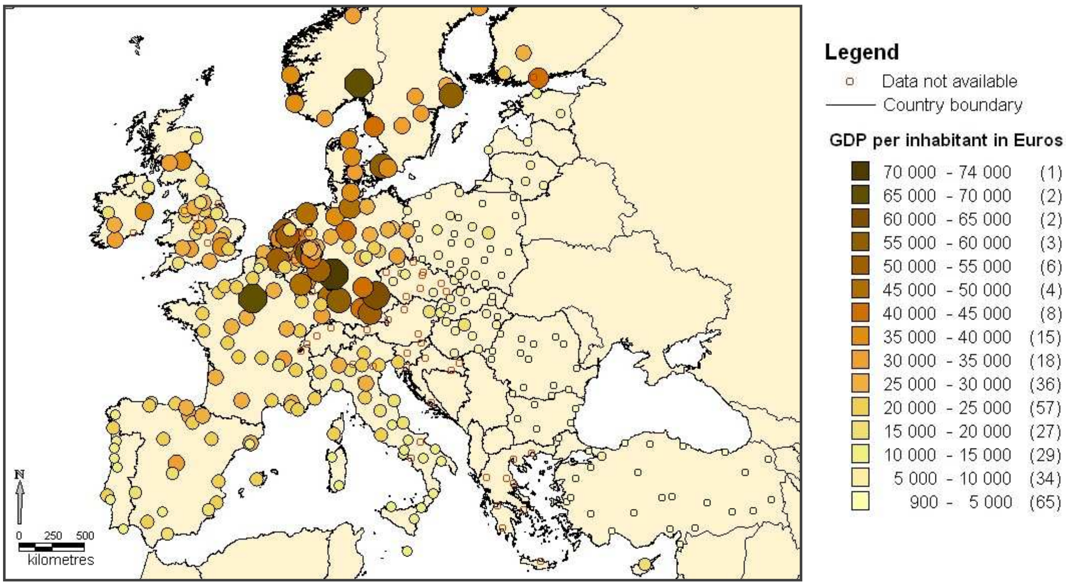
The economic activity will be described by four indicators taken from the urban statistics: the gross domestic product (GDP) per head, the proportion of employment in different economic sectors (and in particular in financial services), the unemployment rate and the number of companies with headquarters. In addition, the number of meetings organised will be considered.

7.2.1. Gross domestic product per inhabitant

As a start, the GDP measures the country's overall economic output. It is the market value of all final goods and services made within the borders of a country in a year. It is often positively correlated with the standard of living (O'Sullivan & Sheffrin, 1996, pp. 57, 305). Figure 24 represents the GDP per head of different towns and cities.[357]

[357] See Appendix 6 on the GDP per head for Urban Audit towns and cities.

Figure 24: GDP per head



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As regards the distribution the GDP per head, a clear North-South divide can be observed. Moreover, the GDP declines slightly in a westward and steeply in an eastward direction.[358]

The highest GDP per head can be found in Frankfurt/Main, followed by Paris, Oslo, Düsseldorf and Regensburg, each one exceeding 60 000 EUR. All cities with a GDP above 36 000 EUR are located in Germany, the Netherlands, and Belgium, Luxemburg and the Scandinavian countries. Outside these countries, Dublin reaches the highest GDP per head with 36 000 EUR, even higher than London’s GDP (35 700 EUR), by the way the latter corresponds to Edinburgh’s GDP.[359] The first Spanish city in the ranking is Madrid (31 000 EUR), but Pamplona (29 900 EUR) and Barcelona (28 000 EUR) come just behind. The first Italian city is Milan (28 000 EUR).

7.2.2. Employment according to economic activities

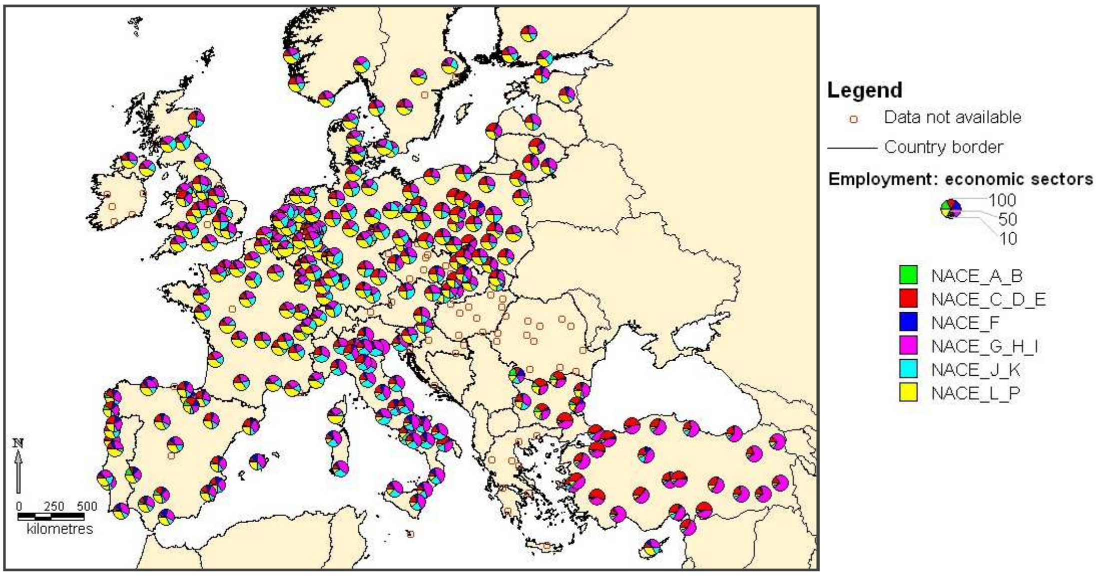
It is also interesting to see the distribution of jobs according to economic sectors because certain branches, such as financial and business services, are generating a higher demand for air transport. Therefore, figure 25 illustrates the proportion of jobs belonging to the different economic sectors.[360]

[358] Figures are missing in particular for Switzerland, Austria and Greece.

[359] Note that the GDP of London refers to a zone that covers also nearby suburbs, contrary to Paris, Copenhagen, Helsinki, Stockholm and Lisbon. This may explain the relatively low value as Kernel data available for Copenhagen and Lisbon indicates also that the latter is below the “Inner Copenhagen” and “Inner Lisbon” GDP. Only for Helsinki, Kernel data is higher than “Inner Helsinki” GDP. Figures are missing for Athens.

[360] See Appendix 7 on the employment according to economic activities for Urban Audit towns and cities.

Figure 25: Proportion of employment in financial and business services (NACE J and K)



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The figure illustrates the differing economic orientations of the cities considered even though they are all dominated by the service sector whereas agriculture, hunting, forestry and fishing (NACE A_B) play a minor role. This also applies to heavy industries but unfortunately the urban statistics include them in the industry sector (NACE C_D_E) therefore not allowing a precise differentiation. Wholesale and retail trade, hotels and restaurants, transportation and storage (NACE G_H_I) represent in almost all cities more than 20 % of employment. In a number of Italian cities their part exceeds 30 % and in most Turkish cities 40 %, going up to 70 % for the latter.

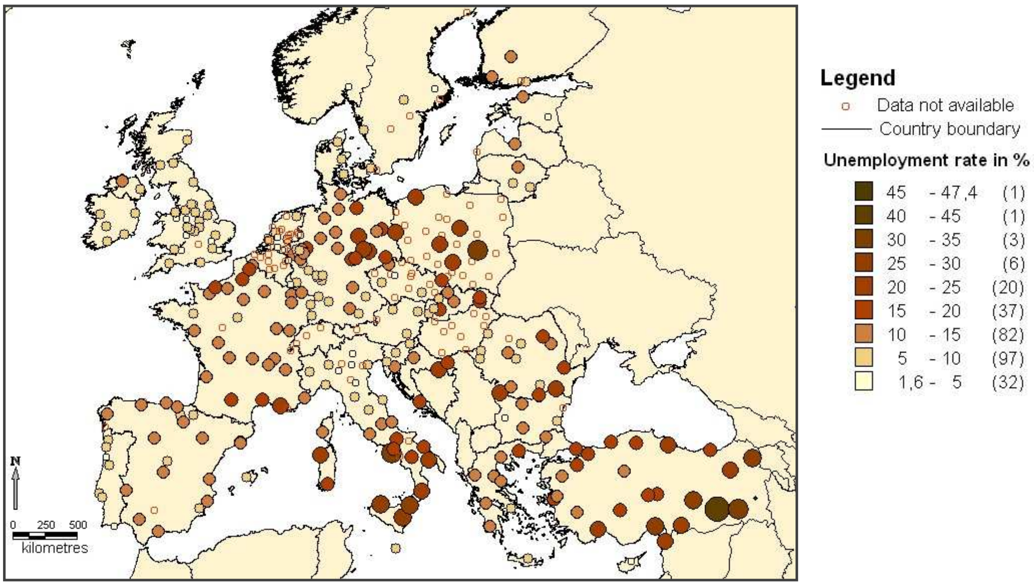
Financial and business services (NACE J_K) represent a large proportion of employment in the cities belonging to a zone that crosses Europe diagonally from the UK via France, Belgium, the Netherlands, Luxembourg, Germany, and Switzerland to Italy. These cities, except for Italy, have also a large proportion of jobs in public administration and defence, education, health and social work as well as in social and personal service activities (NACE L_P) while construction (NACE F) plays a small role. In return, in Italy construction plays a more important role.

As regards the Spanish and Portuguese cities, they have a relatively large proportion of jobs in public administration and defence, education, health and social work as well as in social and personal service activities (NACE L_P) but also in construction (NACE F) and in some cities agriculture, hunting, forestry and fishing (NACE A_B) play a relatively important role.

7.2.3. Unemployment

A small unemployment rate is also an indicator for the economic well-being and therefore showed in figure 26.[361]

Figure 26: Unemployment rate



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Unemployment rates are relatively high in certain regions such as the North and the South of France (e.g. Lens, Amiens and Le Havre in the North, Toulouse, Marseille and Montpellier in the South, each one exceeding 15 %), in Eastern Germany but also in the region of Dortmund, in the South of Italy but also in certain cities in Central and Eastern Europe (e.g. Poland) and in Turkey. In a number of Spanish, French and Greek cities, unemployment rates remain relatively high (10 % to 15%), while Portugal, the UK and Ireland observe lower unemployment rates (5 % to 10 %).

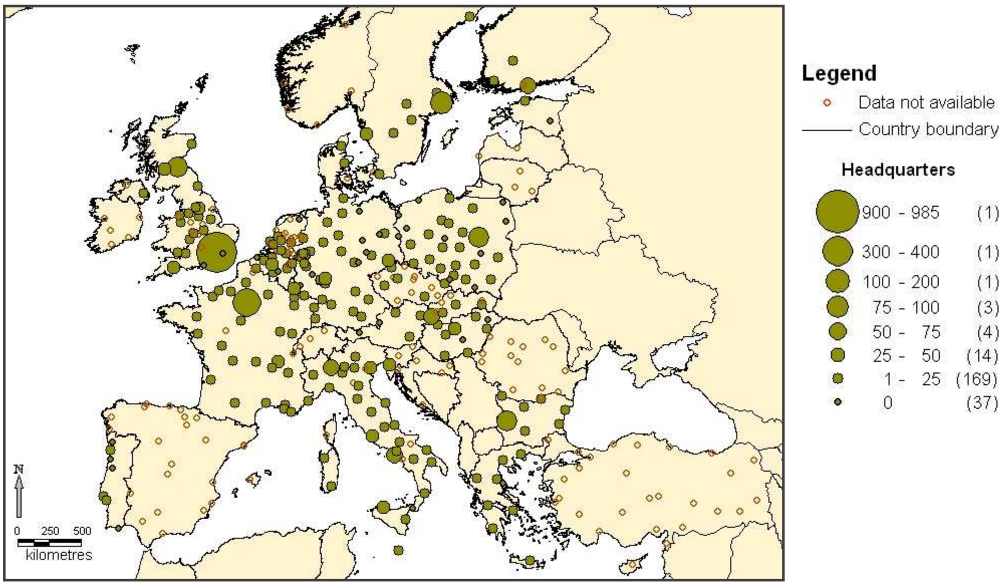
7.2.4. Location of headquarters

The following figure 27 indicates the number of companies that are listed at the national stock exchange and have their headquarters in the city.[362] By far, London concentrates the biggest number of headquarters with 985 which corresponds to more than 28 % of the 3463 headquarters considered. London is followed by Paris and Stockholm with respectively 331 and 134 headquarters. Finally, there are eight cities with 50 to 90 headquarters: Stockholm and Helsinki in Scandinavia, Edinburgh but also three Eastern European capitals (Sofia, Warsaw, and Bratislava) as well as Milan and Naples.

[361] See Appendix 6 on the unemployment rate for Urban Audit towns and cities.

[362] Figures are missing in particular for Ireland, Spain and Switzerland. See Appendix 6 on the number of headquarters for Urban Audit towns and cities.

Figure 27: Number of companies with headquarters within the city (only companies quoted on the national stock market)



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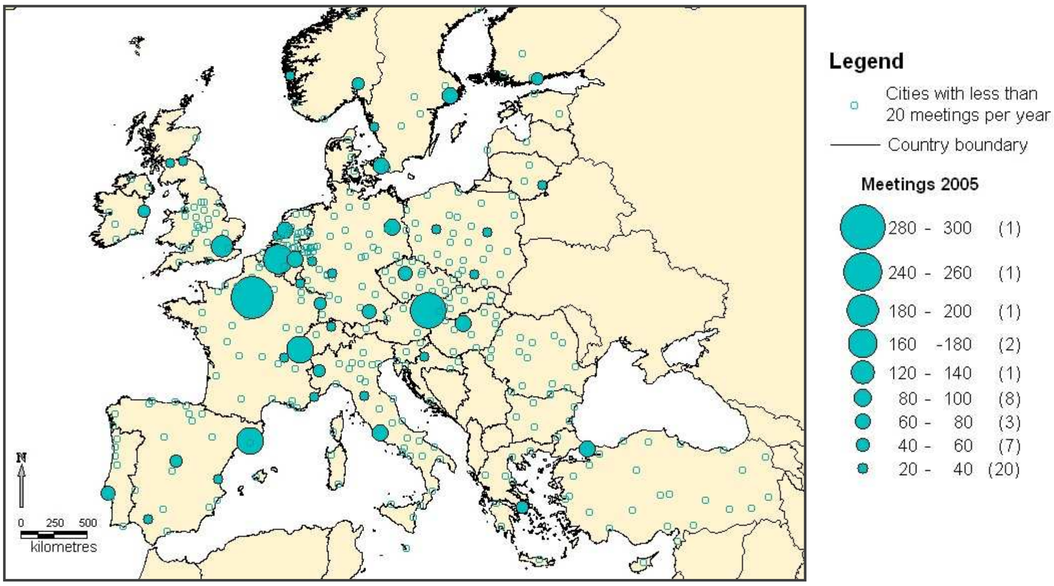
7.2.5. Location of international meetings

International meetings (e.g. congresses) give also an idea about the importance of a city. Figure 28 refers to meetings organised by international organisations with a minimum of 50 participants and includes only cities with at least 20 meetings.[363] This corresponds to 44 cities organising a total of almost 3000 meetings in 2005.

Figure 28: International meetings in 2005



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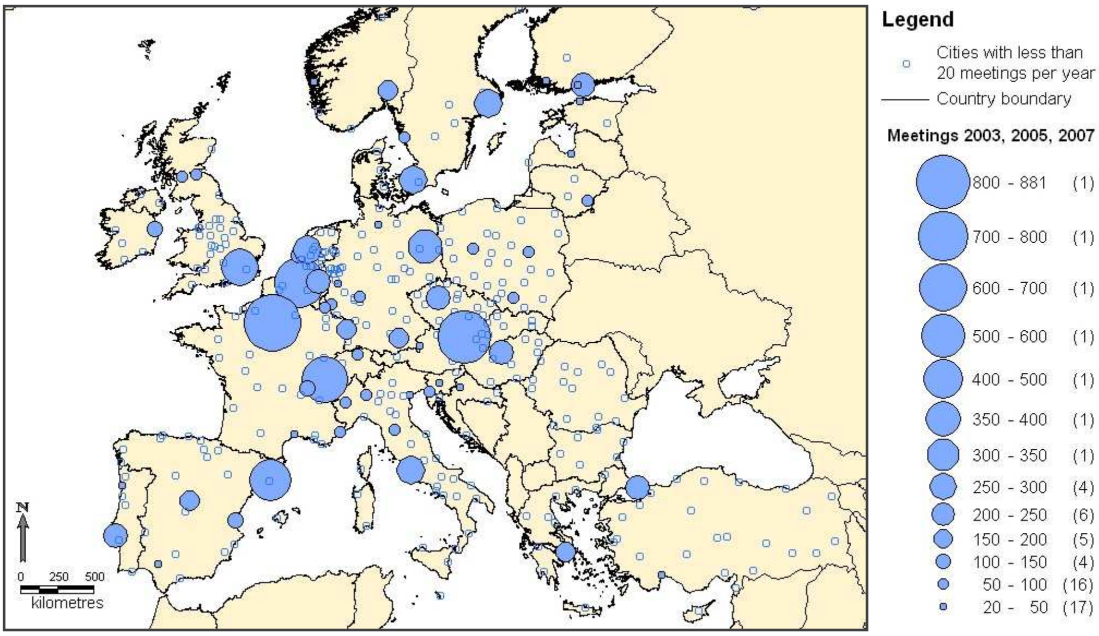
[363] See Appendix 8 on international meetings.

With 294 meetings, Paris heads the ranking. It is followed by Vienna with 245 meetings. Four other cities have welcomed more than 100 meetings in 2005: Brussels, Barcelona, Geneva, and London[364] with 189, 162, 161 and 128 meetings respectively. One can observe that international meetings are not held at the classic touristic destinations in Southern Europe but rather in metropolitan zones of a certain economic importance even though the latter may be also popular touristic destinations (such as Paris or Vienna).

This is also confirmed by figure 29 which indicates the sum of international meetings held in the different cities in the years 2003, 2005 and 2007, i.e. a total of more than 9300 meetings in 60 cities.[365] Most meetings are held in cities of economic and/or political importance. Paris and Vienna concentrate more than 17 % of all meetings. About 50 % of all meetings are hold in ten cities heading the ranking.

Only some touristic destinations of lesser importance at an economic/political scale figure among the cities with the most meetings: Valencia (105 meetings) and Seville (44 meetings), Porto (25 meetings), Venice (44 meetings) and Florence (86 meetings), Montpellier (23 meetings) and Nice (54 meetings). Moreover, there are a number of cities in Central and Eastern Europe that seem to get popular for organising meetings: Poznan (65 meetings), Krakow (54 meetings), Vilnius (53 meetings), Ljubljana (46 meetings), Tallinn (25 meetings), and Zagreb (21meetings).

Figure 29: International meetings 2003, 2005 and 2007



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[364] London ranks only sixth. This could be due to the fact that the United Kingdom (as well as Ireland) has not joined the Schengen Area making more difficult the entry for non-EU nationals having a Schengen visa and thus may deter a number of organisations from holding more international meetings in London.

[365] For figure 19, the meetings organised in 2003, 2005 and 2007 were added up (see Appendix 8). However, only cities with at a minimum of 20 meetings in at least one of the three years were considered.

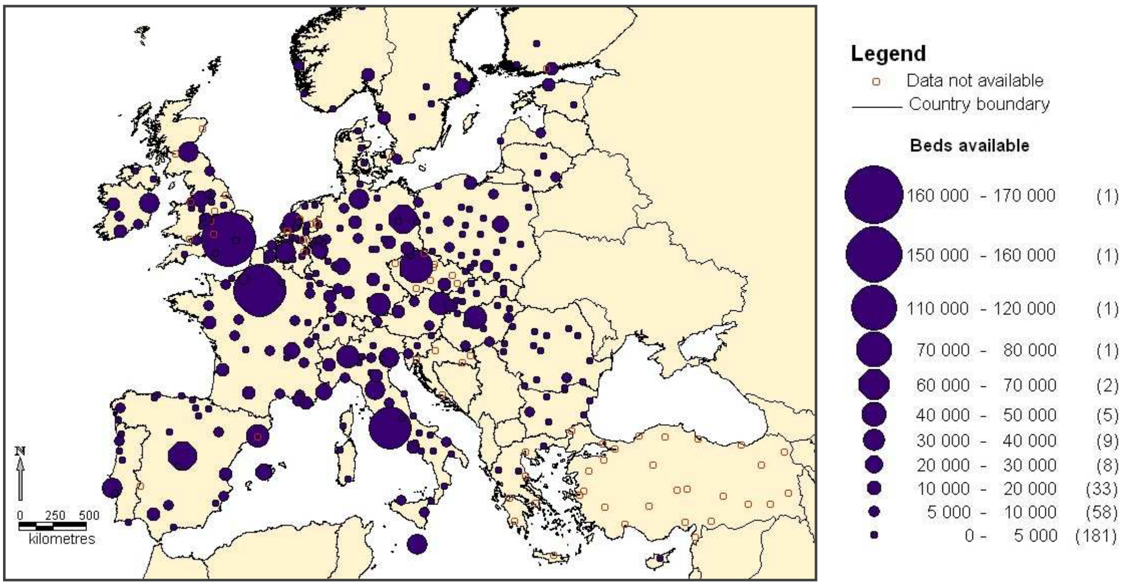
7.3. Attractiveness of certain destinations for tourism

The following figures give an idea about the attractiveness of certain touristic destinations.

7.3.1. Beds available

To begin with, figure 30 illustrates the number of beds available in registered accommodation (excluding camp grounds). It gives an idea of the volume of tourists that may be welcomed.

Figure 30: Beds available in registered accommodation



Own figure

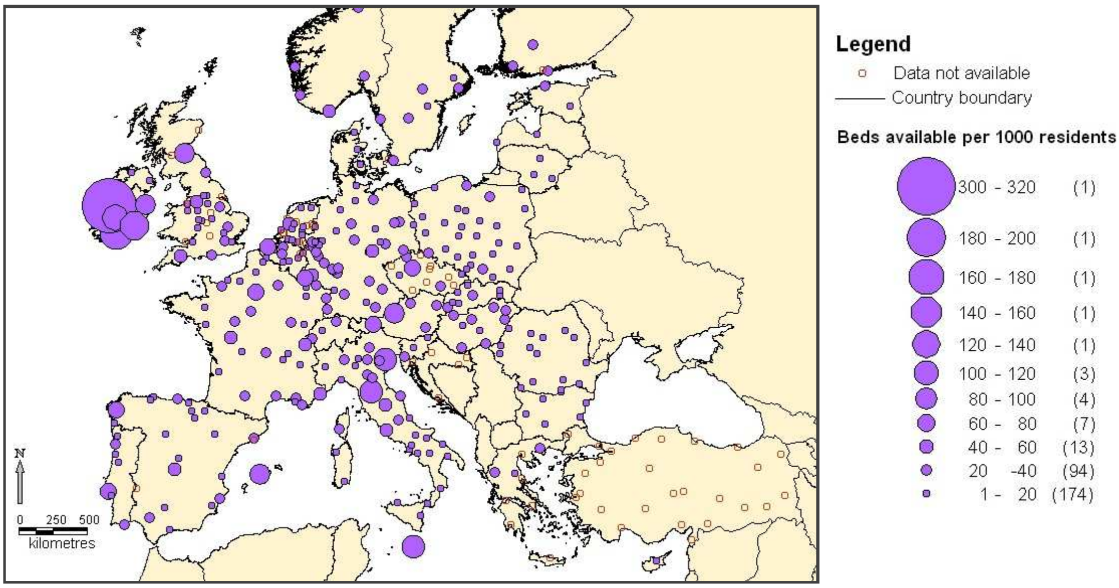
Not surprisingly, most beds are available in the largest cities. Thus, London and Paris head the ranking with 169 000 and 153 000 beds available, concentrating 12 % of the capacity [366]. Rome ranks third with 116 000 beds. Large European capitals and cities of economic importance follow: Prague, Berlin, Madrid, Vienna, Milan, Barcelona, Budapest, and Munich with more than 40 000 beds available. In the group of 20 000 to 40 000 beds available figure bigger cities and cities of economic interest (such as Dublin, Amsterdam, Edinburgh, Brussels, Lisbon, Frankfurt/Main, Stockholm, Warsaw) but also very touristic cities that are less important on an economic or political scale such as Florence, Valletta (Malta), Venice, Palma de Mallorca, and Nice. Capacities for receiving tourists are not equally distributed on the territory but less concentrated than economic activity.

[366] Considering cities of Urban Audit for which this information is available. See Appendix 9 on the number of beds available in registered accommodation.

7.3.2. Beds available per 1000 residents

Figure 31 indicates the number of beds per 1000 residents[367] which integrates thus the size of the city. It gives also an idea about the orientation on tourism of the local economy.

Figure 31: Beds available per 1000 residents



Own figure

Some cities are characterised by a much larger number of beds per 1000 residents than one could expect from their size or their political/economic importance. These cities represent touristic destinations on their own, in particular for their history, their culture and their scenic attraction. Among these cities figure the Irish cities (Galway with 320 beds per 1000 residents, then Cork, Waterford, and Limerick with 130 to 170 beds per 100 residents) but also Funchal (Madeira) with 190 beds per 1000 residents[368], followed by Venice, Valetta (Malta), Florence, Salzburg, Palma de Mallorca, Bruges, Santiago de Compostela each one providing more than 70 beds per 1000 residents.

Distinction between low season and high season

Finally, the distinction between the number of beds available per 1000 residents during the low and the high season[369] allows to identify such zones that are concentrated largely on the summer season while others welcome tourists the whole year despite some seasonal fluctuations. Differences between low and high season may be observed almost everywhere but they vary substantially.

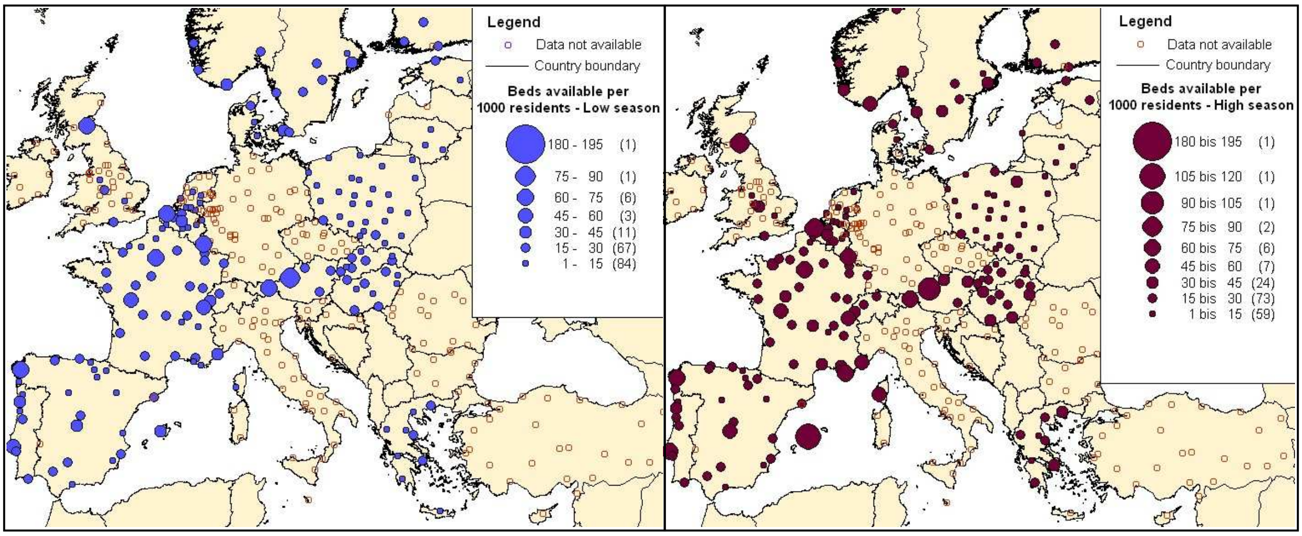
[367] See Appendix 9 on the number of beds available per 1000 residents.

[368] Funchal (Madeira) ranks second but it is located outside the map section.

[369] Figures are missing in particular for Ireland, Germany and Italy but also for a number of cities in the UK (see Appendix 9 on the differences between low and high season).

Figure 32: Beds available per 1000 residents – low season vs. high season

Low season *High season*



Own figure

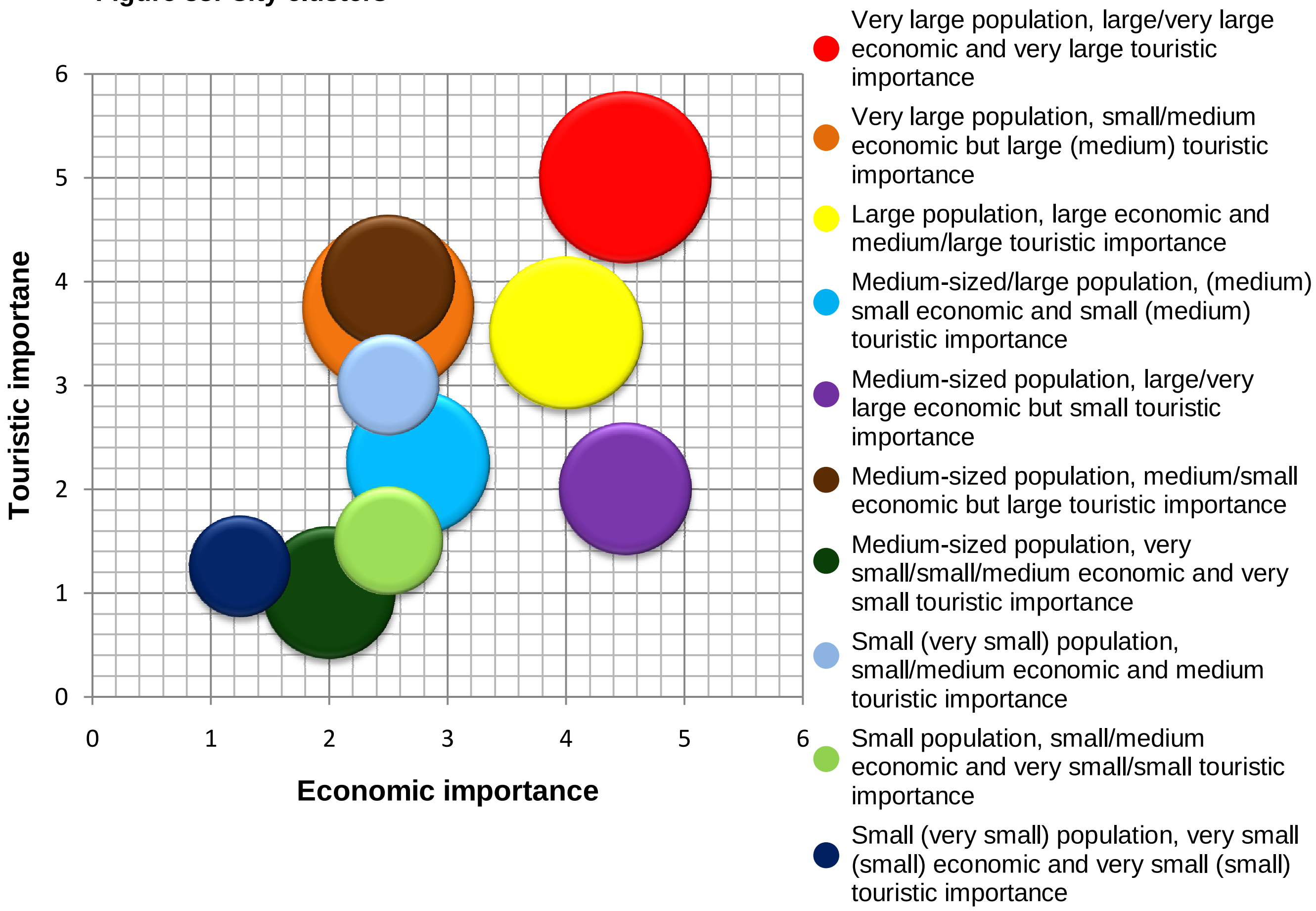
While the large and economically important cities are less affected by closing accommodation during the off-season, in some Greek cities the number of beds available decreases by up to 70 % (in comparison with only -19 % in Athens). In Palma de Mallorca on the Balearic Islands, the capacity of beds falls by 64 %, whereas for the Spanish cities on the continent the decrease is generally less important (figures varying between -18 % for Malaga, -26 % for Santander but only -3 % for Seville, -7 % for Valencia). In France, the differences between high and low season are the most important in Corsica (-76 % for Ajaccio), on the Mediterranean coast (from -30 % to -50 %), but also in Normandy (Caen and Le Havre with respectively -42 % and -22 %) as well as in Clermont-Ferrand in the Southern Centre (-42 %). However, some touristic sites in the Northern parts of Europe are also concerned, e.g. some Polish cities on the Baltic Sea coast or in Hungary.

Conclusion: Strong disparities in the economic, political and touristic interest leading to more or less favourable positions for airports

Chapter 7 gave a review of the spatial distribution of human activity on the European scale. This overview underlined the strong disparities that may be observed as regards the geographical distribution of population but also of economic activity and the attractiveness of certain destinations for tourism. Following these intermediate results, the cities were classified according to their population as well as their economic and touristic importance in five categories ranging from very small, small, medium, and large to very large (see

Appendix 10). Then, hierarchical clustering[370] allowed to identify ten relatively homogenous clusters which are presented in figure 33. The bubbles' size illustrates the cities' population while their economic and touristic importance is indicated respectively on the X- and Y-axis.

Figure 33: City clusters

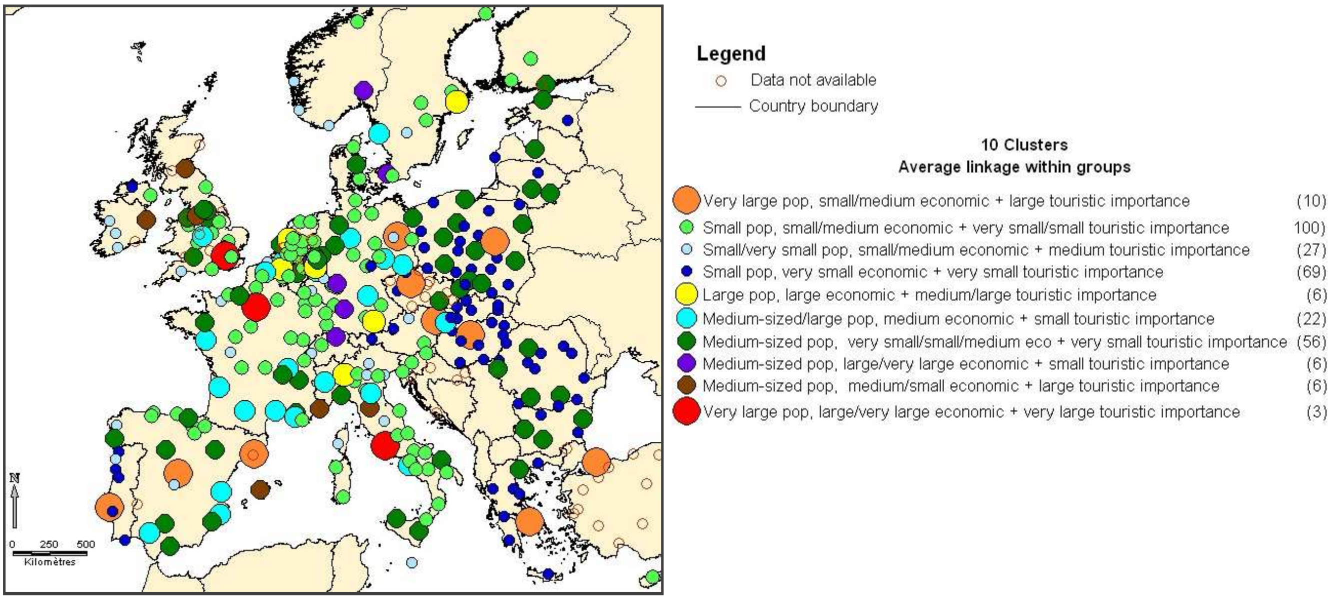


Own figure

Figure 34 illustrates the geographical distribution of these clusters. As regards the analysis of airport strategies, the disparities in the location of the different city clusters are one important aspect. For this reason, all 10 clusters will be examined more in detail.

[370] See Appendix 10 for an overview of the clusters to which Urban Audit cities were assigned (hierarchical clustering using the average linkage within groups method, Squared Euclidean distance, 10 clusters). Appendix 11 allows to compare this solution (in bold type) with the results from hierarchical clustering with a different number of clusters and/or different distance measures.

Figure 34: Geographical distribution of clusters for European cities



Own figure

Very large cities: large or small/medium economic importance and very large or large (medium) touristic importance

Two clusters distinguish the very large cities.

The red cluster includes three cities having a **very large population**, a **large/very large economic importance** and **very large touristic importance**: London, Paris and Rome.

In contrast, the orange cluster refers to cities with a **very large population** but **small or medium economic importance**. They have, however, a **large (partly medium) touristic importance**: Lisbon, Warsaw, Budapest, Madrid, Barcelona, Berlin, Vienna, Istanbul, Athens, and Prague.

Medium and large cities: from very small/small to large touristic importance and even very large economic importance

Cities with a **large population**, a **large economic importance** and **medium/large touristic importance** are united in the yellow cluster: Amsterdam, Milan and Munich with a large touristic importance; Brussels, Stockholm and Cologne with a medium touristic importance. (By the way, Stockholm has a very large economic importance).

Another cluster (in azure) concentrates 22 cities with a **medium-sized/large population**, a **medium (partly small) economic importance** and **small (partly medium) touristic importance**. Among the medium-sized cities figure e.g. Bratislava, Goteborg, Toulouse, Leipzig, Hannover, Nurnberg, Bonn, Antwerp whereas Birmingham, Naples, Turin, Marseille and Lille are large cities, all having a medium economic but a small touristic importance. The medium-sized cities Alicante, Seville, Bordeaux, Montpellier, and Nantes have a rather small economic importance (but at least 2.25) as well as a small touristic importance. The large city

Lyon and the medium-sized cities Dresden and Bologna are characterised by a medium economic and touristic importance. Valencia figures in the category of small economic importance but medium touristic importance.

There can also be distinguished a cluster (purple) which refers to cities of **medium-sized population** having a **large/very large economic importance** but a **small touristic importance**: Oslo, Copenhagen, Stuttgart, Frankfurt/Main, Düsseldorf, and Zurich.

In contrast, the brown cluster relates to cities of **medium-sized population** having a **medium/small economic importance** but a **large touristic importance**: Manchester, Dublin, Nice, and Palma de Mallorca. In this group figure also Florence with a very large touristic importance and Edinburgh with an already large economic importance (although being with 3.5 at the frontier with medium economic importance).

The dark green cluster refers to 56 cities, most of which being of **medium-sized population** with a **very small/small/medium economic importance** and **very small touristic importance**, including Varna, Kaunas, Ostrava with a very small economic importance; Liege, Sheffield, Liverpool, Bremen, Thessaloniki, Rouen, Rennes, Malaga, Murcia, and Cordoba with a small economic importance; and Palermo, Leeds, The Hague, Essen, Dortmund Zaragoza, and Bilbao with a medium economic importance (up to 2.75). In addition, Vilnius, Tallinn, Gdansk and Aix-en-Provence having a small touristic importance figure in this cluster. But also Lodz, Riga, Krakow and Sofia, four large cities and Bucharest, an even very large city, are assigned to this clusters due to their very small or small economic and touristic importance. Finally, Helsinki having a rather large economic importance (but only 3.75) fits in this cluster because of its small touristic importance.

Small and very small cities: from only very small to medium economic importance but from very small to large touristic importance

Small and very small cities are assigned to three clusters: the light blue, the light green and the dark blue ones.

The first cluster (in light blue) includes 27 **small (partly very small) cities** with a **small or medium economic importance** (up to 3.0), most of them having a **medium touristic importance**, such as Porto, Poitiers, Caen, Ajaccio, Bruges, Potsdam, Trier, Verona, Lausanne, Bergen, Tromso, and Exeter. Besides, in this group figure also Galway and Cork with a large touristic importance and Valetta and Venice being characterised by a very large touristic importance. In particular, the assignment of Venice to this group is questionable but can be explained by the wish to restrict the number of clusters. In order to not distort the analysis of the territorial context, this aspect should be kept in mind.

The second cluster (light green) groups 100 cities together which have mostly a **small population**, a **small or medium economic importance** but only a **very small/small touristic importance**, e.g. Charleroi, Gent, Augsburg, Erfurt, Leicester, Newcastle, Portsmouth, Belfast, Dijon, Reims, Nancy, Santander, Ancona, Pescara. Moreover, Strasbourg and Toulon, two medium-sized cities with a medium touristic importance, figure in this cluster but also Hamburg which is a very large city (!) with a medium touristic importance. However, the latter's economic importance although being considered as large is with 3.5 just on the frontier between this category and the medium one. This is also the case of Utrecht, Luxemburg, Geneva, Padova, Wiesbaden and Darmstadt which are small cities with a small or medium touristic importance (even very small for Utrecht) but already classified as having a large economic importance. However, the latter amounts to 3.5 to 4.0 and is thus situated on the frontier between medium and large or next to it. In particular, as regards Hamburg but also Geneva, Padova, Luxembourg, Wiesbaden and Darmstadt, the assignment to this group is questionable but due to the wish to limit the number of clusters. However, this aspect should be kept in mind when analysing the territorial context into which the airports are embedded.

The third cluster (in dark blue) comprises 69 cities, most of which with a **small (even very small) population**, a **very small (partly small** with low values of 1.5 and 1.75) **economic importance** and a **very small (partly small) touristic importance**, such as a number of Polish, Slovak, Czech, Hungarian, Bulgarian, Romanian but also Greek and Portuguese cities as well as Londonderry in Northern Ireland. Due to their small (or very small) population and their very small (or small) economic importance, Funchal (Madeira) and Salzburg figure also in this group despite their large touristic importance as well as eight cities (e.g. Weimar and Innsbruck) being characterised by a medium touristic importance.

8. *Airports and their positioning within the European airport panorama: diverging territorial circumstances, the airport's relative position important which includes the proximity to other airports and the market segments served by them*

Parallel to the concentration of certain traffic flows on big hub airports, secondary poles have emerged pursuing a functional and/or regional specialisation. In the first case, airports specialise in a traffic type (like charter or low-cost vs. network carrier, general cargo vs. express freight) and/or flight distance (short-/medium-/long-distance flights) and thus according to their function in the air transport network while in the second case the specialisation refers on providing air service to a certain region or geographical area.[371]

8.1. Paris CDG, Frankfurt, Amsterdam and London Heathrow airports: four generalist hub airports located in dense and economically but also politically important zones

8.1.1. Traffic patterns

The big former flag carriers prefer largely a hierarchical organisation for their networks according to the hub and spokes model. It allows them to provide a maximum number of connections for their passengers while preserving productivity by a high degree of utilisation of aircraft and capacity. Therefore, they base themselves on the airports where they already realised an important traffic before.

Thus, London Heathrow, Paris Charles de Gaulle, Frankfurt and Amsterdam airports emerged as the four largest generalist hub airports in Europe. They handle a high number of passengers but also a large volume of cargo. They are not only characterised by high traffic figures but also by an important rate of transfer passengers. Frankfurt registers with 53 % of all passengers being in transfer in 2006 the biggest proportion of connecting passengers compared to Amsterdam (42 %), London Heathrow (37 %) and Paris Charles de Gaulle (32 %).[372] Emerging as second hub of Lufthansa, Munich airport even precedes Paris Charles de Gaulle with 34 % of all departing passengers being in transfer.[373] The big hub airports have air services to a large number of destinations operated by a high number of airlines.

Moreover, they are characterised by a very high indirect connectivity (Burghouwt, 2007, p. 71). All hub airports are characterised by an important part of traffic being their respective alliance partners. Thus, mutual dependency between the airport and the dominant operated by the airline using the airport for hubbing and airline is strong.

[371] See Appendices 13 and 14 on the passenger and freight traffic at European airports in 2006. For lack of space, only a selection of data used in chapter 8 is shown but all used data is available to the reader on simple request.

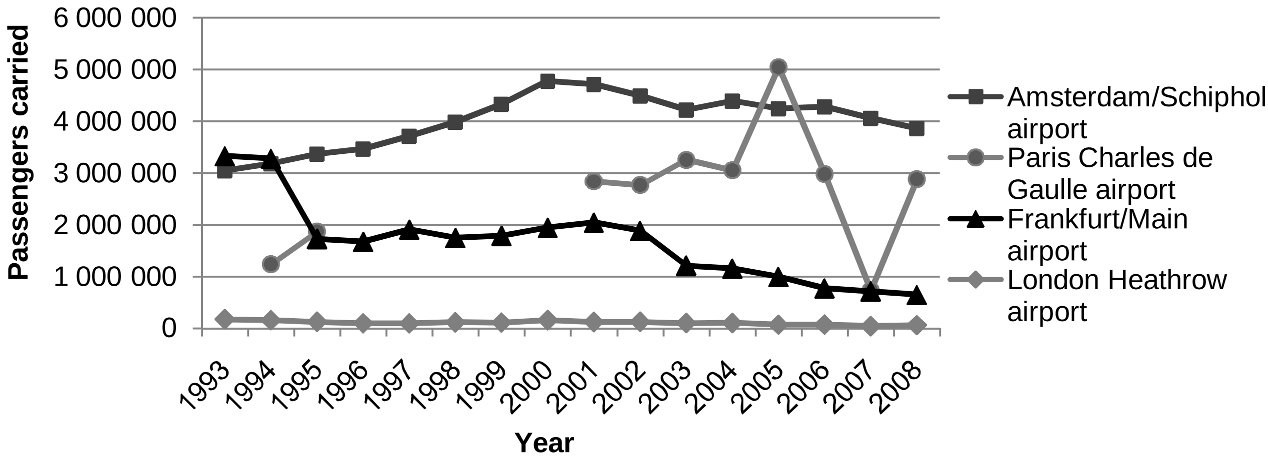
[372] Fraport AG (2007b, pp. 23,27).

[373] Flughafen München GmbH (2007, p. 29).

While scheduled traffic has considerably increased from 1993 to 2008 at the four biggest European hub airport (respectively about +150 % at Paris CDG[374], Frankfurt/Main and Amsterdam Schiphol airports and +70 % at London Heathrow airport, but the latter's initial traffic volume was with 40 million passengers in 1993 the double of the other three airports), non-scheduled traffic has fallen as shown in figure 35. This is in particular the case of Frankfurt/Main airport (-80 %) which is characterised by capacity shortage therefore preferring in particular Lufthansa and its Star alliance partners. At Amsterdam Schiphol airport non-scheduled traffic has decreased since 2000 (-19%). At London Heathrow airport, non-scheduled traffic has decreased too but it has always been very small (-65 %). Only at Paris CDG airport, the development of non-scheduled traffic is less clear since it has increased in particular from 2002 to 2005 and then decreased from 2005 to 2007 before rising again from 2007 to 2008.

In 2006, the share of non-scheduled passenger traffic reached 0.1 % of total passenger traffic at London Heathrow airport, 1.5 % at Frankfurt/Main airport and 5.3 % at Paris Charles de Gaulle airport. At Amsterdam Schiphol airport, 9.3 % of all passengers fall in the category of charter traffic. Measured by aircraft movements, non-scheduled traffic is even less[375] important since non-scheduled traffic is in general operated with lower frequencies but using bigger aircraft with higher load factors. Moreover, non-scheduled traffic is much more concentrated during summer holidays.

Figure 35: Development of non-scheduled traffic at the 4 biggest European hub airports



Own figure

Traffic at hub airports is operated in waves (also referred to as banks) allowing a large number of incoming flights to connect to a large number of outgoing flights in order to increase connection possibilities while reducing waiting time. For this reason, traffic is concentrated not only spatially but also temporally (Burghouwt, Hakfoort, & Van Eck, 2003; Burghouwt & De Wit, 2005; Burghouwt, 2007). This explains also why a certain number of

[374] As regards Paris CDG airport, time series start in 1994 but figures are missing for the years 1996 to 2000.

[375] It represents 0.1 % of all flights at London Heathrow airport, 4.4 % at Paris CDG airport and 8.8 % at Amsterdam Schiphol airport. Corresponding to 2.1 % of all flights at Frankfurt airport, the share of non-scheduled traffic is higher when measuring by the number of flights.

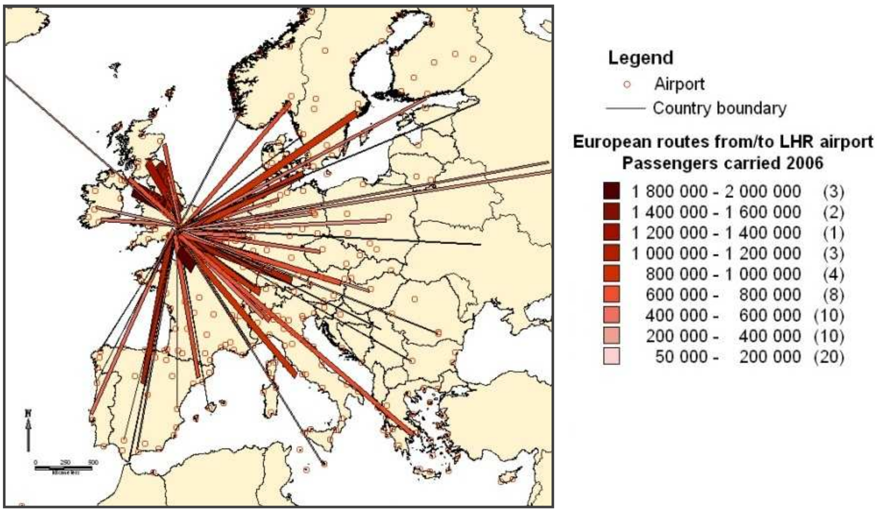
airports are operating close to the capacity limit, at least during peak hours. Already in 2001, the European commission gave attention to the saturation of almost half of the 50 current principal airports. This creates a structural problem that could affect for the next years the capacity of the different airports to attract new traffic or even to keep market shares (Commission of the European Communities, 2001, p. 42).

8.1.1.1. London Heathrow airport

London Heathrow airport is with 67.3 million passengers in 2006 (67.9 million in 2007) the biggest airport in Europe. Practically all traffic is scheduled one. Heathrow airport stands out by its importance at the international level as 90 % of its traffic is international and in particular traffic from and to destinations outside to the European Union (60 % of international traffic, measured in passengers carried). As British Airways had been forced to leave slots at Heathrow airport to Virgin Atlantic Airways and BMI British Midland, it accounts only to about 41 % of total aircraft movements at the airport (BAA, 2007).[376] The limited number of slots prevents British Airways from improving connections at Heathrow airport and from dominating the national market. For lack of capacity, British Airways had to abandon flights to regional airports so as to substitute international flights for them. Encouraged by this choice, regional airports develop direct international flights. Thus, Heathrow airport became an important hub at the international level while losing its significance at the national one.

London Heathrow airport is connected to a large number of European[377] destinations: 62 according to Eurostat data as illustrated by Figure 36 (67 routes with at least 300 flights in 2006 according to OAG data).[378]

Figure 36: European routes from/to London Heathrow airport (passengers carried in 2006)



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[376] In fact, British Airways holds only 40 % of the total number of slots at London Heathrow airport.

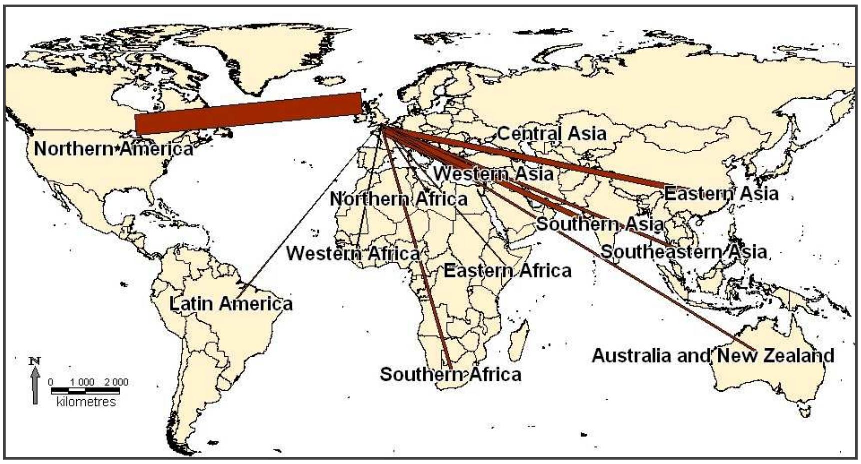
[377] Regions correspond to the United Nations geoscheme.

[378] See Appendix 15 on European routes from/to London Heathrow airport in 2006 (Eurostat). Appendix 17 shows OAG data on departing scheduled flights from London Heathrow airport in 2006.

9 destinations are located within the United Kingdom. Of these 9 routes, only 6 are operated by British Airways: Durham Tees Valley and Newcastle as the only operator, and Aberdeen, Edinburgh, Glasgow and Manchester are served by British Airways and BMI British Midland. The remaining 3 routes to Inverness, Leeds and Belfast City airports are operated only by BMI British Midland. The two most important routes are those to Dublin and Paris CDG airport with almost 2 million passengers, followed by Amsterdam airport with 1.85 million passengers and Frankfurt as well as Edinburgh airports with about 1.5 million passengers. Further 4 routes totalise more than 1 million passengers: Glasgow, Madrid, Manchester and Munich airports. Traffic between London Heathrow and Paris CDG airport is decreasing due to the Eurostar railway link via the Chunnel tunnel (1.49 million passengers by air in 2008). Nevertheless, this route remains an important one allowing British Airways and Air France to feed their respective hub airports.

The following figure 37 illustrates the importance of London Heathrow for intercontinental traffic[379] as it shows the routes to destinations outside of Europe that are operated from the airport: 76 in 2006 (Eurostat) of which 21 destinations are located in Northern America representing 13.8 million passengers, i.e. 21 % of all passengers leaving London Heathrow airport. The most important destination is New York JFK airport with 2.75 million passengers, followed by Chicago O'Hare airport with 1.5 million passengers and further 4 airports (Los Angeles, Toronto Lester B. Pearson, Washington Dulles and San Francisco airports) with more than 1 million passengers each one.

Figure 37: Extra-European routes from/to London Heathrow airport (passengers carried in 2006)



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Moreover, 13 destinations are situated in Western Asia corresponding to 4.9 million passengers, i.e. 7.5 % of total traffic (in particular Dubai with almost 1.4 million passengers in 2006 but also Istanbul Ataturk with 578 000 passengers and Tel-Aviv Ben Gurion and

[379] See Appendix 16 on Extra-European routes from/to London Heathrow airport (Eurostat). Appendix 17 shows OAG data on departing scheduled flights from London Heathrow airport in 2006: 110 routes according to OAG data but only 61 routes with at least 300 flights and further 8 routes with more than 200 but less than 300 flights in 2006.

Larnaca airport each one exceeding 500 000 passengers). 12 destinations are situated in Southern Asia (such as Mumbai with more than 1 million passengers) and 7 in Eastern Asia (headed by Hong Kong and Narita International airport with respectively 1.4 million and 915 000 passengers). Southern Asian and Eastern Asian destinations realise each one 5.3 % of all passengers carried (3.5 million passengers respectively). Altogether, 36 Asian routes are operated from London Heathrow airport totalising 13.8 million passengers or 21 % of the airport's total traffic (measured in passengers carried) and thus as much as North American routes.

In contrast, Latin America represents a very small traffic volume with 689 000 passengers, i.e. 1 % of all passengers. Africa also concentrates only 5.1 % of total passengers but still 3.3 million passengers which is relatively important, in particular in comparison with the traffic at Frankfurt/Main and Amsterdam Schiphol airport. All in all, intercontinental destinations represent 50 % of the overall number of passengers carried in 2006.

A total of 90 airlines offer air services from Heathrow airport to circa 190 destinations. British Airways is still by far the most important airline with 120 destinations[380] in 2006. It represents 43.0 % of all departing flights and 42.2 % of seats offered on departing flights. The second airline is BMI British Midland with 26 destinations[381] representing about 11.3 % of flights and 8.3 % of seats offered. Among the 10 most important airlines as regards departing flights figure Lufthansa (4.4 %), Aer Lingus (3.2 %), Virgin Atlantic (3.0 %), SAS (2.9 %), American Airlines (2.3 %), Iberia (2.3 %), KLM (2.0 %) and Air France (1.8 %). Apart from Virgin Atlantic Airways with 16 destinations, they serve a relatively small number of destinations ranging from 2 to 8. Moreover, most routes are served by only one airline or by two airlines. Only a small number of routes are operated by at least three airlines.

According to OAG data, British Airways and its Oneworld alliance partners represent 52.2 % of seats offered on scheduled flights and 52.6 of flights scheduled. However, Star alliance (around Lufthansa) market shares amount to 23.9 % of seats offered and 27.7 % of flights scheduled while SkyTeam alliance (around Air France-KLM) represents only 5.0 % of seats offered and 6.7 % of flights.[382]

London Heathrow airport is also handling an important volume of cargo (1.4 million tons loaded and unloaded according to Eurostat in 2007).

8.1.1.2. Frankfurt/Main airport

Frankfurt airport, 52.4 million passengers in 2006 (53.9 million passengers in 2007), is situated in the centre of the German airport system. For some years, Munich has emerged as

[380] Including 5 destinations with less than 10 flights scheduled in 2006.

[381] Including 1 destination with less than 10 flights scheduled in 2006.

[382] Figures refer to 2006 alliance configurations. As regards Oneworld alliance, Aer Lingus is included as it left the alliance only in April 2007 due to its new focus is on the low fare, point-to-point market. Japan Airlines, Malev Hungarian Airlines and Royal Jordanian Airlines are not considered as they join the alliance only in April 2007. Relating to Star alliance, Varig is considered to be alliance member as it withdraws from Star alliance only in January 2007 while Air China, Egypt Air, Brussels airlines, and Turkish airlines join the alliance from December 2007 on.

Lufthansa's second hub and reaches 30.6 million passengers in 2006 (33.8 million in 2007). This choice explains by the relative saturation of Frankfurt airport operating near to the capacity limit. As congestion is a real danger, Frankfurt airport was reinforcing collaboration with Hahn airport that is situated at 120 km from Frankfurt for the purpose of transferring a part of its traffic over there. Hahn airport, former military basis, is today specialised in low-cost and freight traffic. However, as from January 2009, Fraport transferred its 65 % share in Frankfurt-Hahn airport to the State of Rhineland-Palatinate thus disengaging itself from the loss-making airport. This decision is based on divergences on the future development of Hahn airport. In particular, Fraport wanted to introduce an additional tax per passenger in order to prevent losses but Ryanair, the major airline, was strictly opposed to this project threatening to leave the airport. Nevertheless, both airports affirmed to continue to collaborate closely.

According to OAG data, 118 airlines serve 290 destinations from Frankfurt airport. However, half of these routes is operated by only one carrier and not highly frequented (i.e. 53 destinations with less than 50 flights, 16 destinations with 50 to 100 flights and further 32 destinations with 100 to 300 flights in 2006). Taking into account only departures of scheduled flights (representing 37.7 millions seats offered and 225 000 departing flights), Lufthansa is by far the dominating airline representing 145 destinations, 59.3 % of seats offered and 60.8 % of flights scheduled. Although there are some airlines, such as Condor, Hapagfly, LTU and Air Berlin operating a relatively high number of routes from Frankfurt airport (respectively to 74, 47, 39 and 15 destinations[383]), they represent together only 6.6 % of the total number of seats available (respectively 3.4 %, 1.4 % 1.0 % and 0.8 %) and even only 5 % of all departing flights scheduled (respectively 2.3 %, 1.2 %, 0.7 % and 0.8 %). United Airlines, British Airways and SAS, although offering only 3 to 5 destinations, figure among the five busiest airlines after Lufthansa and Condor as regards the number of seats available. Nevertheless, they represent only 1.8 %, 1.7 % and 1.5 % of capacity. With respect to the number of flights scheduled, British Airways comes with 2.7 % in second place after Lufthansa, Austrian Airlines with 2.4 % in third place, followed by Condor and SAS with 1.7 % of all flights. When considering market shares of alliances, the Star alliance around Lufthansa is even more dominating with 72.9 % of seats offered and 73.7 % of flights scheduled whereas Oneworld and SkyTeam alliances represent only respectively 4.6 % and 4.5 % of seats offered and respectively 5.2 % and 5.3 % of flights scheduled. This situation is very different from London Heathrow airport where British Airways and its Oneworld alliance are dominating too but with much lower market shares. In consequence, Lufthansa may fully benefit from its position for feeding its hub airport.

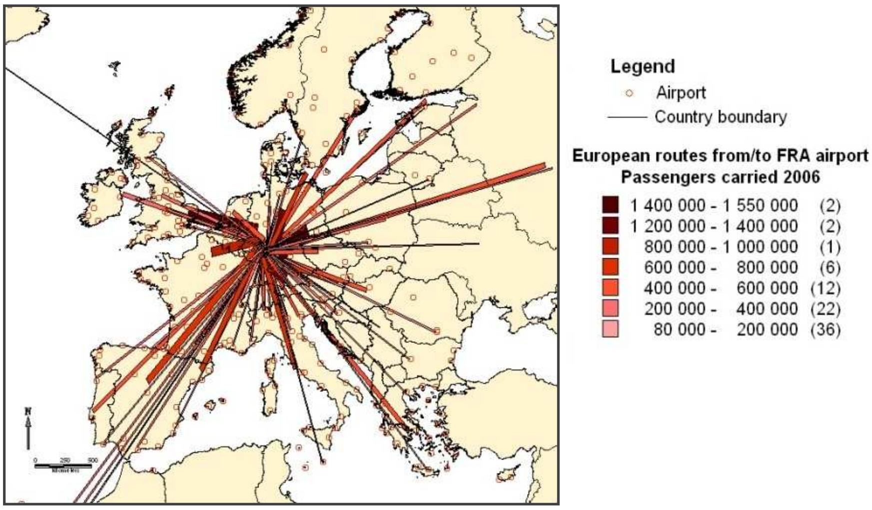
As illustrated by figure 38, Frankfurt airport is connected to a larger number of European destinations than London Heathrow airport: 81 destinations according to Eurostat (146 destinations according to OAG data but only 97 destinations with at least 300 flights and further 7 routes with at least 200 but less than 300 flights[384]). Even though the number of

[383] The total number of destinations includes also those for which less than 10 flights are scheduled in 2006, respectively 12 of 74, 16 of 47, 2 of 39 and 6 of 15 for Condor, Hapagfly, LTU and Air Berlin.

[384] This means that 42 destinations are served by less than 200 flights in 2006: 26 destinations with less than 50 flights each one, 3 routes with 50 to 100 flights and further 13 routes with 100 to 200 flights each one.

destinations is higher, there are a number of routes with relatively low traffic volumes in comparison to London Heathrow airport: 36 routes with 80 000 to 200 000 passengers and further 22 routes with 200 000 to 400 000 passengers. The busiest routes realise relatively smaller traffic volumes, too.

Figure 38: European routes from/to Frankfurt airport (passengers carried in 2006)



Own figure

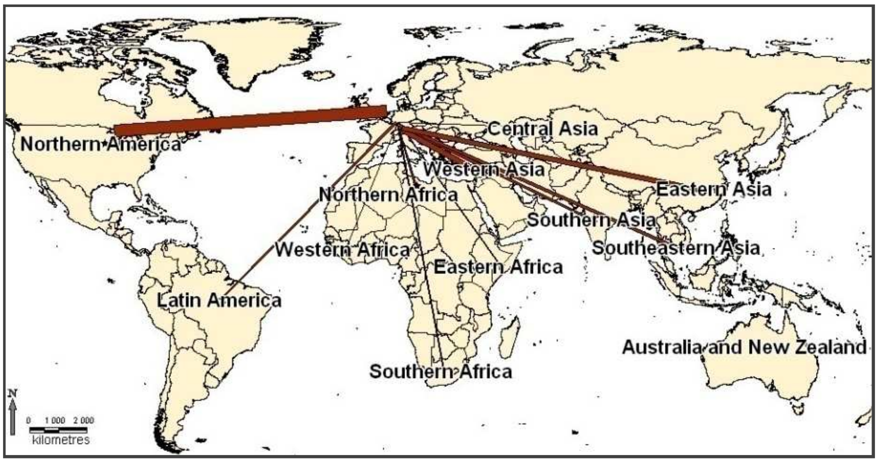
The most important destination is Berlin Tegel airport with 1.54 million passengers in 2006, followed by London Heathrow with 1.51 million passengers, Hamburg airport with 1.29 million passengers and Munich airport with 1.28 million passengers. The fifth most important route is Frankfurt – Paris CDG airport with 980 000 passengers in 2006. In comparison to London Heathrow airport, Frankfurt is well connected at national level serving 13 German destinations that represent 14 % of all carried passengers and 17.5 % of all departing flights. Lufthansa is the dominant carrier on all 12 routes operated within Germany[385]: It represents more than 99 % of scheduled flights on these routes to 7 destinations, and still more than 95 % on routes to further 4 destinations. Only on the route Frankfurt – Berlin Tegel airport, the market share of Lufthansa is of 86 % as Air Berlin represents 14 % of scheduled flights.

At intercontinental level, 71 destinations are covered by Eurostat (144 destinations outside of Europe according to OAG data but only 81 destinations with at least 300 flights each one in 2006 and further 11 destinations with at least 200 flights[386]). As illustrated by figure 39, Northern America is the most important destination region with 7.5 million passengers. It represents 15.9 % of total passengers. 21 destinations are served in Northern America, of which Chicago O'Hare, Washington Dulles and New York JFK are the three most important airports with respectively 858 000, 795 000 and 696 000 passengers.

[385] Lufthansa does not operate flights to Berlin Schonefeld as it serves Berlin Tegel airport.

[386] Consequently, 70 routes are operated with less than 200 flights in 2006: 30 destinations with less than 50 flights, 22 destinations with 50 to 100 flights and 22 destinations with 100 to 200 flights each one.

Figure 39: Extra-European routes from/to Frankfurt airport (passengers carried in 2006)



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Further 13 destinations are situated in Western Asia. They represent 3.3 million passengers, i.e. 7.0 % of all passengers (the three most important routes being those to Istanbul Atatürk, Dubai and Antalya airports with respectively 687 000, 574 000 and 563 000 passengers). In Eastern Asia, 8 destinations are served from Frankfurt airport representing a total of 3.1 million passengers and 6.5 % of all passengers. Narita International airport is the most important with 787 000 while further 4 routes exceed 500 000 passengers each one (Gimpo in South Korea, Beijing, Shanghai and Hong-Kong). The 3 routes towards South-eastern Asia (headed by Bangkok and Singapore with respectively 718 000 and 711 000 passengers) represent 1.6 million passengers, i.e. 3.4 % of total traffic. Moreover, 8 destinations are situated in Southern Asia, they totalise 1.5 million passengers (3.2 % of market share) but no one exceeding 260 000 passengers in 2006. Altogether, 33 Asian routes are operated from Frankfurt airport 20.3 % of passengers and thus more than North American routes.

In contrast, traffic to and from Latin America and Africa is quite small (respectively 2.3 % and 3.8 % of overall passengers or 1.1 and 1.8 million passengers). All in all, intercontinental destinations represent 42.3 % of the overall number of passengers carried in 2006.

Frankfurt airport plays also an important role in freight transport with 2.2 million tons of cargo loaded and unloaded in 2007.

8.1.1.3. Paris Charles de Gaulle airport

Paris Charles de Gaulle airport, the second biggest airport in Europe with 56.4 million passengers in 2006 (59.5 million in 2007), is the hub of Air France and consequently half of the traffic being operated by the airline. Non-scheduled traffic represents only 5.3 % of all passengers carried and 4.4 % of all flights. As regards freight traffic, Paris Charles de Gaulle is a triple hub (Air France Cargo, La Poste and Federal Express). Freight transport, having been neglected at a certain time, is thus an inherent part of the airport's business and management strategy. Three airports play the role of relief airports after the abandonment of the project of a third generalist airport in the area around Paris: Beauvais airport for charter and freight traffic as well as Châteauroux and Vatry airports for freight traffic.

According to OAG data, 130 airlines serve 261 destinations from Paris CDG airport. Nevertheless, 38 destinations are served by less than 50 flights, 22 destinations by 50 to 100 flights and further 45 destinations by 100 to 300 flights each one in 2006. Considering only departures of scheduled flights (representing 38.3 millions seats offered and 243 000 departing flights), Air France is the dominating airline offering air services to 157 destinations[387] and representing 57.1 % of seats available and 58.4 % of flights scheduled. The second airline is Lufthansa with 9 German destinations served from Paris CDG airport, 3.3 % of the total number of seats available and 5.3 % of all departing flights. British Airways and Alitalia come in third and fourth place respectively 2.3 % and 2.2 % of seats available as well as 3.9 % and 2.0 % of all departing flights. They are followed by Easyjet which operates 9 destinations from Paris CDG airport and represents 1.8 % of the total number of seats available and 1.9 % of departing flights.

The SkyTeam alliance around Air France offers 64.1 % of all seats available and 64.5 % of departing flights. This is not surprising given the traffic operated by Air France alone. However, the share of SkyTeam alliance is much smaller than the share of Star alliance at Frankfurt airport but higher than the share of Oneworld at London Heathrow airport. Star alliance represents after all 11.0 % of all seats available and 12.3 % of all departing flights from Paris CDG airport. The share of Oneworld alliance amounts to 5.4 % of all seats offered and 6.5 % of departures.[388]

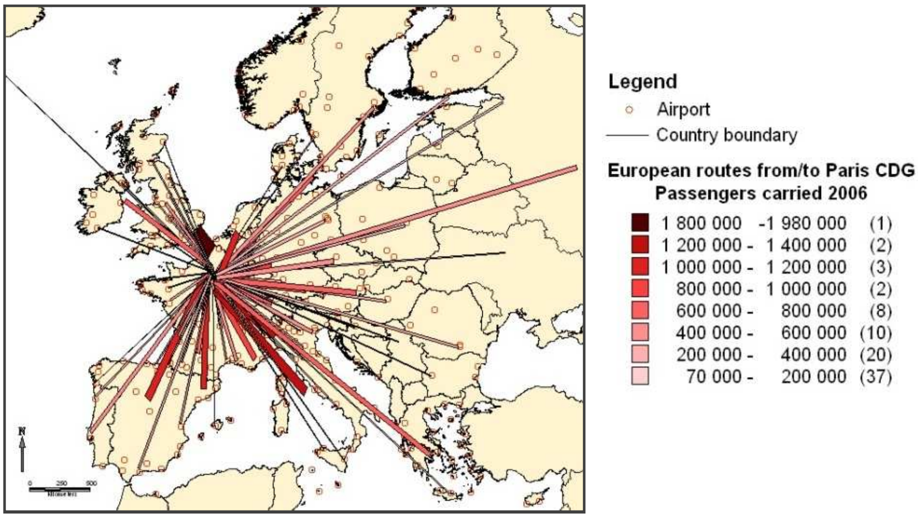
Air services are operated to 83 European destinations from Paris CDG airport according to Eurostat and as illustrated by figure 40 (127 destinations according to OAG data but only 91 routes represent at least 300 flights and further 6 routes at least 20 flights but less than 300 flights each one in 2006)[389]. They represent 30.5 million passengers, i.e. 57.5 % of all passengers carried. As in the case of Frankfurt airport, the number of destinations in Europe is large but there are many routes with relatively low traffic volumes, in particular in comparison with London Heathrow airport: 37 routes with 70 000 to 200 000 passengers and further 20 routes with 200 000 to 400 000 passengers. The most important route is that to London Heathrow airport with 1.97 million passengers. Further 5 destinations realise more than 1 million passengers: Rome Fiumicino, Milan Linate, Madrid Barajas, Amsterdam Schiphol and Barcelona airports. Frankfurt airport represents a traffic volume of almost 1 million passengers (more precisely 987 000 passengers).

[387] Including 2 destinations with less than 10 flights scheduled for 2006.

[388] Figures refer 2006 alliance configurations. Aer Lingus is considered to be a member of Oneworld alliance as it withdraws only in April 2007 from the alliance. Continental airlines is member of SkyTeam alliance, leaving it in 2009 for joining Star alliance. Star alliance includes Air One that joins Alitalia on 31/12/2008 and therefore withdraws from the alliance.

[389] This means that 30 destinations are served by less than 200 flights in 2006: 15 routes represent less than 50 flights each one, 7 routes 50 to 100 flights and further 8 routes totalise 100 to 200 flights each one in 2006.

Figure 40: European routes from/to Paris CDG airport (passengers carried in 2006)



Own figure

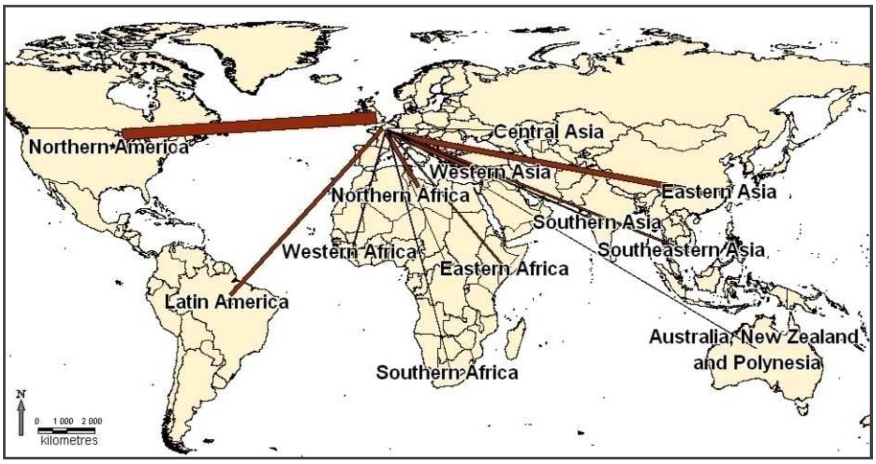
The first French destination is Nice Côte d’Azur airport with 887 000 passengers, followed by Toulouse-Blagnac and Marseille Provence airport with respectively 680 000 and 582 000 passengers. All in all, air services are offered to 14 destinations in France that represent together 4.9 million passengers (i.e. 9.2 %) and 25 000 departing flights (i.e. 10.7 %). According to OAG data, Air France is the only carrier or offers more than 90 % of seats available on departing flights on all routes except for Nice and Basel-Mulhouse airport where Easyjet is competing for market shares. Consequently, the Air France market share dropped to 70.1 % of all departing flights and 62.0 % of seats offered on the Paris CDG – Basel-Mulhouse route and 76.9 % of all departing flights and 79.0 % seats offered on the Paris CDG – Nice route.

At intercontinental level, for 79 destinations data are collected by Eurostat (134 destinations outside of Europe according to OAG data but only 65 are served by at least 300 flights and further 13 destinations by at least 200 flights)[390]. As illustrated by figure 41, Northern America is the most important destination region with 7.3 million passengers. It represents 13.9 % of total passengers. 15 destinations are served in Northern America, of which New York JFK and Montreal Pierre Elliot Trudeau are the two most important airports with respectively 1.7 million and 977 000 passengers. All 27 Asian destinations represent 14.9 % of passengers. Routes to Eastern Asia and Western Asia are the most important: the 9 destinations in Eastern Asia totalise 3.3 million passengers (i.e. 6.2 % of total passengers) with Tokyo International being the main airport served from Paris CDG airport and further three destinations with 450 000 to little more than 500 000 passengers (Hong-Kong, Beijing and Shanghai); the 9 destinations in Western Asia represent 2.5 million passengers (4.8 % of total passengers), of which the most frequented routes are Tel-Aviv Ben Gurion and Dubai airport with respectively 644 000 and 532 000 passengers). Finally, 4 routes are operated to

[390] This means that on 56 routes totalise less than 200 flights each one in 2006: 23 destinations are served by less than 50 flights, 15 destinations by 50 to 100 lights and further 18 routes by 100 to 200 flights in 2006 each one.

Southeastern Asia and 5 routes to Southern Asia representing respectively 2.1 % and 1.5 % of total passengers.

Figure 41: Extra-European routes from/to Paris CDG airport (passengers carried in 2006)



Own figure

In contrast to London Heathrow, Frankfurt/Main and Amsterdam airports, Paris CDG airport serves a relatively large number of destinations in Africa: 25, of which 12 are located in Northern Africa, 6 in Western Africa and 4 in Eastern Africa. All in all, they represent 9.1 % of all passengers (4.8 million passengers). Routes to Northern Africa represent 2.4 million passengers (with 501 000 passengers to Tunis/Carthage airport and 383 000 passengers to Casablanca Anfa airport while all other routes are inferior to 250 000 passengers). Eastern Africa represents 894 000 passengers with the airport of the island of Mauritius being the most important destination (416 000 passengers), followed by the island of Reunion, one of the French overseas *"departments"* (185 000 passengers). Destinations in Western Africa represent 847 000 passengers but only Dakar airport exceeds 250 000 passengers while the other totalise less than 150 000 passengers each one.

Moreover, Paris CDG airport realises a relatively important traffic with Latin America where 11 destinations are served representing 2.6 million passengers, even though corresponding to only 4.9 % of the airports overall traffic. The two most important routes are those to Sao Paulo and Mexico airport with respectively 549 000 and 423 000 passengers. All in all, intercontinental destinations represent 42.5 % of all passengers.

Paris CDG airport handled more than 1.4 million tons of cargo in 2007. The airport is not only the hub for Air France Cargo and the French post office but also of Federal Express.[391]

8.1.1.4. Amsterdam Schiphol airport

Amsterdam airport counts 46.0 million passengers in 2006 (47.8 million in 2007) and is therefore of a supranational size. After the merger of KLM and Air France, a restructuring

[391] See chapter 8.2.1 for some more explanations.

process has got under way: Air France-KLM has embarked on a two-hub strategy connecting both airports by aircraft commuting between them, i.e. 15 round trips per day (Air France-KLM, 2005). It seems that cultural differences, being important at the beginning, have been taken into account. In fact, both airlines complete one another since Air France has a good position on traffic towards Africa and KLM towards Asia.

From Amsterdam airport, 248 destinations are served by 99 airlines according to OAG data. However, on 39 routes are operated less than 50 flights, on 19 routes 50 to 100 flights and on further 51 routes 100 to 300 flights in 2006. As regards departures of scheduled flights (representing 26.9 million seats offered and 191 000 departing flights), KLM is the dominating airline offering air services to 121 destinations and representing 49.1 % of seats available and 53.2 % of flights scheduled. The second airline is Transavia, belonging to the Air France-KLM group, which serves 50 destinations[392] from Amsterdam airport and totalises 5.4 % of seats available and 4.8 % of departing flights scheduled. In addition, among the 10 most busiest airlines figure Easyjet, Lufthansa, British Airways, Air France, Northwest Airlines, BMI British Midlands, SAS Scandinavian Airlines and Alitalia with a share in departing flights scheduled decreasing from 3.4 % to 1.3 %. The corresponding share in the number of seats available varies from 4.2 % to 1.3 % but with slight difference in the order. The number of destinations ranges between 2 and 8.

The breakdown of the scheduled traffic according to airline alliances shows results similar to the situation at Paris CDG airport. The SkyTeam alliance around the Air France-KLM group totalises 59.6 % of all seats available and 61.8 % of departing flights whereas the Star alliance operates 9.2 % of all seats available and 10.7 % of all departing flights and the share of Oneworld alliance reaches 5.9 % of all seats offered and 5.5 % of departures.[393]

82 European destinations are served from Amsterdam airport according to Eurostat and as illustrated by figure 42 (140 destinations according to OAG data but only on 91 routes are operated at least 300 flights and on further 8 routes at least 200 flights but less than 300 flights in 2006)[394]. They represent 26.9 million passengers, i.e. 64.1 % of all passengers carried. As in the case of Frankfurt and Paris CDG airports, air services are offered to a large number of destinations in Europe but a number of routes realises relatively low traffic volumes when comparing with London Heathrow airport: 34 routes with 70 000 to 200 000 passengers and further 26 routes with 200 000 to 400 000 passengers. The most important route is that to London Heathrow airport with 1.84 million passengers in 2006. Further 2 destinations represent more than 1 million passengers: Barcelona and Paris CDG airports. In fourth and fifth place come Madrid Barajas and Copenhagen/Kastrup airports with 997 000 and 784 000 passengers respectively. Due to the size of the country and the development of road and railway infrastructure, there is almost no air traffic with the Netherlands (0.01 % of

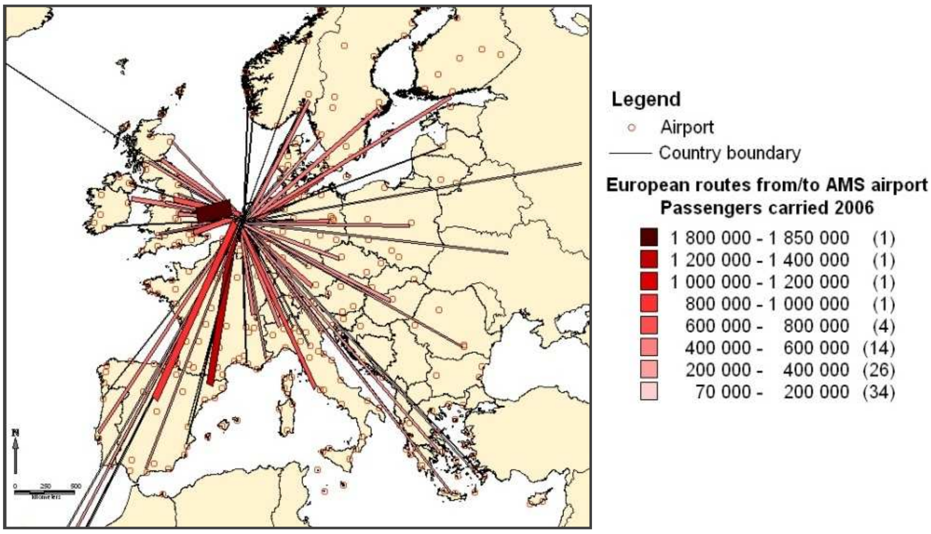
[392] Including 1 destination with less than 10 flights scheduled for 2006.

[393] Figures refer 2006 alliance configurations. Aer Lingus is considered to be a member of Oneworld alliance as it withdraws only in April 2007 from the alliance. Continental airlines is member of SkyTeam alliance, leaving it in 2009 for joining Star alliance.

[394] This means that 41 destinations are served by less than 200 flights in 2006: 20 routes totalise less than 50 flights each one, 10 routes 50 to 100 flights and further 11 routes represent 100 to 200 flights each one in 2006.

the airport's total traffic in 2006, including also destinations with much smaller traffic volumes than those considered in the Eurostat database of air passenger by routes). As regards European destination, 28 % of traffic is for airports within the UK, 13 % for Spanish airports and 9 % for German ones.

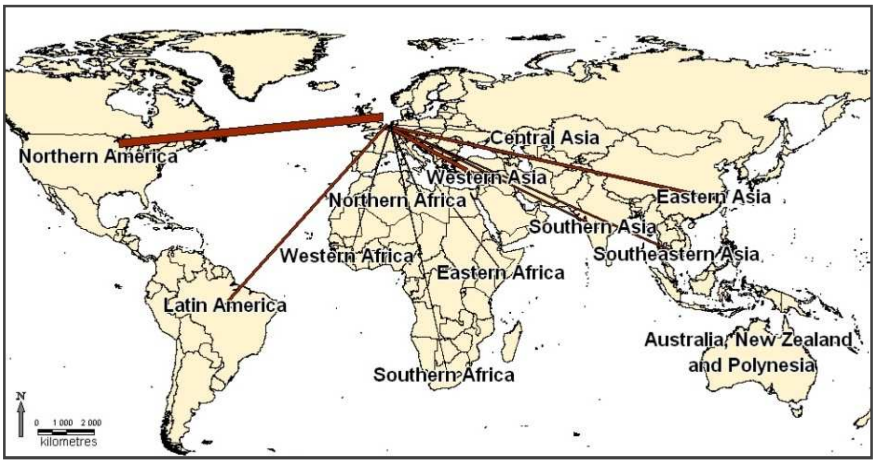
Figure 42: European routes from/to Amsterdam Schiphol airport



Own figure

As regards intercontinental traffic, data on 67 destinations is collected by Eurostat (108 destinations outside of Europe according to OAG data but only 48 routes totalise at least 300 flights and further 10 destinations at least 200 flights).[395]

Figure 43: Extra-European routes from/to Amsterdam Schiphol airport



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[395] This means that on 50 destinations totalise less than 200 flights each one in 2006: 19 destinations with less than 50 flights, 9 destinations with 50 to 100 lights and further 22 destinations with 100 to 200 flights in 2006 each one.

As illustrated by figure 43, Asia is the most important destination region with 6.2 million passengers in 2006. It represents 14.7 % of total passengers. 28 destinations are served in Asia of which 11 are located in Western Asia representing 2.4 million passengers (5.6 % of all passengers carried) with Antalya and Istanbul being the two most important airports (533 000 and 491 000 passengers respectively). 7 destinations are located in Eastern Asia. They realise a traffic of 1.7 million passenger in 2006 of which Narita (400 000 passengers) and Hong-Kong airports (373 000 passengers) are the most important destinations. All in all, 4.2 % of passengers travel to and come from Eastern Asia. In addition, 4 destinations are located in Southeastern Asia representing 1.0 million passengers (i.e. 2.5 %) with Bangkok International and Singapore/Changi airport totalising 410 000 and 372 000 passengers respectively. Then, 5 destinations are served in Southern Asia (948 000 passengers, i.e. 2.3 %) where Sepang airport in Malaysia is the most important (369 000 passengers).

Northern America represents all in all 5.3 million passengers (12.6 %). Of 19 destinations that are served the three most important ones are Detroit (717 000 passengers), Minneapolis St Paul (509 000 passengers) and New York JFK airport (503 000 passengers). The 11 African destinations totalise 1.9 million passengers (4.4 %) of which 5 destinations are located in Northern Africa but all airports fall below 200 000 passengers. Eastern, Southern and Western Africa concentrate 2 airports respectively, the most important one being Nairobi Jomo Kenyatta airport with 390 000 passengers. Finally, 4.2 % of traffic concern routes to Latin America (1.8 million passengers). Nine destinations in this region are served from Amsterdam airport but no one exceeding 330 000 passengers. 3 airports are located on the Netherlands Antilles and 1 on the Lesser Antilles. All in all, intercontinental destinations represent 35.9 % of all passengers.

As regards freight traffic, 1.65 million tons of cargo were loaded and unloaded at Schiphol airport in 2007.

8.1.2. Accessibility by public transport of Frankfurt, Paris CDG and Amsterdam airport

In order to get a better idea of the territory where the existing and potential traffic lies, knowing full well that all three airports are well served by railway and in particular by HST, access time had been studied.[396] The analysis shows big differences in the accessibility of the three airports in March 2007. It underlines not only the importance of technical aspects of infrastructure (like HST lines vs. classical train lines) but also the relevance of the operating mode including aspects like transfers, waiting time and the number of stations served on the way. Access times, increasing by 30-minute steps, are represented by different colours from blue over green, yellow and orange to red. The analysis focuses on the area where passengers arriving at the airport can get within 3 to 3.5 hours. Small rectangles mark all destinations for which travel time from the airport is known. Their colour indicates the number of transfers

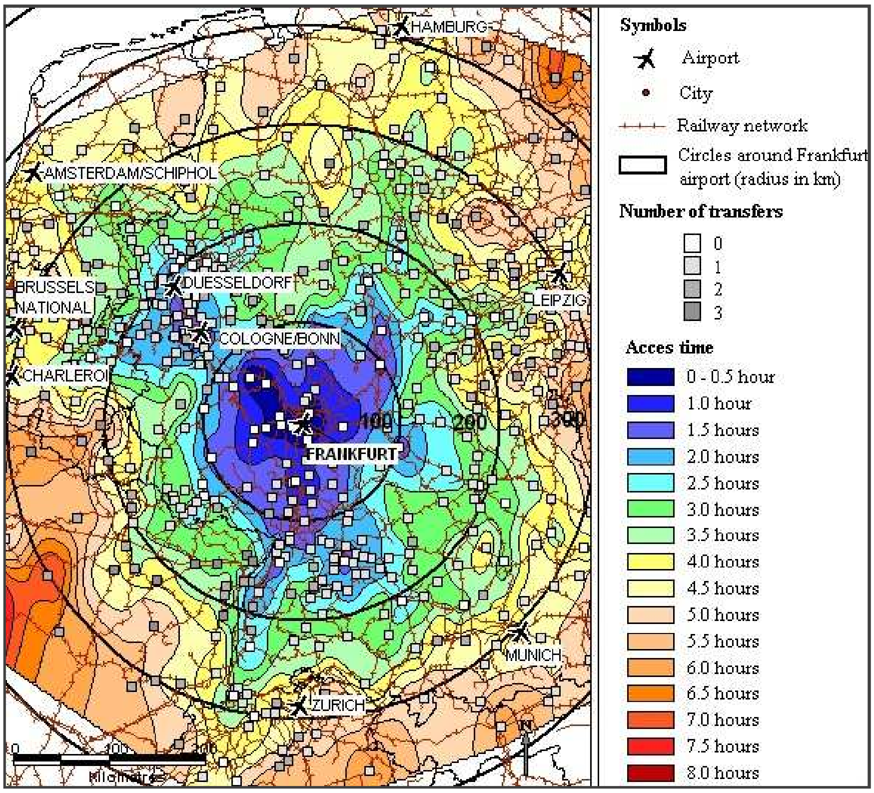
[396] The results were presented at the “1st International Scientific Conference: Competitiveness and Complementary of Transport Modes – Perspectives for the Development of Intermodal Transport” organised by the University of the Aegean, 10-12 May 2007, Chios and are published in the conference proceedings (Horn, 2007).

(white to dark grey). One can observe that access time zones differ significantly from the form of a circle emphasising that equidistant points from the airport are not necessarily of the same accessibility.

8.1.2.1. The case of Frankfurt airport

Figure 44 shows the accessibility of Frankfurt/Main airport located in the south of the city.[397] The analysis concentrates on a zone of about 300 km (air-line distance) around the airport.

Figure 44: Frankfurt airport – accessibility by public transport



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The zones of a shorter access time are stretched along the important ICE (InterCity Express) railway lines passing by Frankfurt airport: via Fulda, Erfurt and Weimar to Leipzig, via Hanover to Berlin or Hamburg, via Mannheim, Stuttgart, Augsburg to Munich, via Cologne and Dusseldorf to Dortmund and via Karlsruhe, Baden-Baden and Freeburg to Basel.

The area that can be reached within 1-hour access time covers a zone of about 40 to 70 km around the airport. In a westward and a southward direction, the area that is characterised by 1-hour access time extends up to 80-90 km, including Limburg, Mannheim and Heidelberg. Siegburg-Bonn and Cologne (at 150 km distance) in the north-west as well as Fulda the north-east of Frankfurt have ICE train services to the airport and thus benefit with an access time of only 60 minutes from a much better accessibility than their surrounding areas.

[397] See Appendix 18 on journey times by public transport.

The 90-minute zone corresponds to an area of about 70 km eastwards of the airport and 90-100 km round the northern, western and south-western regions. This zone extends significantly, up to 130 km, to the north-east (Bad Hersfeld) and the south of the airport (Karlsruhe, Pforzheim). But also Baden-Baden, Offenburg and Stuttgart in the south (at 130-180 km distance), Wurzburg in the east (at 100 km), and Bonn, Dusseldorf, Aachen and Wuppertal in the north-west (at 120-180 km) are favoured by good train connections compared to their surroundings that can be joined from the airport only within 2 hours.

The area that can be reached within 2 hours covers a zone of about 100-110 km, with a less accessible part in the east and considerable extensions in the north-east and the east (like Bad Hersfeld, Wurzburg at 130 km distance) as well as in the south (like Tubingen, Lahr at 180-200 km) and in the north-west (Duisburg, Essen, Aachen and Duren at 200 km). Also Gottingen and Eisenach in the north-east such as Hagen in the north-west benefit from a better accessibility compared to their surroundings.

The area that can be reached within a 2.5-hour access time follows the form of the 2-hour zone. In the north-west, north-east and south, even passengers from cities that are at 200-230 km distance (like Gottingen, Erfurt, Nuremberg, Ulm, Saarbrucken, Liege) can join the airport within 2.5 hours whereas eastwards the 2.5-hour zone includes an area at 180 km distance. The northern and the western/south-western areas are less accessible: the considered zone covers only a territory up to 100-130 km from the airport.

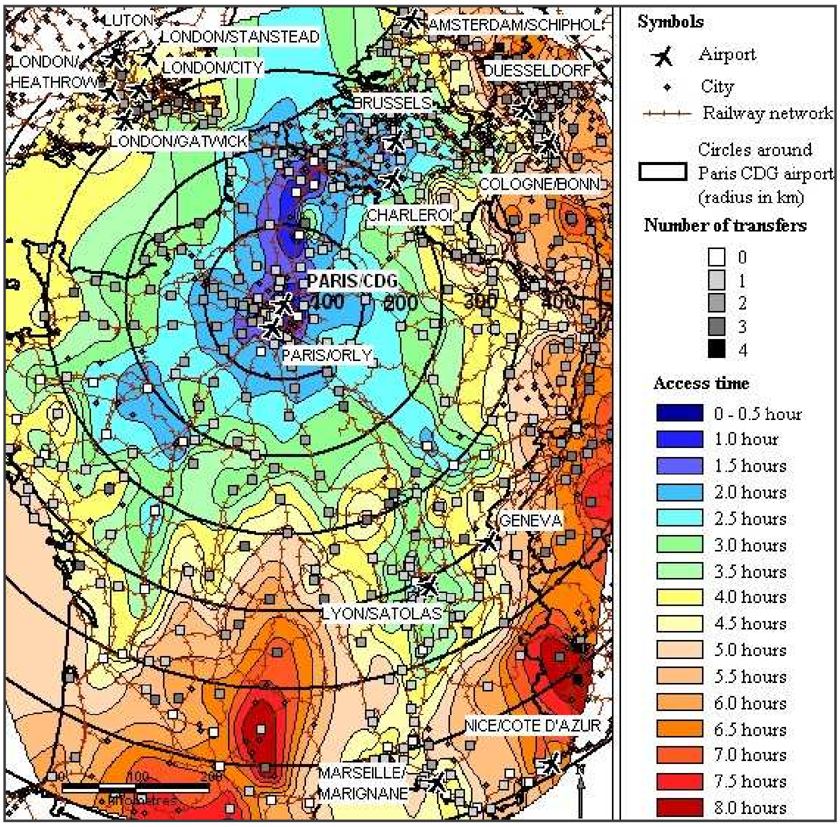
The 3-hour zone follows the form of the preceding 2.5-hour access time zone and emphasizes observed tendencies. It covers an area of up to 250-300 km distance in the north-east (e.g. Hanover, Weimar), in the south-east (e.g. Ingolstadt, Augsburg), in the south (e.g. Basel) and in the north-west (e.g. Arnhem, Muenster, Bielefeld) while it extends up to only 100 km in the east (e.g. Bamberg), up to 180-200 km in the south-west and up to 150 km in the west.

Since Frankfurt airport has direct access to regional and long-distance traffic thanks to two train stations, numerous destinations benefit from direct train services without transfer (75 of 539 destinations, i.e. 14 %). Another 322 destinations can be joined from the airport with only one transfer (60 %). This means that almost 75 % of all destinations can be reached easily. Only 29 destinations (5 %) necessitate a connection at Frankfurt central station. In fact, the half of them is situated in the north of Frankfurt explaining longer travel times to this region. The overwhelming part of destinations that can be reached directly or with one transfer contributes to the good accessibility of Frankfurt airport – in spite of two major differences in operating HST in France and Germany. Firstly, in Germany most high-speed railway lines are classical railway lines that were upgraded for ICE. Thus, speed is limited to 200-230 km/h (exceptionally 250 km/h) compared to 300 km/h speed of French TGV. Secondly, ICE stops at more train stations on the way than the TGV. For these reasons, the German HST is slower than its French counterpart but the disequilibrium as regards the different regions' accessibility is less important. Even if there are some exceptions (like Stuttgart that is more easily accessible than its surroundings), the territory is quite continuous since the differences in access time between ICE train stations and points that are situated between are smaller. Moreover, there is only one train station that was constructed outside a bigger city: Siegburg-Bonn at 25 minutes by tramway from Bonn.

8.1.2.2. The case of Paris CDG airport

The accessibility of Paris CDG airport situated in the north of the French capital is illustrated by figure 45.[398] Compared to Frankfurt airport, the form of the zones covered by an equal access time varies significantly. The zones of a shorter access time follow the important TGV railway lines: from Paris via Lille to Brussels or Calais-Fréthun, from Paris to Lyon, then via Valence TGV and Avignon TGV to Nimes or Aix-en-Provence and Marseille and finally from Paris to Le Mans or Saint-Pierre-des Corps.

Figure 45: Paris Charles de Gaulle airport – accessibility by public transport



Own figure

The 60-minute access time zone is stretched north-eastwards, south-eastwards and south-westwards where an area up to 40 km around the airport can be reached whereas the northern, western and eastern regions are less accessible. This zone covers Paris and a large part of the southern, eastern and northern suburbs of Paris. But there is also a big area around TGV Picardie station (only 30 minutes from the airport although at 90 km distance!) extending until Lille at 190 km distance from the airport that can be joined in 1 hour.

The area that can be reached within 90 minutes follows the preceding zone in north-south direction. It covers a territory up to 80 km south-westwards, about 60 km southwards of the airport and almost 200 km northwards. In east-west direction, the 90-minute access time zone

398 See Appendix 19 on journey times by public transport.

extends up to 50 km westwards but only 30 km eastwards. Being at 220 and 240 km distance from the airport, even Calais-Fréthun and Brussels are accessible within 90 minutes.

The 2-hour access time zone covers an area up to 120 km around the airport in the west, south-west, south and south-east and up to 260-280 km in the north, including the larger surroundings of Calais and Brussels. An important area including St-Pierre-des-Corps (next to Tours) as well as Le Mans and surroundings is also well connected to the airport by direct TGV service. Therefore, this region as well as Dijon, Le Creusot TGV station and Lyon are at only 2 hours travel time despite a distance of 200-280 km and of even 400 km for Lyon.

The area that can be reached within 2.5 hours covers a territory of about 150 km around the airport with significant extensions up to 280-300 km northwards (including the western half of Belgium with cities like Liege, Antwerp, Bruges), south-westwards (covering the larger surroundings of Le Mans and Tours) and south-eastwards (along the TGV line to Dijon and continuing until Dole). Besides, some islandlike areas are also characterised by an access time of up to 2.5 hours since they benefit from a very good accessibility compared to their larger surroundings: Poitiers, the proximity of Le Creusot and Lyon at 300 to 400 km and even Valence TGV station at 480 km distance from Paris CDG!

Finally, the 3-hour access time zone follows mostly the preceding zone covering a large part of France and Belgium. It reaches northwards almost the Dutch-Belgian frontier at more than 300 km distance and Ashford/Kent in Great Britain at more than 250 km distance. It covers an area up to 320 km south-eastwards from the airport (like Besançon) and up to about 320-380 km distance south-westwards (including Rennes, larger surroundings of Poitiers). In the south and west, this zone extends up to 220-250 km while eastern areas have poorer train services to the airport. Therefore, eastwards only an area up to 150-200 km can be reached within 3 hours. However, a very large territory covering Le Creusot, Macon, Saint Etienne, La Tour du Pin and Valence (at 300-500 km in the south-east) belongs to the 3-hour access time zone as well as Nantes (at 350 km in the south-west) and Aachen (at 320 km in the north).

Paris CDG, being directly served by HST via a TGV station on site, cannot take a full advantage of this integration, at least for the moment. The airport, situated on the north branch of the TGV network, is well connected to the north but for eastern, southern and western destinations, it is necessary to go first to Paris for getting a TGV or a classical train at one of Paris's six train stations. Only few trains pass by Marne-la-Vallée Chessy TGV station that was created for bypassing the capital. So, few destinations benefit from direct train services without transfer (51 of 485 destinations, i.e. 10.5 %). Even the number of destinations that can be reached with only one connection is limited (202 of 485 destinations, i.e. 42%) since going through Paris signifies up to two connections: one when changing train at Paris North or East station, two at St Lazare, Montparnasse, Austerlitz or Lyon train station. This problem concerns 37 % of all destinations and results in a worse accessibility of the western, eastern and southern regions that is reflected in a smaller extension of the access time zones in these directions. The situation has changed considerably with the inauguration of the East European high-speed rail link that started operation on 10 June 2007: Strasbourg is now connected directly to Paris CDG airport in less than 2.5 hours instead of 5 hours and a transfer via Paris East station today. Consequently, journey time to a large number of eastern destinations will decrease. Since exact travel times were not yet known when this analysis was carried out, travel time gains by the new HST were not taken into account. This refers also to travel time gains that result from the new high-speed railway line connecting Amsterdam to Brussels and from which Paris CDG airport has been benefiting since the end of 2007: Travel time from Paris CDG airport to Amsterdam reduced from 4 to 3 hours leading to an even better accessibility of the northern regions.

Some northern, south-eastern and south-western destinations are already connected to the airport by direct HST service. Figure 38 shows that a large part of the northern regions benefits from TGV since stations are close to each other (TGV Haute Picardie at 90 km, Arras/Douai at 150 km, Lille at 190 km and Brussels at 240 km distance from the airport). Thus, the better accessibility of these regions becomes apparent already when considering the 60- and 90-minute access time zone. The south-eastern and south-western regions benefit less from TGV: The first stations on the two south-eastern branches are situated at Dijon, Dole and Besancon at 260, 300 and 320 km from the airport and at Le Creusot, Lyon and Valence at 300, 400 and 480 km distance. On the two south-western branches the first TGV stations are located at Le Mans, Laval and Angers at 200, 260 and 280 km distance and at St-Pierre-des-Corps and Poitiers at 220 km and more than 300 km distance. So, only from the 2-hour access time zone on, the effects of HST appear. HST improves the region's accessibility but its impact concentrates on the destinations' proximity while places between are characterised by a worse accessibility (see light blue, green and yellow zones). This creates a discontinuity in the territory's accessibility. Furthermore, some TGV stations were constructed outside of bigger towns (e.g. Le Creusot and Valence) what limits the gain of time to the TGV stations' nearer surroundings since another transport is necessary to join the final destination. This explains the small light blue- and green-coloured zone next to TGV Haute Picardie station in the north of the airport: a regional train and a bus have to be taken for the final destination.

8.1.2.3. The case of Amsterdam Schiphol airport

The following figure 46 illustrates the accessibility of Amsterdam Schiphol airport.[399] Like Frankfurt and Paris CDG airports, it is connected to the railway network by a train station on site. One can observe that the access time zones' form is relatively even and less stretched.

The 60-minute access time zone covers an area of up to 50-60 km around the airport, including Utrecht (at only 30 minutes) and Rotterdam, with a little indentation in the south-east of the airport. The 90-minute zone goes up to 90 km, with three small extensions (north-eastwards, south-eastwards covering Eindhoven and in the south towards Brussels).

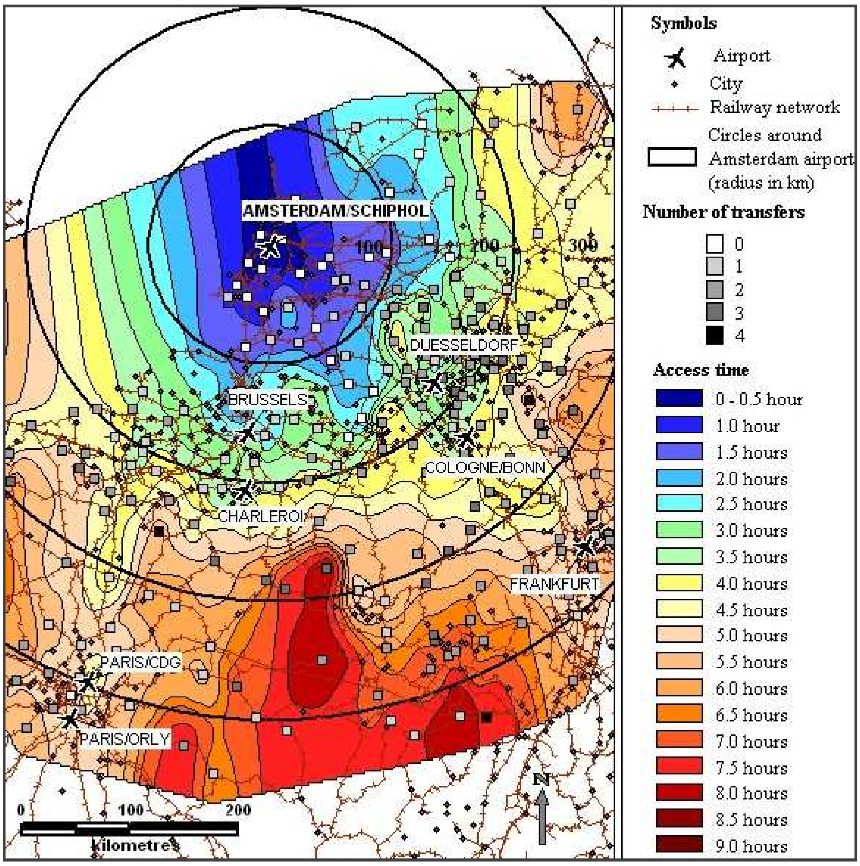
The area that is characterised by an access time of 2 and 2.5 hours follows quite exactly the form of the preceding zone, emphasising the three extensions. Within 2 and 2.5 hours, an area of up to 100 km and 120 km can be reached. As regards these two zones, they extend up to 140-150 km (for 2 hours) and 170 km (for 2.5 hours) in the north-east, in the south-east and in

[399] See Appendix 20 on journey times by public transport.

the south (including Brussels). Gelsenkirchen, Duisburg and Dusseldorf at 160-180 km distance can also be reached within 2.5 hours whereas their surroundings are less accessible.

The 3-hour access time zone follows to a large extent the preceding zones covering a territory up to 180 km from the airport. Except for the area eastwards, regional disparities in access time decrease. The 3-hour access time zone extends up to 200-220 km eastwards but it encloses an area that is more difficult to access.

Figure 46: Amsterdam Schiphol airport – accessibility by public transport



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As regards the Netherlands, so far there are no important high-speed rail links but Amsterdam airport is served by HSTs that continue their journey on classical railway lines. This explains also the relatively even and less stretched for of the different access time zones. By the end of 2007, the new high-speed railway line from Amsterdam to Brussels started operation. It reduced travel times to Brussels, Paris and London by one hour.

8.1.3. Implications for the airports' territorial embeddedness

For the purpose of understanding the importance of the different access time zones, it is necessary to consider the airports' traffic patterns. Being major hubs, all three airports are characterised by important transfer traffic. As regards connecting passengers, the airport's catchment area theoretically extends to the whole world. Nevertheless, a large origin-destination traffic volume represents an advantage for hubbing. Moreover, a considerable part of the air traffic concerns short-distance flights, for which airport's catchment area has a relatively limited size but HST may be a serious competitor. For long distance flights, and for all hub airports intercontinental traffic represents a large share in the overall traffic volume, the catchment area is much larger. In return, low-cost and charter traffic are less important. However, the latter also benefit from broad catchment areas as customers accept longer access times in exchange for lower ticket prices.

The following figure 47 shows the territory into which Amsterdam, Frankfurt and Paris CDG airports are embedded into with regard to the different access time zones. It concentrates on 1.0 hour to 3.0 hours access time and represents the catchment areas for short-distance flights (up to 1 hour, maybe 1.5 hours), for medium-distance flights (up to 1.5 hours, maybe 2 hours) and in parts the catchment areas for long-distance and charter/low-cost flights (up to 2 hours, even 2.5 to 3 hours), even though one has to be careful when interpreting these access time zones where they overlap, even partially, with the access times zones of other airports. Anyway, the definition of the airport's catchment area refers to the area within which exiting and potential (!) traffic lies...

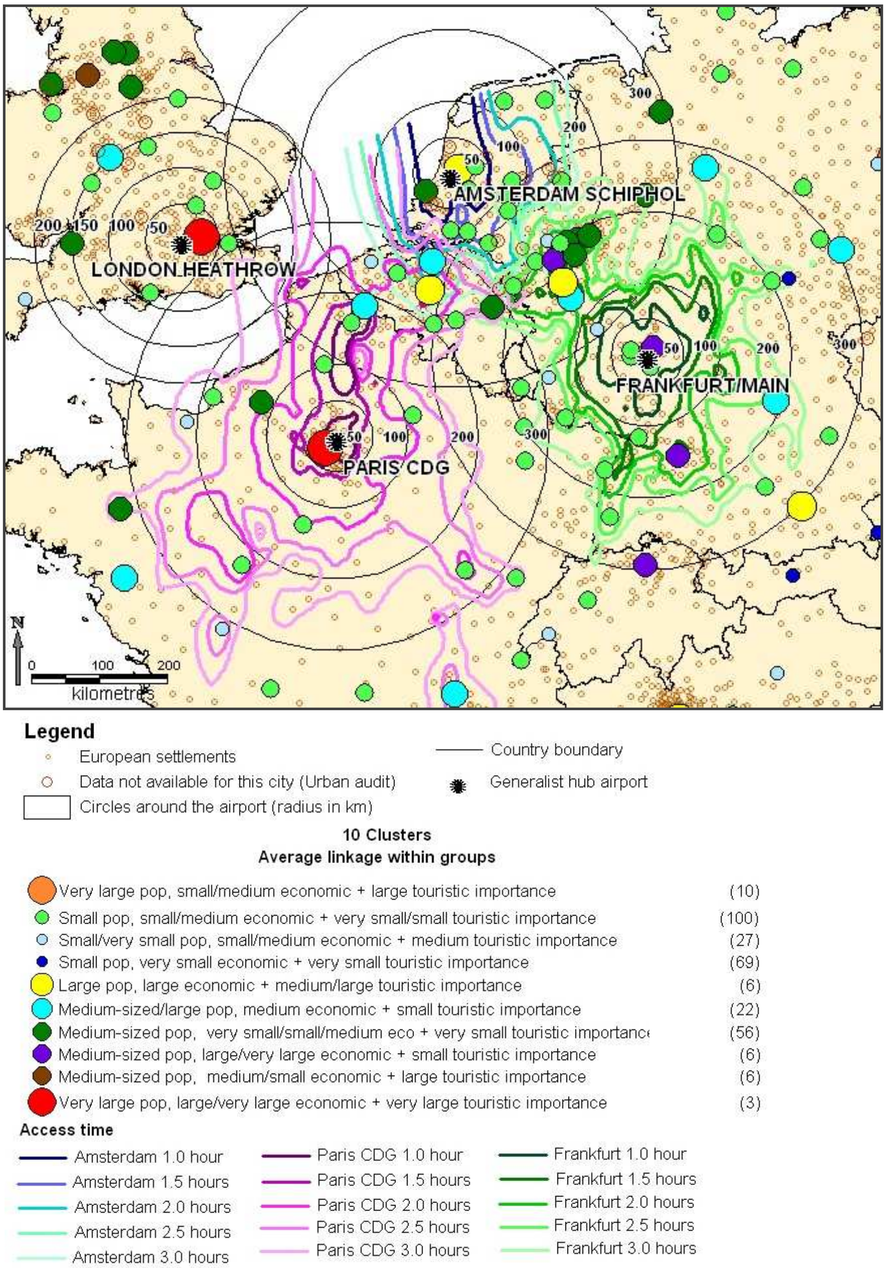
London Heathrow airport is also shown even though a detailed analysis on access times was not carried out as the only HST link is that linking London eastwards to Paris and Brussels considering that access times apart from this link are relatively similar for a given distance. Therefore, kilometric distance was used for drawing circles around the airport.

Finally, figure 47 illustrates the location of the four airports with reference to the city clusters as described in chapter 7. One can observe some similarities but also differences.

London Heathrow and Paris CDG airport are both situated next to two cities with a very large population and of a large/very large economic importance as well as of a very large touristic interest (red colour). They seem to dominate the landscape as there are certainly some small cities of a small/medium economic but only of a very small/small touristic importance (light green colour) in the surrounding area. However, they are at a distance of more than 50 km up to 150 km from London Heathrow airport. Once leaving the urban area of London, the density of cities decreases. Moreover, these cities are of a limited economic or touristic relevance and size. Only at 150 km from the airport are located Bristol and Birmingham: Bristol (dark green) being a city with medium-sized population but of a very small/small economic importance and of a very small touristic interest and Birmingham belonging to the azure cluster which comprises cities of medium-sized/large population and of medium (partly small) economic importance but only of a small (partly medium) touristic importance.

As regards Paris CDG airport, the situation is relatively similar. Once leaving the Paris urban area housing density decreases with some small cities of a small/medium economic importance but only a very small/small touristic relevance (Le Havre, Reims, Lens, Amiens, Orleans in light green) as well as Rouen (dark green), which is a medium-sized city even though its economic and touristic importance is relatively limited, that are located around Paris and at 100 to 200 km distance from the airport. Thanks to the airport's integration into the French high-speed railway network, Lille (azure cluster), a city with medium-sized/large population of medium (small) economic interest although its touristic importance is small (partly medium) being located 200 km from the airport, may be reached with 1 hour. Lens and Amiens but also Brussels, the latter belonging to the yellow cluster which groups together cities of a large population, a large economic importance and a medium/large touristic importance, are located within the access time zone of 1.5 hours. The extension of the access time zones of 2.0 to 3.0 hours into south-western and south-eastern direction is particularly interesting as the transport offer of airports situated in these areas diverges from the traffic patterns observed at the four hub airports. As regards the extension of the zones of 2.0 to 3.0 hours access times from Paris CDG airport in the northern direction the situation is different as they tend to overlap, at least partially, with the zones of 1.5 to 3.0 hours access time from Amsterdam airport.

Figure 47: The territorial context into which Amsterdam, Frankfurt, Paris CDG and London Heathrow airport are embedded



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Amsterdam Schiphol airport is located next to Amsterdam (yellow cluster) which is of a large population, a large economic importance and touristic importance. Even though Amsterdam's importance is limited in comparison to Paris or London, the airport is situated in a dense area, notably with The Hague (dark green) and Utrecht and Almere (light green cluster) situated at less than 50 km from the airport and within 1 hour travel time. Moreover, within 1.5 hours access time further cities belonging to the light green cluster (Breda, Tilburg, Arnhem, Apeldoorn, and Eindhoven) are located. Finally within 2 hours may also be reached Nijmegen (light green) as well as the medium-sized city of Antwerp (azure) figuring among cities of a medium (partly small) economic importance even though the touristic importance is small (partly medium). Unemployment rates in Amsterdam and in its surroundings are moderate (between 6 % and 9 %) although not as low as e.g. in England. Air traffic may benefit from the presence of foreigners. In this respect, on can observe that non-EU nationals represent a relatively large part in the population compared to EU nationals (8.5 % and 3.6 % respectively in Amsterdam; 2 % to 8.0 % and 0.4 to 2.7 % respectively in the surrounding).

Frankfurt/Main airport is located next to Frankfurt which is a city (purple cluster) of only a medium-sized population but having a very large economic importance although the touristic importance is medium. Moreover, three small cities, namely Darmstadt, Mainz, Wiesbaden, are situated at only 20 to 30 km from the airport and may be reached within 30 minutes (even 20 minutes for Mainz). Although all three cities are in light green, Wiesbaden and Darmstadt are actually characterised by a large economic importance. However, the touristic relevance of these three cities is rather small. Thank to the airport's integration in the ICE network, Cologne, a city with a large population and of a large economic and a medium/large touristic interest (figuring in the same yellow cluster as Amsterdam or Brussels) may be reached within 1 hour travel time although being at 150 km from the Frankfurt airport. Several cities are located within 1.5 hours access time: small cities of a small/medium economic importance and of a medium or of a very small/small touristic interest (Koblenz in light blue and Karlsruhe in light green respectively), Wuppertal (dark green) figuring among the medium-sized city of a very small/small/medium economic interest and a very small touristic interest, Bonn (azure) being a medium-sized/large city of a medium (partly small) economic interest and a small (partly medium) touristic relevance and even Stuttgart and Dusseldorf, both belonging to the same purple cluster as Frankfurt referring to medium-sized cities of small touristic interest but of a large/very large economic relevance. Finally, the 2 hours access time zone includes the whole region around Dusseldorf, Cologne and Bonn (including small and medium-sized cities of a limited economic and touristic importance in light blue, light green and dark green). As regards unemployment rates, they are relatively moderate in Frankfurt and its surroundings (8-9 %) but increase when leaving Frankfurt westwards (11-12 % in Cologne and the region of Dortmund with 15 % in Dortmund itself). The proportion of foreigners is relatively high, as well as regards EU-nationals (6.7 % in Frankfurt and 4.7 to 7.3 % in the surroundings) but also as regards non-EU nationals (in particular in Frankfurt with 14.9 %, but still above 10 % in the surroundings and when leaving Frankfurt westwards).

The catchment areas of Paris CDG, Amsterdam and Frankfurt airport are quite distinct but they tend to overlap. This has an implication on the competition potential. As to short-distance traffic, 1-hour zones are clearly separated indicating absence of competition for origin-destination traffic. As regards medium-distance flights, corresponding to catchment areas of 1.5 to 2 hours access time, one can observe that the 1.5-hour zones are well separated even if they approach whereas 2-hour zones of Amsterdam and Paris CDG tend to overlap. However, only a small area between Brussels, Gent and Antwerp is concerned. Apart from that, catchment areas for medium-distance flights approach but do not overlap. As regards long-distance flights, catchment areas, referring to an access time of 2 to 2.5, even 3 hours, cover a larger area and thus do partly overlap. Concerning 2.5-hour access time, the catchment areas of Amsterdam and Paris CDG overlap enclosing a larger area than for medium-distance flights that covers in particular Brussels and Antwerp. The catchment areas of Frankfurt and Amsterdam approach also but they overlap only for Duisburg, Neuss and Gelsenkirchen. Catchment areas of Frankfurt and Paris CDG overlap for a limited area, including notably Liege. With respect to the area that may be reached within 3 hours, the catchment areas of Amsterdam and Paris CDG airport overlap enclosing a large part of Belgium (including Gent, Antwerp, Brussels). The catchment area of Amsterdam and Frankfurt airport overlap covering two areas: on the German territory including Duisburg, Essen, Dortmund, Dusseldorf and Cologne, on the Dutch territory from the German-Dutch frontier to Arnhem. As regards the catchment areas of Frankfurt and Paris CDG, the overlapping zone limits to Liege and large surroundings.[400] From zones where catchment areas overlap arises some competition for long-distance flights. Nevertheless, one should be careful when interpreting this map. Certainly, a passenger from Dusseldorf, accepting 3 hours travel time for taking a long-distance flight, might also go to Amsterdam airport but departing from Dusseldorf he is still much closer to Frankfurt airport since the travel time amounts to only 1.5 hours. All other things being equal, this passenger would prefer Frankfurt to Amsterdam airport. But as prices (airport charges, prices for plane/train tickets) and air services (destinations, frequencies, direct/indirect flights) at different airports, and even at hub airports, are not necessarily the same, potential passengers of Amsterdam airport come even from Dusseldorf.

Following the figure 47, there is evidence to suggest that competition for Frankfurt, Paris CDG and Amsterdam airports but also for London Heathrow as regards origin-destination traffic comes rather from smaller airports situated within the catchment area or next to. However, despite some overlapping, their flight offers are different, in particular as regards intercontinental services. Most of these airports will be dealt with in detail later on.

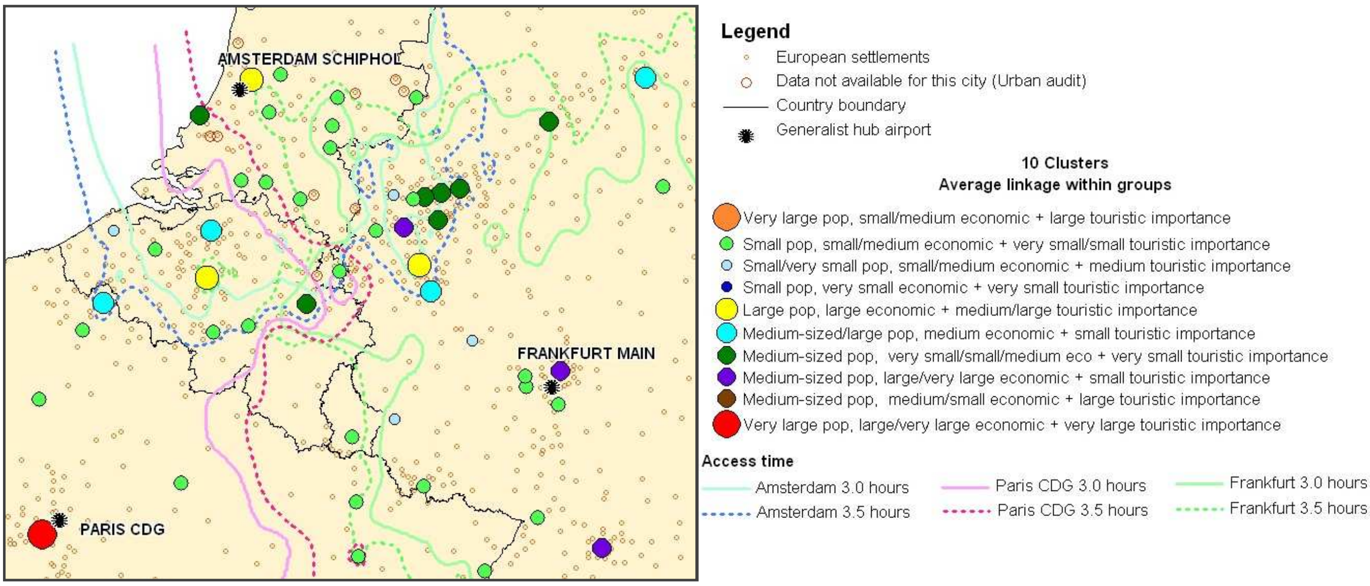
For low-cost and charter customers, the catchment areas cover a zone going up to 3 hours access time. So, catchment areas for charter and low-cost flights correspond largely to those for long-distance flights. Nevertheless, the importance of the zone with such long access time is limited in comparison to zones referring to smaller access times (such as 1 hour, 1.5 hour or 2 hours). Low-cost and charter traffic are two marginal market segments for Frankfurt airport (representing 1.6 % and 1.5 % of all passengers respectively). The situation is different for

[400] In this respect, the situation may have evolved since the inauguration of the East European high-speed railways reducing journey time between Paris and Frankfurt and thus also for cities lying in between. As regards the travel time between both airports, it is still long with 4 h 50 minutes. Moreover, one has to change trains in Mannheim and at Paris East train station. (Alternatively, one can pass by Cologne and Brussels (4 h 40 minutes) but this route necessitates also two transfers.)

Paris CDG airport and Amsterdam where low-cost and charter traffic are a little more important although their proportion amounts to only 5.0 % and 5.3 % for Paris CDG and 11.0 % and 9.3 % for Amsterdam airport. Thus, competition limits to the overlapping catchment areas of Amsterdam and Paris CDG, i.e. a large part of Belgium covering Brussels, Gent, and Antwerp.

As certain charter and low-cost customers accept even 3.5 hours access time, the catchment areas for this market segment of Amsterdam and Paris CDG overlap enclosing a larger part of Belgium, exceeding the frontier to the Netherlands in the north (including Delft) and France in the south (like Lille). Figure 48 shows that possible competition for charter/low-cost traffic is even more important than for competition for long-distance traffic but it is limited to Amsterdam and Paris CDG airport (zone of 3.5 hours access time for Frankfurt airport given only for information) and of course less people would accept such an access time.

Figure 48: Access time zones of 3.0 and 3.5 hours



Own figure

In addition, some airports with a very high proportion of low-cost traffic have emerged next to Paris CDG, Amsterdam, Frankfurt airport and London Heathrow airport. These airports will be considered separately as their specificity is just that they serve a metropolitan zone which is already served by larger airports. Despite their sometimes large distance, they have established themselves as additional airport. Their traffic figures, which are out of all proportion to the population and the socio-economic characteristics of their environs and underlines the role they play for air services to and from the nearby metropolitan areas.

8.1.4. The implementation of intermodal transport concept

By analysing access by railway transport to three of the four big hub airports this chapter emphasis the role of intermodality for extending the reach of these airports and thus for potential competition between hub airports but also between the latter and other airports located within the airports' catchment areas or so close that their catchment areas partly overlap. It underlines the importance of the subject for airports even if it calls into question competing positions and the balance of power between the parties involved in air and rail transport.

Air-rail intermodal transport has much advanced in recent years. In 2004, already 18% of all passengers arrived at Frankfurt airport by long-distance train, both HST and classical trains (Fraport AG, 2005). Three levels of integration exist. The most advanced is *AIRail* service with baggage check-in at the train station. It concerns two routes: Frankfurt-Stuttgart, but also Frankfurt-Cologne, where in only ten months 50% of all air passengers have switched to train. Code-sharing agreements exist between Deutsche Bahn and four airlines allowing the passenger to reserve the train journey under the airline's flight number. *Rail & Fly*, on which cooperate 80 airlines, 30 tour operators and the Deutsche Bahn, allows the traveller to use his plane ticket also for the train, a possibility used by 1.6 million passengers in 2005. For Paris CDG, *TGVair* is marketed by the SNCF and eight airlines allowing the passenger to buy a combined ticket. But in 2005, 88 % of all passengers used two separate tickets for train and plane, only 12 % a combined ticket. About 76 % of all passengers transferring from HST to air at Paris CDG chose themselves to go by train to the airport. Long transferring times are another problem: 3 h 40 minutes on average at Paris CDG. Thus, work has to be done on the organisation and marketing of intermodal journeys.

Despite the progress in recent years, implementing intermodal projects often turns out to be difficult. Integrating airports in the railway network concerns three dimensions: a technical, a commercial and a political associating various actors (like railway companies, air carriers, airport operators, railway authorities) but discussion concentrates often on technical aspects neglecting relations and cooperation between the different parties involved. Good examples for the consideration of the commercial dimension are *TGVair* and *AIRail.* For the latter, the proposal to take the train at Stuttgart for going to Frankfurt is made automatically e.g. when a passenger wants to buy a ticket for Stuttgart-New York (see Annexe). This also applies to Cologne.

Last but not least, the question is how airports participate in this development. It is obvious that intermodal transport is relevant to the airport's accessibility and to competition between airports, even if it is limited to certain areas and certain market segments. Moreover, the transfer of passengers from air to rail, being in line with the objectives of the European commission that supports the integration of air transport in CO_2 emission trading, is an interesting perspective for airports being close to the capacity limit or where the number of slots for several airlines is restricted. It allows airports to continue growth by modifying traffic structure and diversifying their activity. However, for the purpose of a more complete idea of airport competition and air-rail intermodal transport, further analysis, going beyond the scope of this work, would be necessary.

8.2. Airports specialised in freight traffic located next to large metropolitan areas but sufficiently distant in order to operate 24/7 – the relocation of the DHL hub to Leipzig/Halle airport underlines the large extension of catchment area for cargo traffic

Regarding freight traffic, general cargo has different characteristics from express freight. General cargo is in large part transported aboard normal passenger aircraft but all cargo flights are developing the last years. Express freight is a quite young activity distinguishing from general cargo. As delivery times are much shorter and customers' willingness to pay higher, intra-European flights are operated whereas general cargo for an intercontinental destination or arriving at a European airport from overseas is normally transferred on route and transported by freight vehicles to its final destination as required delivery times are long enough to avoid an expensive intra-European flight. This has an impact on freight traffic being handled by European airports, in particular on all cargo flights being concentrated on a small number of airports.

The ranking of the airports handling large volumes of cargo is headed by Frankfurt, Amsterdam Schiphol, Paris CDG and London Heathrow, the four big generalist hub airports. They benefit from the great number of destinations and high frequencies of passenger aircraft representing a considerable capacity for the transport of cargo and a real advantage for airlines which may choose between using belly capacity of passenger aircraft where possible and operating freighter aircraft if volumes of cargo are sufficiently high. This is also illustrated by the fact that only Paris CDG airport concentrates a large number of commercial flights operated by cargo aircraft (47 900 flights in 2007 but Paris CDG airport acts also as the main European hub for Federal Express) whereas at the other three of the four generalist hub airports the number of freighter flights is much less important than one could expect from the volume of cargo handled by these airports (26 000, 17 500 and 2900 flights respectively operated at Frankfurt, Amsterdam and London Heathrow airport). Among the busiest airports as regards freight traffic can be found of course more airports handling large volumes of passengers, such as Milan Malpensa, Madrid Barajas, Munich, Copenhagen Kastrup, Vienna, London Gatwick, Manchester and Rome Fiumicino.

In addition, some airports with little (or relatively little) passenger traffic figure also among the airports handling large volumes of cargo, e.g. Brussels, Cologne, Liege, East Midlands, Bergamo Orio al serio, and Oostende. Leipzig/Halle just entered the ranking of the 30 busiest airports as regards freight traffic with 86 000 t loaded and unloaded in 2007 due to the inauguration of the DHL hub in October. Already in 2008, the volume of cargo reached 430 000 t.

8.2.1. Traffic patterns

8.2.1.1. Cologne/Bonn, Leipzig/Halle, Brussels and Liege acting as hubs of express freight companies

UPS, DHL, TNT and Federal Express, the four big integrators being specialised in international express freight, have established their European hubs at the airports of Cologne/Bonn, Leipzig/Halle (after leaving Brussels airport), Liege and Paris CDG airport respectively.

Paris CDG airport

Federal Express established its European hub at the airport in 1999. This choice may be explained by different elements. The basic requirement was the possibility to operate day and night, seven days the week (24/7). Another advantage is the possibility to develop the airport facilities themselves but also the area around since the airport disposes of some space reserves allowing to consider the extension of the hub in the future, which is rare for an airport of this size. Moreover, Federal Express cooperates with other airlines using the airport, in particular with Air France, mainly for resorting to its capacities for serving very low frequented destinations, but also e.g. with Iberia, for which Federal Express assumes the provision of an international express parcel carriage service, including shipment within 24 hours and door-to-door pick-up and delivery. Besides, Federal Express cooperates with French customs authorities which established an office on site in order to reduce time lags due to customs control.[401] Federal Express operates about 280 flights per week which corresponds to 14 500 flights per year. Thus, Federal Express represents 30 % of the 47 900 flight movements of cargo aircraft registered in 2007. All in all, Paris CDG airport is Europe's busiest airport as regards scheduled flights of air freighters.[402]

Cologne/Bonn airport

At Cologne/Bonn airport, 709 000 t of cargo were loaded and unloaded in 2007. As regards freight traffic, Cologne/Bonn is the second German airport, even though coming far behind Frankfurt airport and the sixth busiest freight airport in Europe. In respect of aircraft movements, the airport ranks second just behind Paris CDG airport with 28 600 commercial freighter flights being operated in 2007.

UPS is operating its main European hub at Cologne/Bonn airport with on average 150 intra-European and 130 intercontinental flights per day serving 70 and 8 airports respectively. Thus, UPS represents 60 % of the airport's volume of cargo in 2005, before DHL with 30 % and Federal Express with 10 % (Calais, 2006). Since then, DHL transferred its flights from

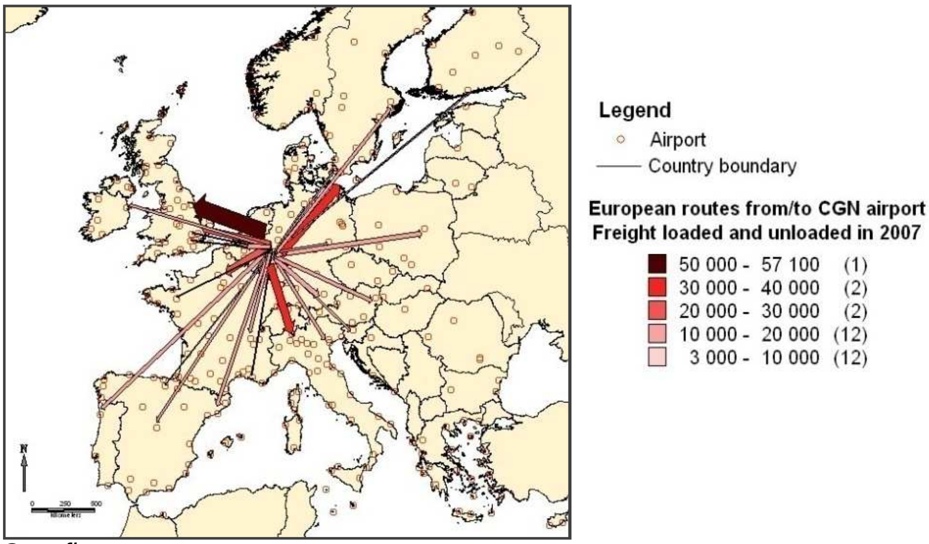
[401] Information from a visit of the Federal Express hub at Paris CDG airport on 11 February 2010.

[402] Actually, Bucharest/Otopeni airport handled, according to Eurostat, 51 800 scheduled flights of cargo aircraft in 2007. This figure is rather surprising since the total volume of freight loaded and unloaded amounts to only 17 350 t and includes also cargo which is transport on board of passenger aircraft.

Cologne/Bonn to its new hub at Leipzig/Halle airport. In return, Federal Express (already operating from the airport since 2005) wants to take over a part of the capacity freed up by the relocation of DHL in order to develop its hub for traffic from and towards the Central and Eastern European countries.

According to Eurostat data, 45 destinations were served in 2007 (representing 701 000 t, i.e. 99 % of total volume of cargo). Their traffic volumes are shown in figure 49: The three most important destinations are East Midlands (57 000 t), Dubai (43 000 t) and Philadelphia (41 000 t).

Figure 49: European routes for air freight from and to Cologne/Bonn airport (tons)



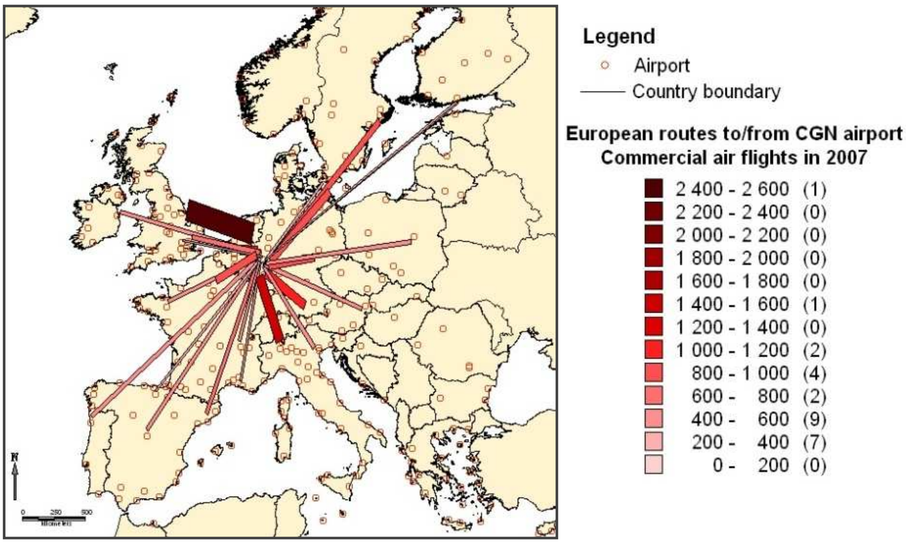
Own figure

All in all, 29 European routes are operated from the airport corresponding to 58.8 % of the overall traffic. As illustrated by figure 49, only 5 routes exceed 20 000 t (East Midlands, Bergamo, Malmoe, Paris CDG and London Stansted airports) whereas 12 routes totalise less than 10 000 t and further 12 routes less than 20 000 t. In addition to Western, Southern and Northern Europe, two destinations in the former communist countries are served: Warsaw and Ljubljana.

Intercontinental traffic is limited to 16 destinations of which 5 are located in Northern America totalising 118 000 t, i.e. 16.7 % of the overall traffic (Philadelphia, Louisville, New York JFK, Newark Liberty and Memphis International airports). Further 11 destinations are situated in Asia. Particularly important are the 5 routes to Western Asia representing 108 000 t, i.e. 15.4 % of the overall traffic (Dubai, Istanbul/Ataturk, Sharjah, Bahrain and Tbilisi airports).

Considering the number of flights, European routes (figure 50) totalise 76.2 % of all movements of air freighters while Asia and Northern America represent only 14.4 % and 9.4 % respectively. This may be explained by the fact that on intercontinental routes and larger aircraft is used in general.

Figure 50: European routes for air freight from and to Cologne/Bonn airport (flights)



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In addition to cargo traffic, Cologne/Bonn airport handled 9.8 million passengers in 2006 (10.4 millions in 2007). All in all, 37 airlines operate air services from the airport according to OAG data but 11 of which totalise less than 100 flights scheduled each one. As regards Eurostat, 34 destinations are served from Cologne/Bonn airport corresponding to 7.1 million passengers (72.7 % of the overall traffic) in 2006. 31 destinations are located in Europe: the 8 German destinations represent 48.4 % of the overall traffic (headed by Munich and Berlin Tegel airports with 1.2 million and 840 000 passengers respectively). Moreover in Western Europe, air services are operated to 3 Austrian destinations (6.4 %), to Zurich (2.3 %) and Paris CDG airports (2.4 %). A large role play the 11 destinations in Southern Europe (Italy, Spain and Portugal) representing 22.0 % of all passengers. In addition, three London airports (Stansted, Heathrow and Gatwick) and East Midlands airport are served (8.1 %). There is no destination in the Scandinavian countries but three in Eastern Europe: Prague, Budapest and Warsaw but they totalise only 3.9 % of passengers. Finally, three routes are operated to Turkey (Antalya, Istanbul/Ataturk and Izmir airports with 471 000 passenger all in all, i.e. 6.6 %).

Leipzig/Halle airport

In October 2007, the new European hub of DHL started operations at Leipzig/Halle airport. In two steps, DHL flights were transferred to Leipzig/Halle airport: In October 2007 flights from the Cologne gateway; then in March 2008, flights from the previous European DHL hub in Brussels. Noise nuisance, to which residents from the neighbouring communities were opposed, brought DHL to leave the airport. DHL chose Leipzig/Halle airport for the relocation of its hub. There may be some political reasons for the choice of the airport as DHL belongs to the Deutsche Post AG but at the same time it illustrates the large extension of catchment areas for freight traffic. Due to the high cost of air transport, transport by road is substituted for air transport whenever this is reasonable explaining the large catchment areas. This applies to express freight and even more to general cargo as delivery times are less tight.

Since March 2008, on average 60 aircraft take-off and land per working day and 1500 tons are handled. All in all, 46 destinations are served of which 36 are located in Europe (such as Athens, Balaton, Barcelona, Basel, Bergamo, Bologna, Bratislava, Brussels, Cologne/Bonn, Copenhagen, East Midlands, Frankfurt, Gdansk, Geneva, Hamburg, Helsinki, Katowice, Kiev, Linz, Ljubljana, London, Luxembourg, Lyon, Madrid, Marseille, Moscow, Munich, Nantes, Nuremberg, Ostrava, Paris, Prague, Rome, Sofia, Stockholm, Stuttgart, Victoria, Warsaw) as well as Istanbul, Bahrain, New Delhi, Hong Kong, Sharjah and Singapore in Asia and New York and Wilmington in the USA.

The volume of cargo loaded and unloaded has been multiplied by 16 since the inauguration of the DHL hub amounting to 430 000 t in 2008 (compared to 27 000 t in 2006); the number of freighter flights having been sextupled reaching 27 000 in 2008 (compared to 4200 in 2006).

Apart from freight traffic, there is also some passenger traffic at Leipzig/Halle airport: 2.1 million passengers in 2006 (2.4 million in 2007). Charter traffic is relatively important as it represents 24.5 % of the total number of passengers. As regards scheduled traffic (OAG data), Lufthansa is the busiest carrier representing 30.4 % of seats available and 40.9 % of all departing flights scheduled. Air Berlin, Condor, Germanwings, Hapagfly, Hapag-Lloyd Express rank second to sixth as regards the capacity with 21.3 %, 13.7 %, 7.7 %, 7.6 % and 7.6 % of the total number of seats available respectively. While Lufthansa serves only Frankfurt, Munich and Dusseldorf airports and Germanwings to Cologne/Bonn airport, the other airlines offer larger numbers of destinations but some of them are served at low frequencies. [403] As regards the geographic distribution of destinations in 2007 (according to Eurostat), 19 destinations of 26 are located in Europe. 7 German airports are served from Leipzig representing 36.6 % whereas the 7 Southern European destinations totalise 25.1 % of traffic. In addition, air services are operated to Vienna, London Stansted and Paris CDG but also to Varna and Burgas airports in Bulgaria.7 destinations outside of Europe are served from Leipzig airport of which Antalya is the most important with 227 000 passengers (11.0 %), followed by Kuwait International airport with 124 000 passengers (6.0 %) while the other 5 destinations totalise 10.9 % (Hurghada, Monastir, Punta Cana (Dominican Republic) and the US airports Hartsfield-Jackson Atlanta and Bangor International).

Brussels airport

Until March 2008, DHL was operating its European hub at Brussels airport. With 734 000 t of freight loaded and unloaded in 2007, Brussels airport is the fifth biggest airport as regards cargo traffic. At the same time, 24 600 freighter flights were operated.

As regards the destinations served from Brussels airport, New York JFK, Singapore, Incheon, Riyadh King Khaled and Hong Kong airports are the busiest one with 52 000 t, 49 000 t,

[403] Air Berlin offers 26 destinations of which 10 are served with less than 10 flights scheduled in 2006. For Condor, Hapagfly and Hapag-Lloyd Express, the number of routes operated amounts to 19, 18 and 5 respectively, of which 5, 8 and 2 totalise less than 10 flights scheduled in 2006.

45 000 t, 44 000 t and 34 000 t respectively. East Midlands airport, the most important European destination, ranks sixth with 29 000 t. All in all, Eurostat collects data on 45 destinations covering 681 000 t (i.e. 92.7 % of total traffic). 25 destinations are situated in Europe representing 38 % of total traffic. 10 Asian destinations totalise almost as much traffic as the European destinations (37.0 %). Finally 6 routes concern Northern America and 4 routes Africa totalising 15.8 and 9.1 % of the overall traffic respectively. As regards the number of flights operated (data collected on 55 destinations representing 94.0 % of the total number of flights), Europe represents 65.5 % of all freighter movements (25 destinations). Asia comes second with 19.9 % of all flights (15 destinations). Northern America and Africa totalise 7.1 % and 7.5 % of the total number of flights respectively and 8 and 7 destinations[404].

By the way, Brussels airport handles a relatively large number of passengers: 16.6 million passengers in 2006. Charter traffic represents 18.2 % of all passengers, the majority of traffic being scheduled one.

Liege airport

Liege airport is an important freight airport in Europe, even though having also some charter traffic to touristic destinations.[405] With 364 000 t of cargo loaded and unloaded in 2007, Liege airport is the ninth busiest freight airport in Europe. As regards the number of cargo flights, the airport ranks just behind Frankfurt and Brussels airport with 24 200 movements in 2007.

Since 1998, TNT operates its European hub at Liege airport. On average, more than 40 aircraft take-off and land per night and more than 1.500 employees handle about 100 000 shipments. Other cargo airlines use also the airport, e.g. CAL Cargo Air Lines, Emirates Sky Cargo, Emerald Airways, Icelandair Cargo, Ukraine International.

As regards the destinations served by Liege airport, the two most important routes are those to the airports Tel-Aviv Ben Gurion (80 000 t) and Shanghai Pudong (23 000 t).

A total of 60 destinations are served by Liege airport which is more than from Cologne/Bonn airport. In addition, the busiest route realises a larger traffic than at Cologne/Bonn. In return, there are a number of routes with relatively low traffic figures. This concerns in particular the European destinations where 39 destinations totalise less than 10 000 t each one as illustrated by figure 51. Only 7 destinations exceeds 10 000 t of which London Stansted, Keflavik (17 000 t each one) and Milano Linate (14 000 t) are the most important ones.

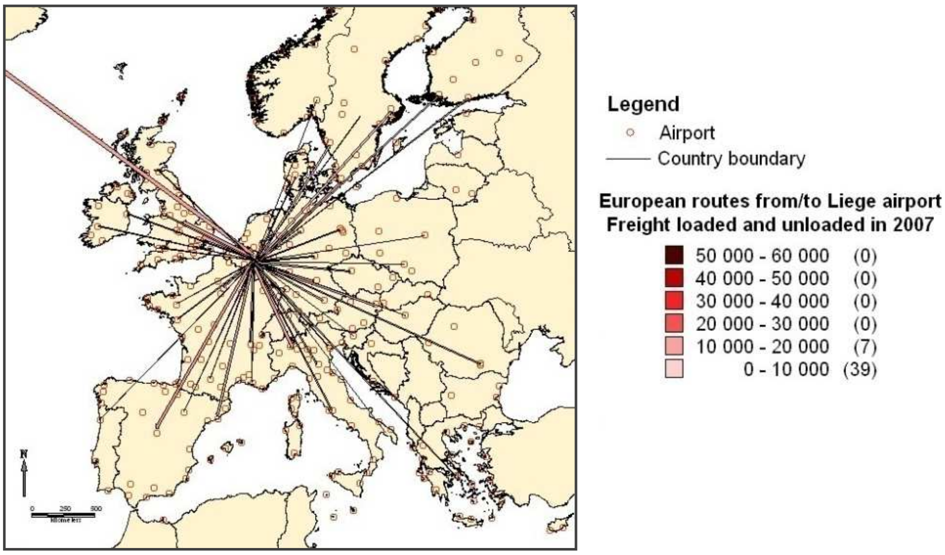
All 46 European destinations represent 61.6 % of the airport's overall traffic: 14 destinations are located in Western Europe (including 6 German destinations) realising 16.3 % of the total traffic, followed by 11 destinations in the Scandinavian countries (16.7 % of the traffic), 10 destinations in Southern Europe (15.5 %) and 5 destinations in the UK (10.6 %). Ljubljana and 5 Eastern European destinations (Prague being the most important one with 3 900 t,

[404] 2 of the 8 North American destinations served from Brussels airport represent less than 10 flights in 2007 each one.

[405] Charter traffic amounts to 298 000 passengers in 2006 and 329 000 passengers in 2007. Airlines such as Nouvelair, Freebird, Thomas Cook, Jetairfly, Belleair and SunExpress serve the airport.

Bucharest/Otopeni, Budapest/Ferihegy, Warsaw/Okecie and Katowice) totalise 2.5 % of the total traffic.

Figure 51: European routes for air freight from and to Liege airport



Own figure

Considering intercontinental traffic, Asia is the most important region representing 32.5 % of tons loaded and unloaded at the airport. Traffic to this region is concentrated on Western Asia comprising 7 destinations, including Tel-Aviv Ben Gurion airport, the most important one, followed by Istanbul/Ataturk airport (8 000 t) whereas the other destinations are below 2 000 t each one. The only Eastern Asian destination Shanghai Pudong airport is the second destination of the airport as regards the volume of cargo loaded and unloaded in 2007.

As regards the number of movements of air freighters (arrivals and departures), 84.3 % of flights concern Europe while Asia and Northern America represent respectively 11.4 % and 4.3 %. The most important destination is still Tel-Aviv Ben Gurion airport, but it is followed by 8 European destinations totalising each one more than 577 flights in 2007 (London Stansted, Nuremberg, Vienna, Bologna, Keflavik, Madrid Barajas, Basel-Mulhouse and Munich). All in all, 18 destinations realise 500 to 1000 flights and 28 destinations 100 to 500 flights.

8.2.1.2. Luxembourg, East Midlands, Oostende, Bergamo, Frankfurt-Hahn, Maastricht and Brescia airports more concentrated on general cargo but also handling express freight

The airports of Oostende, Luxembourg, East Midlands and Bergamo are also used by express freight companies but they do not work as hubs for them. Thus, these airports are more concentrated on the general cargo market segment.

Luxembourg airport

Luxembourg airport is the seventh airport as regards the volume of cargo in 2007 with 703 000 t loaded and unloaded. 13 000 freighter flights were operated. In addition, Luxembourg airport welcomed 1.6 million passengers in 2006 as well as in 2007.

According to Eurostat, 48 destinations were served in 2007 (representing 94.3 % of the airport's overall traffic). The most important route concerns Baku/Heydar Aliyev airport with 146 000 t, followed by Abu Dhabi airport with 52 000 t. Further 19 destinations are served in Asia (of which 3 destinations totalise more than 20 000 t each one). Thus, Asia represents 57.9 % of the total traffic. 8 routes are operated to Northern America of which the busiest are to Huntsville International, New York JFK and Los Angeles International with 34 000 t, 26 000 t and 20 000 t. All in all, Northern American routes correspond to 18.5 % of the total volume of cargo. As regards Africa and Europe, 8 destinations are located respectively in these regions representing 9.9 and 9.4 % of the overall traffic. Relating to the number of aircraft movements, Asia is still the most important destinations region with 50.2 % of all flights but it is followed by Europe representing 21.6 % of all flights.

East Midlands airport

318 000 tonnes of freight were loaded and unloaded in 2007, thus ranking second in the UK and eleventh among European ones. DHL, TNT, UPS, the British Post also use the airport. A specialisation is encouraged by Manchester Airports Group between the airports of Manchester and East Midlands. Manchester airport is used by a hundred airlines offering 115 destinations i.e. the whole range of long- and medium-distance flights, including low-cost and charter traffic to the detriment of freight traffic which is concentrated at East Midlands airport. Nevertheless, the latter was used by 4.7 million passengers in 2006. 32.5 % of them were using charter flights, the rest travelling mainly with low-cost carriers (such as bmibaby, Ryanair and Easyjet).

According to Eurostat, 31 destinations were served from the airport of which 27 are located in Europe: 8 destinations in Western Europe, 5 in Southern Europe, 3 in the Scandinavian countries, 3 in Ireland, 6 in the UK, 1 in Iceland, 1 in Eastern Europe). All in all, they totalise 82.9 % of the overall volume of cargo and 93.4 % of all flights. The two most important destinations are Cologne/Bonn and Belfast International airport with 56 000 t and 41 000 t respectively. East Midlands is connected to the airports handling the largest volumes of cargo in Europe, including also Paris CDG, Frankfurt/Main, Amsterdam, Liege and Leipzig/Halle airport. As regards the remaining 4 destinations, three are located in the USA and one in Kuwait.

Bergamo Orio al serio airport

Bergamo Orio al serio airport handled 134 000 tonnes of cargo in 2007 and 9 800 freighter flights. Except for Tel-Aviv/Ben Gurion airport, all destinations are located in Europe and mainly in Southern and Western Europe. In addition, East Mildands, Budapest/Ferihegy and

Bucharest/Otopeni airports are served. The most important destinations are Cologne/Bonn and Brussels airports with almost 30 000 t each one, followed by East Midlands airport with 13 000 t. Thus, these three destinations represent more than half of the airport's overall traffic. The airport is used mainly by DHL and UPS, thus handling much express freight.

In addition, 5.2 million passengers used the airport, mainly for low-cost traffic.

Oostende airport

Oostende airport in Belgium concentrates also on freight. 105 000 t were loaded and unloaded and 2 400 cargo flights handled in 2007. Moreover, there is some charter traffic (159 000 passengers which is more than 90 % of the total number of passengers). Airlines like Egypt Air, Saudi Arabian airlines and MK (UK) use the airport in order to enter the European market. Thus, more than 90 % of the airport's traffic concerns African destinations (8 routes of which those to Tripoli, Cairo and Lagos are the most important one with 36 000 t, 26 000 and 11 000 t respectively.

Frankfurt-Hahn airport

Frankfurt-Hahn airport is known for its low-cost traffic (3.5 million passengers in 2006, 4.0 million passengers in 2007) but it handled also 112 000 t freight and 3 600 cargo flights in 2007. The airport is served by airlines, such as Aeroflot, Air France Cargo, Air Cargo Germany, Etihad Crystal Cargo, MNG Airlines, National Air Cargo. According to Eurostat 19 destinations were served in 2007 representing 105 000 t, i.e. 94 % of the airport's total traffic. The three most important destinations are Novosibirsk/Tolmachevo, Moscow Sheremetyevo and Cairo airports with 32 000 t, 22 000 t and 14 000 t respectively, i.e. 60 % of the airport's total traffic. Considering also Abu Dhabi and Dubai airports (10 000 t each one), 5 routes concentrate 80 % of the overall volume of cargo loaded and unloaded.

Maastricht airport

58 000 t of freight were loaded and unloaded in 2007 and 3800 flights were operated. According to Eurostat, air services are operated to 5 destinations of which Nairobi Jomo Kenyatta airport alone represents half of the total volume of cargo with 30 000 t. Further two African airports are served: Lusaka and Johannesburg (with 1 900 and 7 400 t respectively). The second most important destination is Istanbul/Ataturk airport with 12 200 t of freight. Finally, air services are also operated to Amman/Queen Alia airport (5 000 t). One of the airlines operating air services from the airport is Cargolux.

In addition, 273 000 passengers used the airport in 2006 (138 000 passengers in 2007). Charter traffic represents 31.2 % of all passengers is 2006. Moreover, KLM had scheduled 1 000 flights from Maastricht to Amsterdam airport and Easyjet 600 flights to Berlin Schonefeld airport in 2006. Both abandoned their flights to/from Maastricht but Ryanair and Transavia are still serving the airport.

Brescia/Montichiari airport

At Brescia airport, 43 000 t of freight were loaded and unloaded and 2 700 flights operated in 2007. Brescia airport is well connected to Italian airports with 14 destinations served in Italy. They represent 44.2 % of the volume of cargo handled. In addition, air services are operated to Athens, Frankfurt/Main and Amsterdam airports but they totalise only 1.7 % of traffic. Moreover, 10 destinations are located in Asia, corresponding to 48.7 % of the overall volume of cargo. As regards aircraft movements, 90.4 % of all cargo flights refer to Italian destinations!

Besides freight traffic, the airport registered also 225 000 passengers in 2006 (186 000 passengers in 2007): two-thirds were carried by low-cost airlines and one-third by charter airlines.

Vatry airport

37 000 t were loaded and unloaded at Vatry airport and 1 100 aircraft movements registered in 2007. The airport is located at 150 km of Paris. The two busiest destinations are Lagos and Entebbe airport with 13 000 t and 11 000 t respectively. All in all, 22 destinations are served from Vatry airport representing 95.8 % of the total volume of cargo and 93.6 % of all flights handled. Air services are operated to 3 European destinations (Milan Malpensa, Vigo and Santa Maria airport) but they totalise only 2.3 % of the volume of freight and 5.1 % of all flights. There is almost passenger traffic (8500 in 2006 of which 58.1 % belong to the charter segment, number of passenger decreased to 4500 in 2007).

8.2.2. The territorial context into which cargo airports are embedded

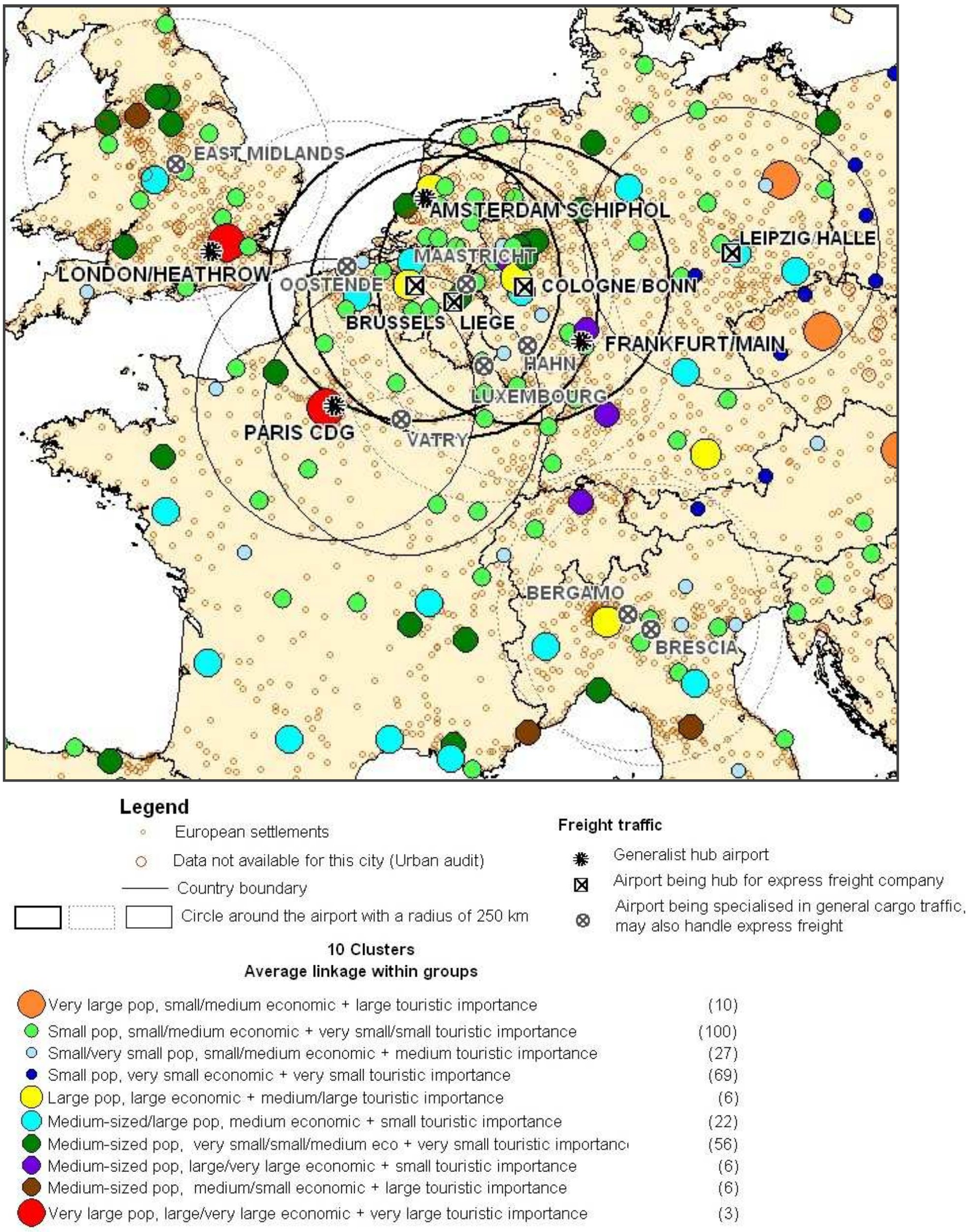
The hubs of the express freight companies and airports that may be considered as being specialised in freight transport are concentrated from a geographic point of view.

8.2.2.1. Proximity to densely populated and economically important zones important to airports having established themselves as hubs of express freight companies

Liege, Brussels and Cologne airport are situated in a triangle, Liege being about 100 km from Brussels and 125 km from Cologne airport and Cologne airport being about 200 km from Brussels airport. Figure 52 illustrates the zones located within a radius of 250 km around these three airports (continuous thick black line).

Due to the proximity of Liege, Brussels and Cologne airports, there is a large area of intersection where are located Brussels, Amsterdam and Cologne, all three being large cities of a large economic importance and a medium/large touristic interest (in yellow). Moreover, one can find in this zone Antwerp and Bonn, two cities belonging to the cluster of a medium-sized/large population, of a medium (partly small) economic relevance and a small (partly medium) touristic importance (in azure), as well as Dusseldorf, a medium-sized city of large/very large economic interest although its touristic relevance is rather small (in purple). Finally, there are further 6 medium-sized cites and 20 small cities even though their economic and touristic importance is very limited (in dark green, light green and light blue). Thus this zone is very dense.

Figure 52: The territorial context into which airports being specialised in general cargo and being hubs for express freight companies are embedded



Own figure

Considering the zones covering a radius of 250 km around the three airports, then Brussels and Liege benefit from their proximity to the urban area of Paris (in red) but also from Lille (in azure) whereas Cologne/Bonn airport profits from the Frankfurt region comprising the city of Frankfurt (medium-sized city of large/very large economic importance despite a rather small touristic interest, in purple) as well as Mainz, Wiesbaden and Darmstadt (in light green) next to Frankfurt as well as Hannover (in azure). Given the very short delivery times and the high cost of freight express, these airport need to be located next to the economic centres of the region that is served by them. This applies also to Paris CDG airport which has established itself as hub for Federal Express. Paris CDG airport benefits mainly from the direct vicinity of the urban area of Paris and is situated relatively close to this densely populated and economically powerful zone served by Liege, Brussels and Cologne/Bonn airports (see continuous thin black line representing zone within 250 km around the airport).

Leipzig/Halle airport, where DHL established its new hub after having been forced to leave Brussels airports due to complaints from residents for noise nuisance, is located away from the just described densely populated and economically important zone served by Liege, Brussels and Cologne/Bonn airport. However, within a radius of 250 km around Leipzig/Halle airport are situated not only Berlin and Prague, two capitals figuring among cities of a very large population, a rather small/medium economic importance but a large (partly medium) touristic relevance (in orange), but also a number of medium-sized/large cities of a medium (partly small) economic interest and a small (partly medium) touristic importance (Leipzig, Dresden, Hannover and Nuremberg, in azure) and at least 10 small or very small cities (in light green, light blue and dark blue). Moreover, this zone is less well served by air transport and airport infrastructure is less developed, which is also due to the commitment already made by the former flag carriers to their respective hub airports whereas Leipzig is located in the Eastern part of Germany between two former political frontier: To the west of Leipzig is the former political frontier between West Germany and the RDA; to the east is the former external frontier of the European Community which has been existing for about fifteen years until Poland and the Czech Republic joined the EU in 2004.

8.2.2.2. Next to large metropolitan areas but located rather outside of dense urban areas important to cargo airports handling general cargo but also express freight

The airports being specialised in general cargo although they may also handle express freight are also close to densely populated and economically important zones but they are located rather outside of dense urban areas. This is possible since delivery times are less tight and represents an advantage with respect to noise nuisance as airports aiming at developing freight traffic need to operate day and night. Figure 52 illustrates the zones located within a radius of 250 km around these eight airports by a thin grey dotted line.

Oostende airport is relatively close to the densely populated and economically important zone served by Liege, Brussels and Cologne airport but it is located outside of the dense urban area. Luxembourg airport is in a similar position but whereas Oostende is located to the west of the triangle formed by Liege, Brussels and Cologne airports, Luxembourg airport is situated to the south of it and takes thus a more central position. This also applies to Maastricht airport and in particular to the airports Hahn and Vatry.

East Midlands airport too is situated outside of a dense urban area but in the centre of England with Birmingham (azure) and Manchester (brown), two medium-sized cities of medium economic interest but of varying tourist importance (small and large respectively), being situated at 50 to 100 km from the airport. Further four medium-sized and six small cities are located within a radius of 150 km. Finally, there is the dense urban area of London which is only 200 km from the airport.

Bergamo and Brescia/Montichiari airports are situated in Northern Italy, outside of a densely populated area but still close to the major economic centre of Italy, and at only 50 km of each other. Milan, a large city of a large economic importance and a medium/large touristic interest (in yellow), is at less than 50 km of Bergamo airport which is very important since the airport handles mainly express freight and at 100 km of Brescia airport. Within less than 250 km are also located Turin and Bologna (in azure), medium-sized/large cities of medium (small) economic importance and of small (medium) touristic relevance. In addition, Florence and Genoa, two medium-sized cities of medium/small economic importance (in brown and dark green) as well as further seven small cities (in light blue and light green) are located within 250 km in an eastward direction. Unlike figure 52 might suggest, Zurich being at less than 250 km is more difficult to reach than Bologna or Florence as one has to pass the Alps.

Finally, figure 53 indicates the larger territorial context into which freight airports are embedded by illustrating the zones that are located within a radius of 500 km around the airports. They represent the area that may be covered within one day road haulage.

Figure 53: The larger territorial context for freight airports and hubs for express freight

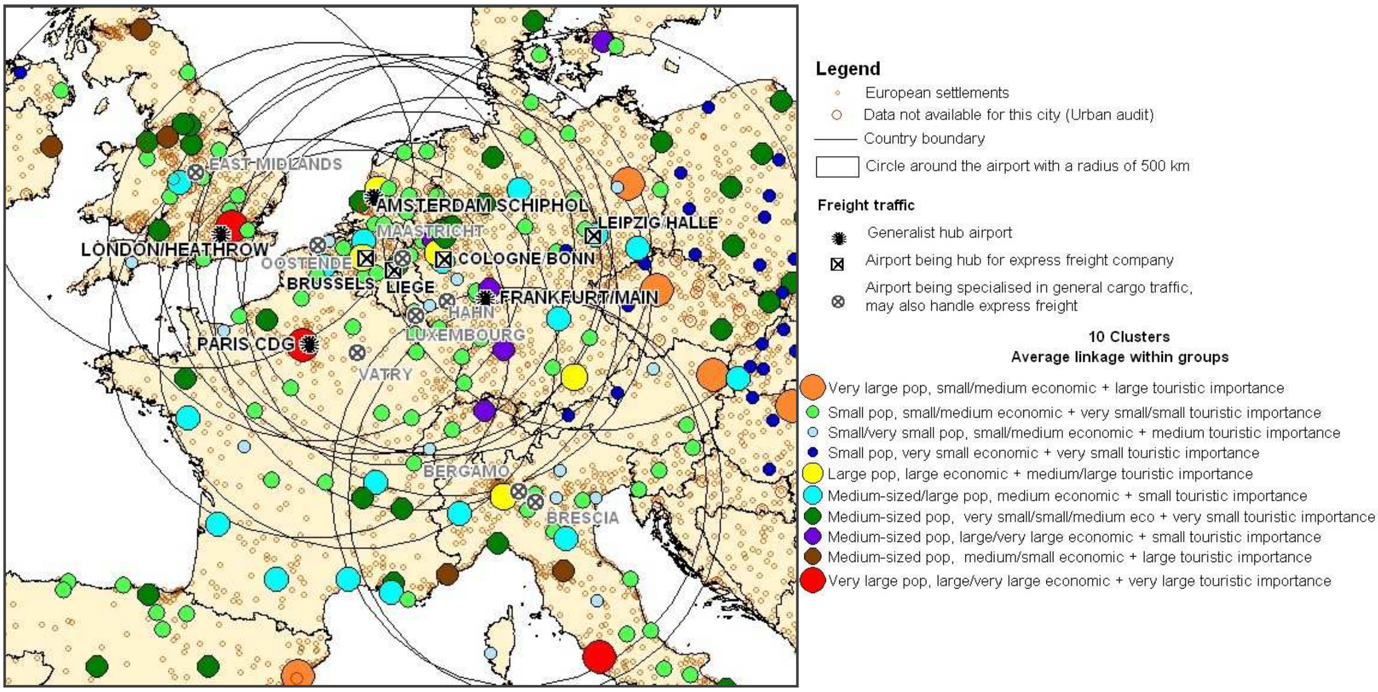


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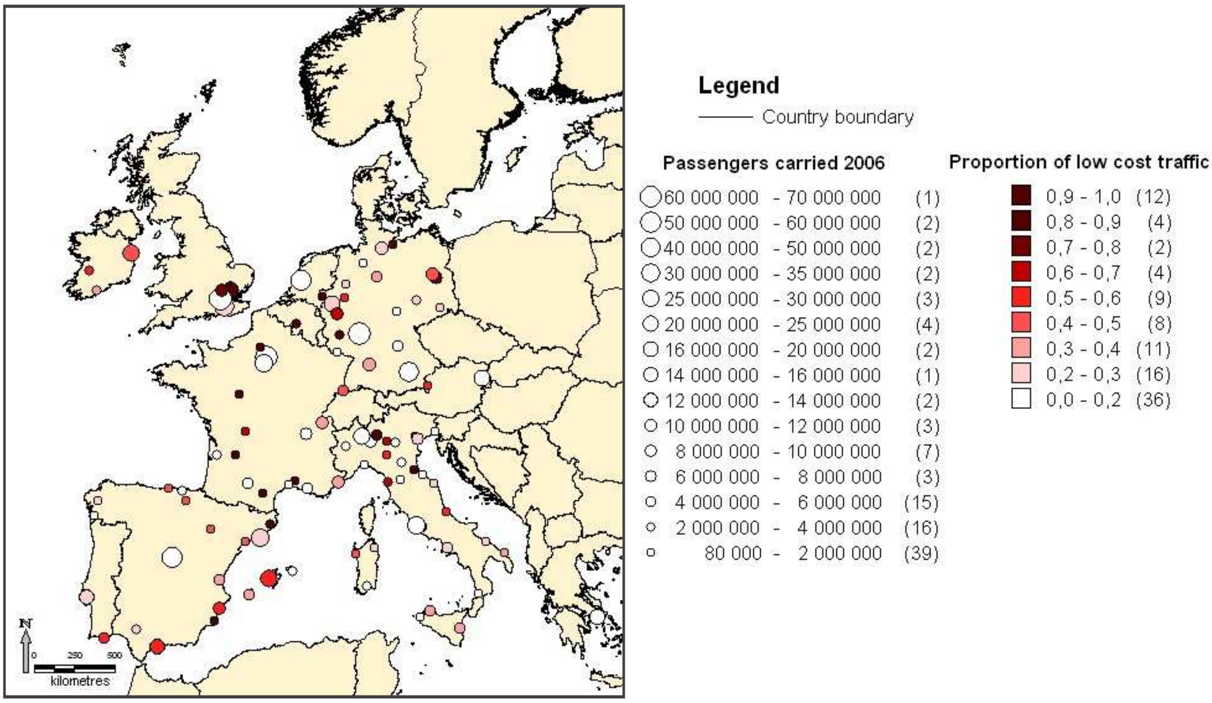
Figure 53 points up the small size of the area where population and economic activity are concentrated. Due to relatively small distances, the zones of 500 km around the airports of Liege, Brussels, Cologne, Oostende, Luxembourg, Hahn, Maastricht, Vatry and Paris CDG overlap largely. There is even a quite large area of intersection with the zones of 500 km around the airports of Leipzig/Halle as well as of Bergamo and Brescia even though being located more to the east and to the south respectively. As regards East Midlands airport, there can also be identified a relatively large area of intersection with the airports being located on the European mainland. However, the Channel represents a barrier for which reason it is more difficult to reach East Midlands when coming from the European mainland than another airport situated at a similar distance but on the same side of the Channel.

8.3. Emergence of airports with a strong low-cost traffic

Low-cost carriers have entered the market only since the liberalisation of air transport within the EU.[406] However, it is mainly since 2000/2001 that low-cost traffic has been booming. No-frills airlines operate primarily point-to-point air links that are characterised by relatively high volumes of traffic. However, low-cost airlines do not constitute a homogenous group, also as regards network structures. For this reason, a large number of airports are concerned by the growth of low-cost traffic. This is also illustrated by figure 54 which indicates the proportion of passengers carried by low-cost airlines in the total traffic of about 100 European airports in 2006. The focus is on airports located in Germany, France, Spain and Italy.

Figure 54: The proportion of low-cost traffic in the overall passenger throughput of European airports in 2006



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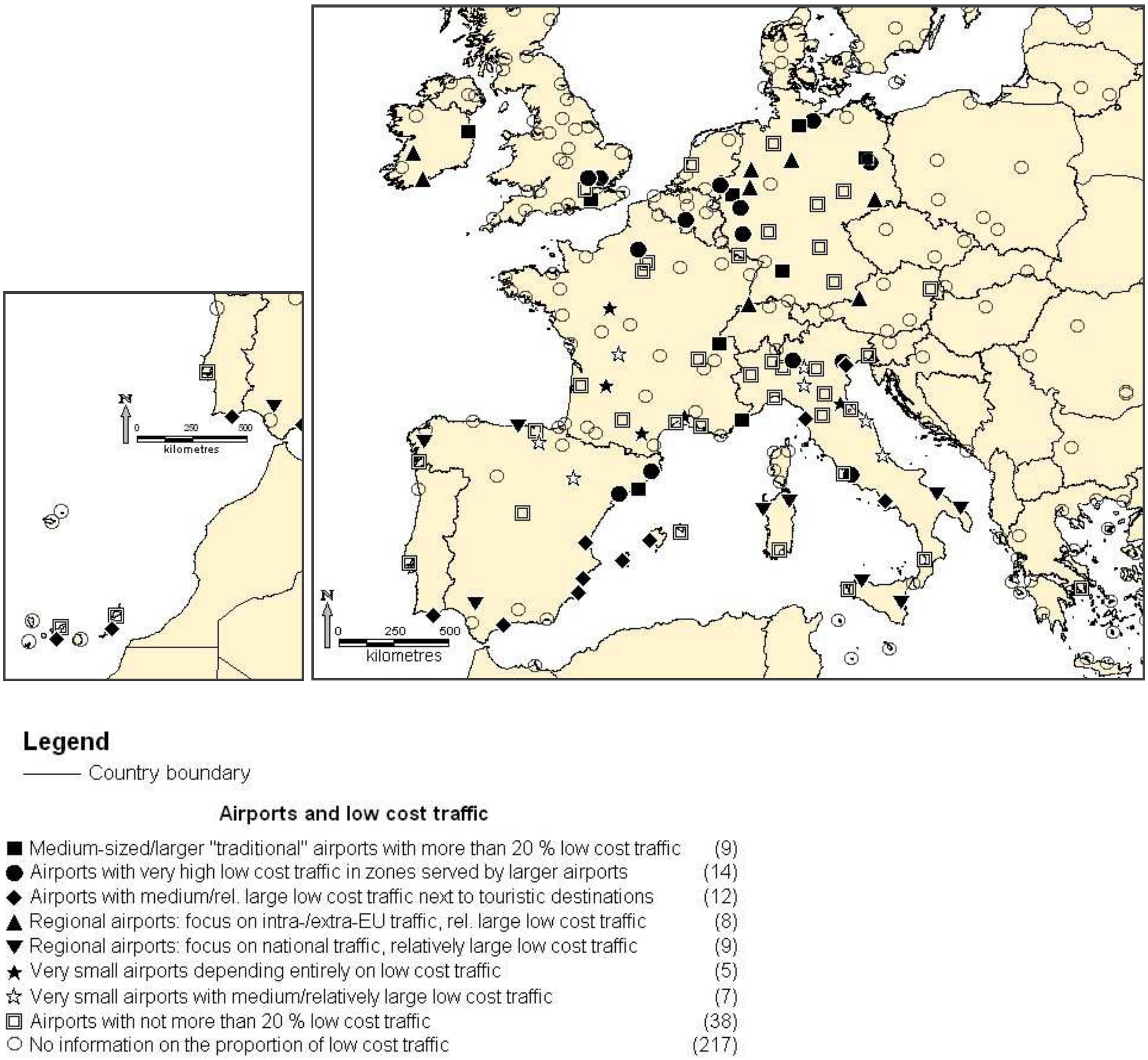
For two-thirds of the airports considered low-cost traffic represents more than 20 % of their total passenger throughput. For half of them, low-cost traffic corresponds even to more than 50 % of their overall traffic. Thus, low-cost traffic concerns a large number of airports. Apart from the four generalist hubs London Heathrow, Paris CDG, Frankfurt and Amsterdam airports, where the proportion of low-cost traffic is very low due to capacity shortage mainly, airports of all sizes seem to profit from the growth of low-cost airlines. For this, reason,

[406] Ryanair began its flight operations already in 1985, during a decade in which the bilateral arrangements for the operation of air services between the UK and Ireland were liberalised. Once the third liberalisation package was introduced in 1993 Ryanair was able to start services between the UK and continental Europe. Easyjet launched flights between London and Scotland in 1995 and started operating its first routes between the UK and continental Europe in 1996.

chapter 8.3 focuses on a selection of airports which are characterised by more than 20 % of low-cost traffic in their total passenger throughput. Differences may be distinguished as regards their traffic patterns (figure 55) but also with respect to the territorial context into which the airports are embedded. Before concentrating on the territorial context into which the airports are embedded, their traffic patterns will be analysed.

Figure 55: Different types of airports handling low-cost traffic in 2006



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8.3.1. Traffic patterns

The airports which have benefited from the growth of low-cost traffic may be classified according to different types. They will be presented in detail in the following.

8.3.1.1. *Medium-sized and larger "traditional" airports with a rather medium proportion of low-cost traffic, served by traditional full service carriers and some charter airlines*

The first group (■) refers to medium-sized and larger airports which already had a relatively strong passenger throughput before the emergence of no-frills airlines[407] The proportion of passengers carried by low-cost carriers in their total traffic goes to 40 %, even 70 % for Dublin airport when considering also Aer Lingus which officially withdrew from Oneworld only in 2007 due to its new focus on low-fare traffic. Among these airports figure London Gatwick, Dublin, Barcelona, Hamburg, Dusseldorf, Berlin Tegel, Stuttgart, Geneva and Nice. The traffic growth over the period from 2000 to 2006 varies according to the airports. Whereas Dusseldorf, Nice and London Gatwick registered a quite low rise in their traffic (4 % to 7 %), the passenger throughput for Dublin and Barcelona increased by 54 %. Berlin Tegel, Hamburg, Stuttgart and Geneva are situated in between with a traffic growth of 15 % to 28 %. During the same period, charter traffic has decreased, in percentage shares in the overall traffic for all airports and also in absolute numbers (except for Barcelona where it has slightly increased). Non scheduled traffic remains an important market segment for London Gatwick airport which has always handled a relatively large part of charter traffic corresponding to still 26.4 % of its total traffic in 2006 (in comparison to 34.4 % in 2000). All other airports registered a rather modest proportion of non scheduled traffic (up to 9 % of their total passenger throughput in 2006 in comparison to up to 15 % in 2000).

These airports are served by the traditional full service airlines, too. They all offer a relatively wide range of destinations. The focus is on national and/or intra-European traffic, except for London Gatwick and Dusseldorf airports where passengers travelling to extra-EU destinations corresponds to 35 %[408] and 27 % of the airport's overall traffic respectively. As regards London Gatwick, this large proportion of extra-EU traffic is in part due to charter traffic of which 39.8 % of all passengers are travelling to extra-EU destinations. For both airports, intra-European traffic represents about 50 % of all passengers whereas national traffic is relatively small. In contrast, national traffic represents between 40 % and 48 % of all passengers for Hamburg, Berlin Tegel, Nice and Barcelona airports, and the rest being mainly intra-European traffic (39 % to 44 %) whereas extra-European flights corresponds to 10 % to 16 % of the airport's passenger throughput. Due to their geography, Dublin and Geneva handle very little national traffic; they focus on European routes on which travel more than 90 % of their passengers[409].

In the following, Dublin, Geneva, Stuttgart and Nice airports will be considered in detail.

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[407] In 2000, passengers numbers ranged from almost 8 million (Geneva and Stuttgart airports) to 31 million (London Gatwick airport).

[408] As regards extra-EU traffic, it is mostly intercontinental traffic according to Eurostat route data: For London Gatwick 30 % of all passengers travel on intercontinental routes.

[409] The notion of intra-European traffic has no meaning for Geneva airport since Switzerland did not join the European Union.

Dublin airport

The airport counted 21 million passengers in 2006 (23.2 million in 2007). Low-cost traffic is particularly important as the Irish carrier Ryanair established its base at Dublin airport and even surpassed Aer Lingus as the airport's largest passenger carrier in June 2006. In 2007, Ryanair passengers represented just over 40 % of the airport's overall passenger throughput in comparison to Aer Lingus with 34 %. Aer Lingus, the former national carrier, which switched to low-cost traffic. Dublin airport is served by other low-cost airlines, too, including FlyBe, Centralwings, Germanwings and Sky Europe Airlines. Moreover, the traditional full service carriers such as Lufthansa, British Airways, Air France, Alitalia, Iberia and SAS which offer services to their respective hubs. Dublin airport handles also some charter traffic corresponding to 8.7 % of the airport's passenger throughput.

In 2006, a total of 94 airlines served 183 destinations from Dublin of which 47 scheduled operators served 142 scheduled routes. According to Eurostat, which registers traffic on 74 major routes representing 86 % of the airport's total traffic, there is a clear focus on European destinations (68 according to Eurostat) totalising more than 90 % of all passengers. As regards intercontinental traffic, Northern American destinations are the most important. In Europe, the Dublin-London route is the busiest. In addition, the three London airports Heathrow, Stansted and Gatwick served from Dublin head the ranking of the most important destinations with 2.0 million, 1.0 million and 747 000 passengers in 2006.

Geneva airport

Geneva airport, 9.8 million passengers in 2006 (10.7 million in 2007), was confronted quite early to the withdrawal of Swissair and had to look for airlines that could be interested in operating from the airport. Since then the market share of Easyjet has increased up to 32.6 % in 2006 (Aéroport International de Genève, 2007, p. 5). The airport based its strategy on establishing customer loyalty and building up a lasting relationship with the airlines, which is even more important for low-cost carries. The airport also segments services according to airline requirements (like creating a dedicated low-cost terminal).

Easyjet Switzerland, a subsidiary of Easyjet, has its operational base at Geneva. In 2006, Easyjet[410] offers 29 destinations served by Geneva. The two most important routes are Geneva-London Gatwick and Geneva-London Luton with 1571 and 1551 flights scheduled in 2006. Further 4 routes are operated with more than 700 flights scheduled in 2006: Nice, Paris Orly, Amsterdam and Barcelona. Finally, 10 destinations are served with more than 300 flights (Rome Ciampino, Liverpool, London Stansted, Bristol, Berlin Schonefeld, Madrid Barajas, East Midlands, Alicante and Newcastle). In addition, Easyjet started daily flights to Hamburg and Prague as well as seasonal services to Ibiza, Olbia and Palma de Mallorca. In 2007, Easyjet entered some routes already served by competitors, e.g. Bordeaux (daily flights), Brussels (twice daily) and Porto (daily) as well as seasonal flights to Cagliari. Moreover, Easyjet launched medium-haul services to Marrakech and Las Palmas (Gran

[410] Figures refer to Esasyjet and Easyjet Switzerland.

Canaria). Other low-cost carriers using the airport are FlyBe, Fly Globespan and Jet2.com with air services to four, two and two British destinations respectively. Norwegian Air Shuttle and Atlas Blue served Oslo and Marrakech respectively already in 2006 and expanded their services in 2007. All in all, low-cost traffic represents 35.9 % of scheduled traffic (in passengers).

The airport is also served by the Star alliance, SkyTeam and Oneworld alliance which represent 24.7 %, 16.2 % and 12.8 % of scheduled traffic. In addition, there is some charter traffic (5.5 % of all passengers carried).

In 2006, a total of 47 scheduled airlines served 100 destinations from Geneva of which 77 are in Europe and 23 outside (Aéroport International de Genève, 2007, p. 6). According to Eurostat, which indicates the traffic of 36 routes representing only 77 % of the airport's total passenger throughput, there is a clear focus on Europe with 32 destinations realising 95 % of the airport's overall traffic. The three most important routes concern London Gatwick, Paris CDG and London Heathrow with 600 000 to 700 000 passengers each one. The Geneva-Zurich route ranks fourth with 550 000 passengers carried in 2006.

Stuttgart airport

Stuttgart airport was used by 10.0 million passengers in 2006 (10.3 million in 2007). Whereas charter traffic amounted to 8.4 %, low-cost traffic represented 36.4 % of the airport's total passenger throughput in 2006.

Several low-cost airlines serve the airport, Germanwings being the largest of them and ranking second behind Lufthansa. According to OAG data, Germanwings concentrated 17.4 % of all seats offered and 13.6 % of all departing flights scheduled in 2006 (compared to 24.2 % and 31.6 % respectively for Lufthansa). Berlin Schonefeld was the busiest destinations with 1135 flights, followed by Hamburg with 939 flights as well as London Stansted, Dresden and Vienna with 650 to 700 flights. Further five destinations are served by 300 to 600 flights and 11 destinations by 100 to 300 flights in 2006. All in all, 28 routes were operated. The second low-cost airline is Hapag-Lloyd Express which represented 10.5 % of all seats available and 8.9 % of all flights scheduled serving 23 destinations[411]. Berlin Tegel, Hannover and Palma de Mallora were served by 859, 527 and 411 flights respectively. Further three destinations, namely Paris Orly, Milan Malpensa and Leipzig, represented 300 to 400 flights each one. Finally, 300 to 400 flights were operated to three destinations and 100 to 300 flights to 11 destinations. The third largest low-cost carrier was Hapagfly with 8.5 % of all seats available and 5.1 % of all flights scheduled. With 49 destinations Hapagfly operated a large number of routes but frequencies were relatively low: more than 200 flights to Las Palmas (Gran Canaria) and Tenerife Reina Sofia more than 200 flights, 100 to 200 flights to ten destinations and less than 100 flights to 37 destinations. Among the other low-cost airlines serving Stuttgart airport were Air Berlin (in particular for serving Palma de Mallorca: 639 flights scheduled), Condor (also flying in Palma de Mallorca: 410 flights and 100 to 200

[411] Including 8 destinations with less than 10 flights scheduled in 2006 according to OAG data.

flights to Tenerife Reina Sofia, Antalya, Las Palmas de Gran Canaria) and DBA (offering more than 1000 flights to Berlin Tegel and Hamburg as well as serving Hannover and Nice).

In addition to Lufthansa offering services to 8 German destinations (including Berlin Tegel, Hamburg and Frankfurt with 2590, 2118, 2090 flights and Munich, Dusseldorf and Bremen with 1952, 1935 and 1035 flights) and 12 European destinations, all former European flag carriers fly in Stuttgart[412] in order to feed their respective hubs.

About 60 airlines serve the airport. As regards major destinations, Eurostat figures refer to only 33 routes representing just 73 % of the airport's total passenger throughout. According to this, 85 % of all passengers travel to European destinations but there are also some important destinations in Northern Africa (Hurghada and Monastir airports), in Turkey (Antalya, Istanbul Ataturk and Izmir airports) as well as in Northern America (Hartsfield-Jackson Atlanta International airport). The three busiest routes in Europe are those to Berlin Tegel, Hamburg and Palma de Mallorca with 781 000, 760 000 and 595 000 passengers carried in 2006.

Nice airport

Nice airport, 9.9 million passengers in 2006 (and 10.4 million in 2007), is served by traditional full service airlines as well as by a number of low-cost airlines, including Easyjet, DBA, Fly Globespan, bmibaby, Norwegian Air Shuttle, Sterling Airlines and Sky Europe Airlines, the two latter having gone bankrupt in 2009. In return, Ryanair and Vueling have started flying in and out of Nice airport in 2007. Whereas there is almost no charter traffic, low-cost traffic corresponded to 34.0 % of all passengers in 2006, i.e. about 3.4 million passengers. Easyjet was with 2.0 million passengers, i.e. 20.3 % of the airport's overall traffic, the most important low-cost carrier and second airline behind Air France which represented 31.9 % of the total traffic. As regards airline alliances, SkyTeam totalised 43.7 % of the airport's traffic, the traffic of Star Alliance and Oneworld corresponding to 10.3 % and 8.7 % respectively (Aéroports de la Côte d'Azur, 2007, p. 26).

OAG data confirm the position of Easyjet which represented 18.9 % of all seats available and 10.8 % of departing flights scheduled in 2006, coming just behind Air France (21.1 % and 31.4 % respectively). All in all, Easyjet served 13 destinations of which Paris Orly and London Luton were the most important with 1 764 and 1 254 flights respectively. Further 3 destinations were served by more than 700 flights (Geneva, London Gatwick and Paris CDG airports). More than 300 flights were operated on routes towards Liverpool, London Stansted, Basel-Mulhouse, Berlin Schonefeld and Bristol airports.

In 2006, domestic traffic represents 43.5 % of the airport's total number of passengers. The most important destinations are Paris Orly and Paris CDG airports representing together 3.2 million passengers, i.e. 74 % of all domestic traffic. 52 % of all traffic is European (including

[412] Traditional full service carriers include KLM (1589 flights to Amsterdam), SAS (1146 flights to Copenhagen), Alitalia (1088 flights to Milan Malpensa), British Airways (1086 flights to London Heathrow and 848 flights to Birmingham), Austrian Airlines (1064 flights to Vienna), Turkish Airlines (738 flights to Istanbul Ataturk airport) and Air France (1695 flights to Paris CDG airport and 734 flights to Lyon Saint Exupery).

destinations inside and outside of the EU). Consequently, only 4.5 % of the airport's traffic concerns intercontinental destinations (Aéroports de la Côte d'Azur, 2007, p. 27).

8.3.1.2. *Airports with a very high proportion of low-cost traffic located in zones that are already served by larger airports but not necessarily within this market segment*

The second group (●) relates to Charleroi, Bergamo, Rome Ciampino, Treviso, London Stansted and London Luton, Frankfurt-Hahn, Cologne/Bonn, Niederrhein/Weeze, Berlin Schonefeld, Beauvais, Girona and Reus airports. They are characterised by a very large proportion of low-cost traffic of almost 70 % up to 100 % (the only exception being Reus airport with 46.6 % where charter traffic is even more important with 51.3 % of the airport's total passenger throughput). Over the period from 2000 to 2006, most airports registered a spectacular growth: The passenger throughput for Charleroi has been multiplied by more than eight, for Rome Ciampino and Girona by about six, for Beauvais by five, for Bergamo by more than four and for Schonefeld by almost three. The traffic increase ranged from 50 to 100 % for London Luton, Stansted, Cologne/Bonn and Reus.[413] Thus the traffic growth registered by these airports has been considerably higher than for those airports belonging to the first group and low-cost traffic contributed largely to this development. Moreover, these airports are all located in zones that are already served by larger airports but not necessarily within this market segment.

Except for Reus airport, charter traffic represents only a small part of traffic in 2006 (between 0 % and 11 %). Charleroi, Frankfurt-Hahn, Beauvais, Niederrhein/Weeze, Lubeck and Treviso airports owe all their traffic growth to low-cost airlines and have never handled much charter traffic. Rome Ciampino, Bergamo, London Luton, London Stansted and Berlin Schonefeld had a relatively important charter traffic before the emergence of low-cost traffic (73.2 %, 68.3 %, 61.5 %, 31.7 % and 24.0 % respectively in 1996) whereas Girona and Reus airports were dedicated entirely to non scheduled traffic with more than 95 % of all passengers carried by charter airlines in 1996.[414] Most of these airports are not served by full service airlines.

Apart from Reus airport which is characterised by large charter traffic, the airports belonging to this group will be presented in detail.

Charleroi

The Belgian airport of Charleroi registered 2.2 million passengers in 2006 (2.4 million in 2007). It is mainly used by Ryanair offering air services to about twenty destinations. In

[413] For Lubeck and Treviso airports, the traffic has been multiplied by almost three from 2001 to 2006. For Frankfurt-Hahn, the passenger throughput has increased by 140 % from 2002 to 2006 and for Niederrhein/Weeze by 180 % from 2003 to 2006. Earlier data is not available.

[414] Strictly speaking Beauvais airport handled 100 % non scheduled traffic but the airport counted only 60 000 passengers in 1996.

addition, Wizzair served three destinations in 2006 (Budapest/Ferihegy and Warsaw with almost 300 and Ljubljana airport with 100 flights scheduled) according to OAG data. There is no charter traffic.

Bergamo Orio al Serio airport

The airport of Bergamo Orio al Serio handled 5.2 million passengers in 2006, i.e. +80 % since 2003 and a traffic multiplied by 14 compared to 1998). After express freight, the airport turns towards low-cost traffic which represents 85.8 % of all passengers in 2006 whereas charter traffic corresponds to only 11.0 %[415]. In 2006, the airport was served by different low-cost airlines such as Blue Air, Wizzair, Air Berlin, Smart Wings and also by MyAir and SkyEurope, the latter two having gone bankrupt in 2009. Bergamo airport is one of the Ryanair bases offering services to more than 20 destinations and also intra-Italian flights (e.g. to Rome Ciampino).

In fact, Ryanair became the second international carrier on the Italian market entering direct competition with traditional airlines. But also Alitalia and Lufthansa serve the airport: Alitalia offering flights to Rome/Fiumicino airport and Lufthansa to Munich airport with 651 and 232 departing flights scheduled in 2006 respectively according to OAG data.

Rome Ciampino airport

Rome Ciampino was Rome's main airport until 1960. Since the opening of Rome Fiumicino airport, Rome Ciampino handled only some charter and executive flights. However, since 2002 the airport has shown a considerable growth reaching 4.9 million passengers in 2006, i.e. +180 % since 2003 and a traffic multiplied by 7 since 2001. The charter traffic corresponds to only 1.7 % of the total volume of passengers in 2006 but low-cost airlines are very busy representing 98.5 % of the total passenger throughput.

The airport is another hub of Ryanair. Thus, the airline has been making a major contribution to traffic growth of Rome Ciampino airport. In 2006, the airport was also used Easyjet, Wizzair, Blue Air, Norwegian Air Shuttle, Smart Wings and Hapag-Lloyd Express[416] as well as by some airlines having gone bankrupt in the meantime (Centralwings, MyAir, Sterlin Airlines). For instance, Easyjet[417] served 11 destinations, London Gatwick, Berlin Schonefeld and Geneva airports being the most important ones with about 700 flights scheduled in 2006 according to OAG data. Further five destinations exceed 300 flights scheduled (East Midlands, Newcastle, Bristol, Basel-Mulhouse and Dortmund airports).

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415 The figure concerning charter traffic comes from the Eurostat data base whereas the figure referring to the share of low-cost airlines in the airport's total passenger throughput was published by the Italian Civil Aviation Authority (ENAC, 2007, p. 83). This applies to all Italian airports.

416 Hapag-Lloyd Express combined its operations with Hapagfly (Hapag-Lloyd Flug called prior to 2005) in January 2007 to become TUIfly.

417 Including Easyjet Switzerland.

Treviso airport

Treviso airport counted 1.3 million passengers in 2006. 97 % of all passengers are carried by low-cost airlines. Thanks to low-cost traffic the airport's total passenger throughput has almost doubled between 2003 and 2006. Charter traffic represents 2.5 % of all passengers.

The airport is used by Ryanair. Thus, the Treviso-London Stansted route was the busiest in 2006 with more than 300 000 passengers. In addtition, Alpi Eagles, an Italian low-cost carrier, served with Rome Ciampino a domestic destination (53 flights in 2006 according to OAG data, 184 000 passengers in 2006 according to OAG data). Moreover, Transavia served Amsterdam from Treviso (283 flights scheduled in 2006). Full service carriers do not operate at Treviso airport.

London Stansted airport

London Stansted airport handled 23.7 million passengers in 2006, i.e. the traffic has been multiplied by more than six since 1996. While charter traffic corresponds to only 3.9 % of all passengers, a large part of traffic is operated by no-frills airlines of which the busiest are Ryanair, Easyjet and Air Berlin representing 59 % of aircraft movements and 88 % of passenger traffic in 2006.[418]

Easyjet, which is only the second airline behind Ryanair, served 25 destinations according to OAG data of which Edinburgh, Belfast International and Glasgow airports totalise 1962, 1659 and 1658 departing flights scheduled in 2006. Further 3 destinations register more than 1000 departing flights (Newcastle, Amsterdam and Copenhagen Kastrup airports with 1424, 1062 and 1038 flights respectively). In addition, more than 700 flights are operated to five destinations (Malaga, Alicante, Munich, Prague and Barcelona airports) and finally still more than 300 flights to 14 destinations. Air Berlin, the third busiest airline, served 12 destinations in 2006 of which Berlin Tegel and Dusseldorf airports are the two most important ones with 1200 departing flights scheduled for each one in 2006. Further 8 routes are operated with 300 to 650 departing flights whereas only two destinations (Palma de Mallorca and Alicante) register fewer flights. Even though transfers are not guaranteed, the airport becomes a hub de facto as passengers make connections on their own.

London Luton airport

London Luton airport counted 9.4 million passengers in 2006 (and 9.9 million passengers in 2007). This means that its traffic has been multiplied by almost five over the last ten years. The charter traffic (e.g. Thomason Airways, First Choice, Thomas Cook) represents 8.1 % of the total volume of passengers, the rest being mainly, about 70 %, low-cost traffic which contributed largely to the traffic increase (OPSTE, 2007, p. 88). The three largest low-cost carriers serving the airport are Easyjet, Ryanair and Wizzair representing 56 %, 13 % and 8 %

[418] In 2006, the market shares of Ryanair, Easyjet and Air Berlin amount to 39 %, 15 % and 5 % of aircraft movements and to 63 %, 20 % and 5 % of passenger traffic respectively (BAA, 2007).

of all aircraft movements (London Luton Airport, Luton Borough Council, 2007, p. 10). Easyjet established its base at Luton and operates air services to 32 destinations: Edinburgh, Glasgow, Belfast International, Amsterdam airports are with 1916, 1914, 1 659 and 1614 flights respectively the four most important destinations, followed by Geneva, Paris CDG, Nice and Barcelona airports totalising more than 1100 flights. In addition, five destinations register 700 to 1000 flights, and 12 destinations 300 to 700 flights and finally seven destinations less than 300 departing flights scheduled in 2006. The third largest airline, Wizzair, served 10 destinations from the airport. They are all located in the former communist countries, Katowice, Warsaw, Gdansk and Budapest being the most important airports with 671, 670, 546 and 393 departing flights scheduled in 2006.

Frankfurt-Hahn airport

Frankfurt-Hahn totalised 3.5 million passengers in 2006. Only between 2003 and 2006, the volume of passengers increased by 50 %. The former US air base was turned over to civil German authorities in 1993 which decided to use it as civil airport. One of the main investor was Fraport AG which, however, decided to withdraw from the loss-making airport as from January 2009. This decision was based on divergences on the future development of Hahn airport. The airport charging its airlines only small fees due to its remote location, Fraport wanted to introduce an additional tax per passenger in order to prevent losses. Ryanair, which serves the airport since 1999 and established a major base at Hahn in 2001-2002, was strictly opposed to this project threatening to leave the airport. In 2006, 96 % of all flights are operated by the airline (DLR, ADV, 2007, p. 4). In addition, Wizzair and Iceland Express operate some services from and to Hahn airport. All traffic is low-cost.

Cologne/Bonn airport

Cologne/Bonn is the hub of UPS but the airport counted also 9.8 million passengers in 2006 (10.4 millions in 2007). Whereas charter traffic represents only 5.2 % of the total number of passengers in 2006, 68.2 % of the total traffic is low-cost which corresponds to 6.7 million passengers (DLR, ADV, 2007, p. 13). Thus the airport registered the largest number of passengers travelling with low-cost airlines among all German airports.

The most important airline was Germanwings[419], a no-frills airline, its traffic corresponding to 34.8 % of the total number of seats available and 30.6 % of all departing flights scheduled according to OAG data. It was followed by Lufthansa representing 18.5 % of all seats available and 22.7 % of all departing flights and by Hapag-Lloyd Express[420], another low-cost carrier, totalising 17.7 % and 15.3 % respectively.

Germanwings offered air services to the largest number of destinations, namely 49. Munich, Berlin Schonefeld and Vienna were the most important destinations with 1330, 1171 and

[419] Germanwings was founded in 1997 as a 100 % subsidiary of Eurowings of which 49 % were held by Lufthansa. As from 1 January 2009, Eurowings sold its participation to Lufthansa.

[420] Hapag-Lloyd Express and Hapagfly combined their operations to become TUIfly in January 2007.

1039 departing flights scheduled in 2006. Further three destinations totalised 700 to 1000 flights (London Stansted, Zurich and Dresden) and 12 destinations registered more than 300 flights. Finally, 18 destinations were served by more than 100 flights in 2006. Hapag-Lloyd Express covered 25 destinations[421] of which Berlin Tegel airport was by far the busiest with 2030 flights scheduled. It was followed Hamburg airport with 777 flights and 6 airports totalising 300 to 500 flights (Palma de Mallorca, Venice Marco Polo, Klagenfurt, Salzburg and Naples airports). Moreover, no-frills airlines such as Hapagfly, LTU[422], DBA[423], Condor, Wizzair, Centralwings and Blue Air used the airport in 2006.

Niederrhein/Weeze airport

After the British withdrew from Niederrhein/Weeze airport in 1999, the former military base is sold to a Dutch group of investors in 2001 which gets the authorisation for using the airport for civilian air traffic. After the construction of a new passenger terminal and a new apron, the airport starts operations in 2003. Ryanair was the first airline serving the airport: 3 flights per week to London. Then, V Bird established its base at the airport but the airline, founded in 2003, had to face complaints by the neighbouring commune of Bergen which resulted in flight restrictions during the weekend. Flight diversions and the transportation of the passengers to alternative airports cost over one million EUR. For this reason, the airline suspended operations on 8 October 2004 and filed for bankruptcy.

Other low-cost carriers, such as Hapagfly, started flying in and out Niederrrhein/Weeze airport and Ryanair increased its transport offer. Due to the traffic growth, residents and the neighbouring commune of Bergen brought a legal action against the airport. As a result, the Higher Administrative Court in Munster decided to cancel the airport's operating licence on 3 January 2006. An appeal was refused by the Court. For this reason, the Dusseldorf District Government filed an objection against the refusal of the appeal. The airport continued operating but due to the legal uncertainty some airlines ceased flights. In February 2007, the German Administrative Court in Leipzig decided that the Dusseldorf District Government could appeal the decision of Higher Administrative Court in Munster to cancel the airport's operating licence. In the meantime, the traffic has increased at the airport with Ryanair establishing one of its bases at the airport and adding new routes. Niederrhein-London Stansted route operated by Ryanair was the busiest with 169 000 passengers in 2006 according to Eurostat. Other carriers, such as Wizzair or Transavia started operations, too.

Niederrhein/Weeze airport registered 583 000 passengers in 2006. Although the beginning was difficult due to the opposition from residents, the airport continued to develop reaching 846 000 passengers in 2007 and 1.5 million in 2008.

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[421] One destination represents less than 10 flights scheduled in 2006.

[422] LTU was taken over by Air Berlin in March 2007 and fully integrated. Thus, Air Berlin announced in 2008 not to use any longer the trademark LTU.

[423] DBA (Deutsche BA) was founded in 1978 as Delta Air and bought British Airways and Berliner Bank in 1992 in order to enter the German market and for feeding its hub at London Heathrow. British Airways transformed DBA in a low fare airline in 2002 before selling its shares in the airline to Intro Verwaltungsgesellschaft, the latter selling the airline to Air Berlin in 2006.

Berlin Schonefeld airport

Berlin Schonefeld airport counted 6.0 million passengers in 2006 (6.3 million in 2007). Whereas the traffic had remained relatively stable since 1994, the volume of passengers has increased by 265 % from 2003 and 2006. This growth is mainly due to low-cost traffic whereas the charter traffic has decreased since 2000 representing only 6.0 % in 2006 compared to 23.7 % in 2003. A number of low-cost carriers, such as Germanwings, LTU, Ryanair and Easyjet fly in and out of Berlin Schonefeld whereas DBA, Air Berlin, HLX used Berlin Tegel airport, the latter registering an total traffic of 11.8 million passengers in 2006.

Schonefeld and Tegel, the two Berlin airports[424], counted 9.0 million passengers travelling with low-cost airlines in 2006 which corresponds to 49.0 % of the overall traffic. As low-cost airlines represent in both airports almost the same number of departing flights (slightly higher at Tegel)[425], the number of passengers is supposed to be also almost the same at the two airports. This would mean that low-cost traffic can be estimated at about 75 % of the traffic at Berlin Schonefeld and 40 % at Berlin Tegel airport.

According to OAG data, Easyjet served 30 destinations with Basel-Mulhouse being the most important destination (1 038 departing flights in 2006), followed by London Luton, Orly and Rome Ciampino airports with 958, 867 and 713 flights respectively. Of the remaining routes, 15 are operated with more than 300 flights while on 10 routes the number of flights is below 300. Germanwings operated 15 routes[426] from Schonefeld airport of which Munich, Cologne and Stuttgart were the busiest with 1225, 1171 and 1135 departing flights respectively. Moreover, 755 flights were scheduled to Munich airport whereas 11 destinations counted less than 300 flights each one. As regards Condor and LTU, they served a relatively large number of destinations (14 and 27 destinations respectively) but at much lower frequencies.[427] Low-cost traffic represents something like

Berlin Tegel airport was served mainly by German low-cost carriers Air Berlin, DBA and HLX. After Lufthansa (33.7 % of all seats available and 34.4 % of flights scheduled in 2006 according to OAG data), Air Berlin[428] was the second airline with 16.1 % of all seats available and 13.1 % of departing flights scheduled. The airline offered services to 48 destinations[429]. The busiest routes were those to London Stansted, Vienna, Palma de Mallorca and Zurich airport with 1215, 1106, 1084 and 1073 flights respectively. Four destinations totalised 300 to 700 flights while 40 routes were served by less than 300 flights each one. The third carrier was DBA whose traffic corresponded to 13.8 % of all seats available and 13.9 % of all departing flights scheduled in 2006. DBA served seven destinations of which Munich airport was the most important with 2 662 flights. Stuttgart (1 872 flights) and Dusseldorf

[424] The third airport Berlin Tempelhof, counting 633 000 passengers in 2006, ceased operating in 2008.

[425] See DLR and ADV (2007, pp. 12-13).

[426] One destination is served by less than 10 flights scheduled in 2006.

[427] Condor scheduled 159 flights to Palma de Mallorca and less than 100 flights to all other destinations, including 4 destinations with less than 10 flights. LTU scheduled 50 to 100 flights for 7 routes while 20 routes registered less than 50 flights, including 4 routes with less than 10 flights according to OAG data.

[428] According to OAG data Air Berlin scheduled also 231 flights to Berlin Schonefeld airport in 2006.

[429] 14 destinations totalise less than 10 flights scheduled in 2006 each one.

(1 736 flights) ranked second and third, followed by Prague, Nuremberg, Karlsruhe and Cologne with 824, 794, 741 and 358 flights. Finally, HLX served six routes, the busiest being by far Cologne with 2 030 flights and thus represented about 6.7 % of all seats available and 5.8 % of all departing flights scheduled in 2006.

Lubeck airport

Lubeck airport was used in the 1990s mainly for charter traffic but passenger throughput was very modest. In 2000, Ryanair started serving the airport and gradually increases its transport offer. However, the airport passes over the 500 000 passenger limit only in 2003 and counted 658 000 passengers in 2006. The airport is served mainly be Ryanair. Thus, Lubeck-London Stansted was the most important route in 2006 with 242 000 passengers which is more than one third of the airport's total passenger throughput. Nevertheless, recent traffic figures indicate that the airport is not yet booming with a throughput below 1 million passengers.

Beauvais airport

Beauvais airport counted 1.9 million passengers in 2006. Its traffic increased by 50 % since 2003 and has been multiplied by 30 over ten years. The major airline is Ryanair but the airport is also used by smaller companies such as Wizzair, Norvegian Air Shuttle and Blue Air. The five most important destinations were Rome Ciampino, Dublin, Bergamo, Girona and Stockholm Skavsta airports with more than 200 000 passengers each one in 2006 according to Eurostat corresponding to 60 % of the airport's total traffic. At the same time, charter traffic represented only 0.7 % of all passengers in 2006.

Girona airport

At Girona airport, more than 3.1 million of 3.6 million passengers in 2006 travelled with Ryanair. Consequently, this only carrier concentrated 86.2 % of the airport's overall traffic. It operated almost 20 000 flights (arrival and departures) at the airport. Thus, the Girona-London Stansted route was the busiest in 2006 with almost 400 000 passengers, followed by Charleroi, Rome Ciampino, Beauvais and Frankfurt-Hahn airports with more than 200 000 passengers each one in 2006. Including carriers such as Transavia, Thomsonfly, Wizzair, Monarch Airlines, Centralwings and Norwegian Air Shuttle the low-cost traffic corresponds to 90 % of the airport's traffic in numbers of passengers, the rest being charter traffic (10.0 % of all passengers in 2006 in comparison with 96.0 % in 1996).

Low-cost traffic contributed largely to the traffic growth that the airport has registered: From 2003 to 2006, the traffic has increased by 150 %; it has even been multiplied by more than eight from 1996 to 2006. Figures referring to 2008 indicate even an increase of Ryanair's activity at Girona airport reaching 5.0 million passengers which corresponds to 91.3 % of the airport's traffic in 2008.

8.3.1.3. *Airports with a medium or relatively high proportion of low-cost traffic located in zones that are less dense and less economically important but destinations of touristic interest*

The third group (◆) of airports that profit from low-cost traffic are located in zones which are less dense and less important from the economic point of view. However, these zones are characterised by a certain touristic relevance, as regards the Spanish airports even by a large touristic interest. The airports belonging to this group are Faro, Alicante, Malaga, Valencia, Murcia as well as Palma de Mallorca, Fuerteventura, Ibiza and Tenerife Reina Sofia but also Pisa, Venice and Naples.

These airports are characterised by relatively large numbers of passengers, 3 to 9 million passengers in 2006, except for Palma de Mallorca and Malaga which counted 22.4 and 13.0 million passengers respectively. Their low-cost traffic is relatively important ranging from 24.1 % to 61.8 % and reaches even 85.1% for Murcia airport.

Alicante, Malaga and Faro airports on the coast of the Iberian Peninsula as well as Tenerife Reina Sofia and Palma de Mallorca airports on the Spanish islands were already large airports in the 1990s (3.5 to 11.3 million passengers in 1996). They were characterised by a high proportion of charter traffic ranging from 66.1 % to 86.3 %. In contrast, the Italian airports Venice and Naples were smaller airports (about 2 million passengers each one in 2006) and only Naples handled some charter traffic (20.2 %). Valencia, Pisa and in particular Murcia[430] were much smaller airports (less than 1 million passengers in 1996) whereas the airports on Fuerteventura and Ibiza were situated in between with 1.8 and 2.4 million passengers and were characterised by a large proportion of charter traffic (44.7 % and 75.0 % respectively).

Over the period from 2000 to 2006, the development of the airports belonging to this group varies. While the passenger throughput for Murcia had been multiplied by 11 and for Pisa and Valencia increased by 141 % and 121 %, the other airports registered a much lower traffic growth: 65 % for Venice, 48 % for Alicante, 39 % for Malaga, 29 % for Fuerteventura, 16 % for Palma de Mallorca, 11 % for Faro and 9 % for Naples. The traffic of Tenerife Reina Sofia and Ibiza even decreased slightly (-2 % and -1 %). In contrast, traffic growth had been much higher for all airports, except for Pisa and Valencia, from 1996 to 2000. During that period, the traffic of Valencia had been multiplied by almost five and the traffic of Murcia had increased by 160 %. For Palma de Mallorca, Fuerteventura, Ibiza, Malaga and Alicante the passenger throughput had increased by 71 % to 98 % whereas for Pisa, Faro, Venice, Tenerife Reina Sofia and Naples it had risen by 30 % to 59 %.

As regards Alicante, Malaga, Tenerife Reina Sofia, Palma de Mallorca, Ibiza and Faro, charter traffic increased during the 1990s but its proportion in the airports' overall traffic was on the decline and this tendency has even reinforced from 2000 on as charter traffic decreased also in absolute figures.[431] The growth in low-cost traffic since 2000 is thus also due to a

[430] Strictly speaking Murcia airport handled 50 % non scheduled traffic but the airport counted only a total of 60 000 passengers in 1996.

[431] Non scheduled traffic decreased by 60 % for Malaga, 48 % for Faro, 47 % for Alicante, 33 % for Ibiza, 27 % for Palma de Mallorca and 17 % for Tenerife Reina Sofia.

transfer from charter to low-cost traffic. At Alicante and Malaga airports, non scheduled traffic represented less than 20 % of the total traffic in 2006 whereas it remained relatively high for Fuerteventura[432], Ibiza, Faro and Palma de Mallorca with 24.5 % to 37.4 %. Only for Tenerife Reina Sofia airport, charter traffic corresponds still to more than the half of its passenger throughput. For the Italian airports and for Valencia and Murcia, the proportion of charter traffic, which was already lower, has also decreased and ranged from 2.7 to 11.8 % in 2006.

These airports are also served by traditional full service carriers but to varying extents. In particular, the Italian regional airports like Venice and Naples are encouraged in the development of their own activities since Rome Fiumicino and Milan Malpensa face difficulties; those of Milan Malpensa are largely due to the airline's decision to maintain flights between Rome and Milan at Milan Linate (2.3 million passengers carried on the Rome Fiumicino-Milan Linate route in 2006 in contrast to 710 000 passengers to Milan Malpensa).

As regards the geographic distribution, traffic to destinations outside the EU is very small (less than 7 %, except for Venice with 12 %). Apart from Valencia and Naples, all airports have only low proportions of national traffic in comparison with traffic to and from other EU member states which is very important (56 % to 94 %). For Valencia and Naples, national traffic is larger than intra-EU traffic even though the latter still represents 47 % and 40 %.

A selection of eight airports, namely Venice, Naples, Pisa, Alicante, Malaga, Palma de Mallorca, Valencia and Faro, will be presented more in detail.

Venice airport

The traffic at Venice airport amounts to 6.3 million passengers in 2006 (and 7.0 million in 2007). Between 2003 and 2006, the traffic increased by 80 %, over a period of 10 years by 140 %. Low-cost traffic represents 24.6 % of the airport's total passenger throughput, charter traffic only 4.8 % of all passengers.

According to OAG data, low-cost carriers such as Easyjet (about 700 flights scheduled to London Gatwick and 300 to Bristol and East Midlands respectively), Hapag-Lloyd Express (serving seven German destinations with a total of 1650 flights), MyAir (1150 flights to nine destinations of which Paris Orly airport was the most important with more than 400 flights), Vueling (operating 200 flights to Barcelona), Norwegian Air Shuttle (20 flights to Oslo Gardermoen), Sterling Airlines (75 flights to Copenhagen) Sky Europe Airlines (150 flights to Budapest/Ferihegy), Smart Wings (60 flights to Prague airports), Jet2.com (120 flights to Leeds Bradford).

Moreover, all major traditional airlines serve Venice airport in order to feed their respective hubs. Thus, frequencies are relatively high[433]. Air One and Alitalia were competing on the

[432] For Fuerteventura, the charter traffic increased in absolute figures but declined in percentage shares.

[433] In 2006, Air France scheduled 2 190 flights to Paris CDG and 889 flights to Lyon Saint-Exupéry airports, KLM 1 089 flights to Amsterdam, Lufthansa 1 858 flights to Frankfurt and 1 654 flights to Munich, Iberia 1 104 flights to Madrid Barajas and 728 flights to Barcelona, Austrian Airlines 1 280 flights to Vienna, Swiss 1 087 flights to Zurich, British Airways 943 flights to London Gatwick (before), CSA Czech Airline 359 flights to

busy Venice-Rome Fiumicino route (2251 flights operated by Alitalia and 1323 operated by flights Air One corresponding to 63 % and 37 % market shares).

Naples airport

Naples airport counted 5.0 million passengers in 2006 (5.7 million in 2007). Low-cost airlines carried 24.1 % of all passengers. Among them figure e.g. Easyjet (5 destinations with a total of 1991 flights), Hapag-Lloyd Express (905 flights), Sky Europe Airlines (596 flights), MyAir (553 flights), Condor (244 flights), Sky Europe Airlines (211 flights) and LTU (100 flights).

Moreover, the airport is served by traditional full-service carriers, in particular by Lufthansa (1337 flights to Munich) and British Airways (944 flights to London Gatwick) but also by Air France and Iberia, even though the latter offer lower frequencies.[434] In addition, Naples airport handled also charter flights (11.8 % of all passengers in 2006).

Pisa airport

Pisa airport was used by 3.0 million passengers in 2006 (3.7 million in 2007). While charter traffic corresponds to only 3.1 %, low-cost traffic represents 61.8 % of all passengers. The airport is served by Easyjet and Ryaniar but also by carriers such as Condor, Hapag-Lloyd Express, jet2.com, Norwegian Air Shuttle, Vueling and Wizzair. Whereas Easyjet operated services to three destinations (414 flights to Paris Orly, 309 flights to Berlin Schonefeld and 236 flights to Bristol) according to OAG data, Ryanair offered more than 10 destinations (including Bournemouth, Lubeck, Girona, Charleroi, Liverpool, Prestwick, Hahn, Dublin and London Stansted).

In addition to Alitalia, Lufthansa, British Airways, Air France and Iberia also fly in and out of Pisa airport although frequencies are lower than at Venice airport but partly higher than at Naples airport.[435]

Alicante airport

At Alicante airport, 8.9 million passengers in 2006, Easyjet[436] was the most important carrier representing 16.4 % of all passengers. Monarch Airlines, Thomsonfly, Air Berlin, Bmibaby, Transavia, Sterling Airlines, Jet2.com, Fly Globespan, LTU, Vueling, Germanwings, Fly Me

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Prague, TAP 340 flights to Lisbon, US Airways 172 flights to Philadelphia International airport, Delta Air Lines 325 flights to New York JFK and 104 flights to Atlanta International airport and Turkish Airlines 109 flights to Istanbul Ataturk airport according to OAG data.

[434] Air France scheduled 407 flights to Paris CDG and Iberia 365 flights to Madrid Barajas according to OAG data 2006.

[435] Lufthansa scheduled 1287 flights to Munich and 449 flights to Frankfurt airport, Air France operated 1335 flights to Paris CDG airport, British Airways 940 flights to London Gatwick and Iberia 359 flights to Madrid Barajas as well as 364 flights to Barcelona according to OAG data.

[436] Including Easyjet Switzerland.

Sweden and Norwegian Air Shuttle were also flying in and out of Alicante airport bringing the low-cost traffic to 57.0 % of the airport's total traffic.

Easyjet was serving 13 destinations, the most important being London Stansted and London Gatwick and Bristol with 946, 814 and 704 departing flights scheduled in 2006 according to OAG data. 300 to 700 flights were operated to further 7 seven destinations. Monarch Airlines ranks behind Iberia but second as regards low-cost carriers with 7.2 % of all passengers. It served four British destinations (Manchester and London Gatwick with about 650 flights, followed by London Luton and Birmingham with 360 and 176 flights). Air Berlin, the third low-cost carrier with 7.1 % of all passengers, offered 14 destinations[437] of which Palma de Mallorca was the busiest with 504 departing flights; eight destinations were served by 100 to 300 flights each one. Bmibaby (4.5 % of all passengers) operated services to five British destinations, the number of flights ranging between 186 and 406 for each one.

Profiting from the development of low-cost airlines, Alicante airport could triple its overall traffic from 1996 to 2006. Since then, low-cost airlines have still strengthened their position at Alicante airport. In 2008, Easyjet is still the first airline with an even higher number of passengers, followed by Ryanair[438] which started operating from Alicante airport and Air Berlin which was already flying in and out Alicante airport. Their market shares amount to 18.0 %, 14.8 % and 7.9 % of the airport's overall traffic.

Charter traffic, corresponding to 75.4 % of all passengers in 1996, continued to increase until 2002 but has fallen since. In 2006, it reached almost its 1993 level and represented so 18.4 % of all passengers.

Malaga airport

Malaga airport handled 13.0 million passengers in 2006. In comparison with 1996, the traffic increased by 175 %. Whereas the charter traffic, representing 75.1 % in 1996, has decreased steadily since 2000 and reaches only 12.2 % in 2006, the overall traffic continued to grow thanks to low-cost airlines starting operations at Malaga airport. In 2006, their market share amounts to 50.8 %. Easyjet[439] becomes even the most important airline with 1.6 million passengers, i.e. 13.7 % of the airport's traffic, before Iberia and Spanair. Monarch Airlines, Air Berlin and Thomsonfly rank fourth, fifth and sixth with 7.1, 5.2 % and 4.7 % of all passengers respectively.

Easyjet served 17 destinations from Malaga airport according to OAG data. The three most important routes concern London Stansted, London Luton and Liverpool with more than 900 flights each one (989, 973 and 927 respectively). Bristol and Newcastle airport rank fourth and fifth with 821 and 717 flights respectively. All other destinations are served by 150 to 400 flights. Monarch Airlines was serving seven British destinations, Manchester and Gatwick

[437] Including one destination with less than 10 flights according to OAG data.

[438] Ryanair was operating 9815 flights from and to Malaga airport (departures and arrivals), coming just behind Easyjet with 11 674 flights and before Iberia with 6140 flights. (AENA statistics: http://estadisticas.aena.es)

[439] Including Easyjet Switzerland.

airport being the most important with 858 and 728 flights, followed by London Luton and Birmingham with more than 400 flights each one. Finally, two destinations are served with 150 to 200 flights and one destination with 43 flights. Like Easyjet, Air Berlin is also operating air services to 17 destinations[440] but frequencies are much lower: Palma de Mallorca, the busiest route concentrates 550 flights, followed by Dusseldorf, Berlin Tegel and Hamburg airports with 291, 255 and 246 departing flights respectively. All other destinations are served by less than 200 flights. Finally, Bmibaby (3.2 % of all passengers) operated air services to 5 destinations of which 4 were served by 400 flights each one: Birmingham, Manchester, East Midlands and Cardiff airports whereas the fifth destinations (Durham Tees Valley) counted only 200 flights.

Low-cost traffic continued to increase at the airport, in particular thanks to Easyjet which strengthened its position by concentrating 18.3 % of all passengers in 2008.

Valencia airport

Valencia airport counted 4.9 million passengers in 2006. Whereas charter traffic corresponds to only 3.7 %, low-cost airlines represent 37.2 % of all passengers. The airport is served by a number of low-cost airlines, including Ryanair (11.6 %), Vueling (9.9 %), Easyjet (6.2 %) and Air Berlin (2.3 %). Vueling was serving 7 destinations, the busiest route being that to Paris CDG airport with 422 departing flights, followed by Seville, Milan Malpensa and Brussels with 362 flights each one. Easyjet was operating services to four destinations (London Stansted, London Gatwick, Berlin Schonefeld and Bristol) with 255 to 364 departing flights according to OAG data.

The airport’s traffic has been doubled since 2003 and multiplied by more than 10 since 1996. This rise is due to low-cost airlines which started operating at Valencia and amplified their services. Thus, Ryanair even got ahead of Iberia and Air Nostrum by more than doubling the number of its passengers in 2008 (reaching 1.4 million passengers). Consequently, Ryanair’s market share increased to 23.6 %. As regards, the total number of passengers travelling with low-cost airlines, their proportion increased, too reaching 50.4 % in 2008.

Palma de Mallorca

Palma de Mallorca airport is Spain’s third largest airport registering 22.4 million passengers of which 54.3 % travelled with low-cost carriers. Air Berlin was the busiest carrier representing 22.9 % of market share. The airline operated services to 40 destinations[441]. The most important routes were those to Dusseldorf and Berlin with more than 1000 departing flights each one, followed by further seven German destinations with more than 700 flights each one. Air Berlin was even flying in Frankfurt/Main airport (695 flights). As regards the remaining 30 destinations, half of them are served by more than 300 flights, half of them by than 300 flights according to OAG data. Among the other low-cost airlines flying in and out

[440] Including 4 destinations with less than 10 departing flights scheduled in 2006.

[441] For only one destination were scheduled less than 10 flights in 2006.

of Palma de Mallorca airport figure Condor, Hapagfly, Thomsonfly, Easyjet and Hapag-Lloyd Express whose market shares amounted to 7.4 %, 5.5 %, 4.4 %, 3.9 % and 1.5 % respectively. Charter traffic represented only 24.5 % of all passengers in 2006.

Faro airport

Faro airport handled 5.1 million passengers in 2006. 55 % of them were travelling with low-cost airlines (ANA Aeroportos de Portugal, 2007, p. 9). A large number of low-cost carriers serve the airport, including Easyjet, Ryanair, Air Berlin, Bmibaby, Condor, Germanwings, Hapagfly, Jet2.com, LTU, Ryanair and Transavia. Easyjet offered services to 8 destinations of which London Stansted and London Luton were the busiest with more than 500 flights, followed by Bristol, Gatwick and East Midlands airports with about 400 flights each one. In addition, Liverpool, Newcastle and Belfast International are served with 260, 213 and 140 flights according to OAG data. Jet2.com was serving Leeds/Bradford and Manchester airports with almost 300 flights each one. Fly Globespan scheduled 251 flights to Glasgow and 210 flights to Edinburgh. Hapagfly was operating routes to 9 destinations but only Palma de Mallorca and Hannover exceeded 100 departing flights scheduled in 2006. As regards Condor and LTU, they served five and 10 destinations respectively but all below 100 departing flights scheduled in 2006. In addition to low-cost traffic, Faro airport handled a relatively large part of charter traffic (32.3 % of all passengers).

8.3.1.4. Regional airports which increase their attractiveness by offering low-cost traffic, some of them focus on intra- and extra-European traffic while others concentrate on national traffic

Airports playing a role rather at regional level, as they serve a relatively small and/or less populated area, were divided into two groups, one (▲) being characterised by a large proportion of intra-European traffic and also a relatively strong extra-European traffic (including Dortmund, Hannover, Munster/Osnabruck, Dresden, Salzburg, Basel, Cork and Shannon) [442] while the second (▼) focuses on national traffic (including Seville, Santiago, Santander, Catania, Palermo, Bari, Brindisi as well as Olbia and Alghero)[443]. The average traffic of the airports belonging to the first group is slightly higher than the average passenger throughput of the airports of the second group[444] (2.8 million on average in comparison with

[442] The first group is characterised by an Intra-European traffic of more than 53 % of the total passenger throughput (except for Dresden where it corresponds to 21 %) and a relatively small proportion of national traffic of not more than 30 % (except for Dresden with 67 %). In return, Dresden is characterised by a relatively large extra-European traffic which distinguishes also the other airports figuring in this group (11 % to 26 %). The only exception are Dortmund and Cork where extra-European traffic represents only 6 % and 2 % but intra-European traffic is even more important with 85 % and 84 %.

[443] The second group is characterised by a very small extra-EU traffic of maximum 4 %, a modest intra-European traffic (less than 30 %, except for Santander and Alghero with 42 % and 37 % respectively) whereas the national traffic is very strong representing at least 58 % in 2006.

[444] The average traffic of the airports belonging to the first group amounts to 2.8 million passengers with a minimum of 1.0 million and a maximum 5.6 million. In contrast, the average throughput of the airports

2.3 million). Moreover, the proportion of low-cost traffic varying from 28.6 % to 55.6 % is slightly larger for the first group than for the second where it ranges from 21.9 % to 45.8 %. Besides, the first group is characterised by a slightly higher proportion of charter traffic of 5.5 % to 13.5 %[445] in comparison to 2.5 % to 11.5 % for the second group.

In addition, certain full service airlines are operating at most of these airports, in particular the respective former national carriers.

Between 2000 and 2006, the airports belonging to the first group register different increases in their traffics. Whereas the traffic increase is relatively small for Munster/Osnabruck, Dresden and Hannover[446], the other airports register a considerable traffic growth ranging from about 60 % for Salzburg and Shannon to 90 % for Cork and 120 % for Basel. Dortmund's[447] traffic also rose very strongly: +90 % from 2003 to 2006. During the same period, the airports figuring in the second group observe a traffic growth of at least 30 % (Olbia, Palerma and Catania) up to almost 90 % for Alghero and Seville and 150 % for Santander.

Dortmund airport: focus on intra-European flights

Dortmund airport handled 2.0 million passengers in 2006 (2.1 million in 2007). Low-cost airlines carried 55.6 % of all passengers while the share of charter airlines corresponded to 5.5 % in 2006. Easyjet was the largest carrier with 13 destinations of which London Luton was the busiest with 677 flights, followed by eight destinations with 310 to 365 flights each one (Barcelona, Prague, Cracow, Milan Malpensa, Budapest/Ferihegy, Alicante, Palma de Mallorca and Rome Ciampino) as well as four destinations with less than 300 flights scheduled in 2006. Air Berlin was the second largest carrier with 20 destinations[448] of which by far the most important route was Dortmund-Palma de Mallorca with 776 flights scheduled in 2006 according to OAG data, followed by Nuremberg with 105 flights, all other destinations being served with less than 100 flights.

In 2006, Lufthansa operated 1210 flights on the Dortmund-Munich route allowing passengers reach easily Lufthansa's second hub. This route was abandoned by Lufthansa which withdrew from Dortmund airport in 2007. Munich airport continues to be served by Germanwings but this does not replace the link with Lufthansa's hub.

belonging to the second group is 2.3 million passengers with a minimum of 650 000 and a maximum of 4.2 million passengers.

445 Except for Salzburg airport where charter traffic represents 36.7 % of the airport's total passenger throughput.

446 The traffic for Dresden and Hannover airports increased by 6% and 4 % whereas Munster/Osnabruck airport even registered a decrease by -10 % but the latter observed an unusual traffic increase in 2000 in comparison with 1999; considering the period from 1999 to 2006, Munster's traffic increased by 3%.

447 Eearlier data is not available.

448 Including 12 routes where less than 10 flights were scheduled in 2006 according to OAG data.

Shannon airport: focus on flights within the EU and to destinations outside the EU

Another important low-cost airport in Ireland is Shannon airport which counted 3.0 million passengers 2006. Offering 30 services from and to Shannon airport, Ryanair handled 1.7 million passengers, i.e. more than 55 % of the airport's overall traffic. Considering also other no-frills airlines as well as Aer Lingus, which left Oneworld in 2007 due to its new focus on low-cost traffic, the proportion of low-cost traffic is even higher. However, Ryanair, the largest carrier at the airport, contributed largely to the traffic growth registered by Shannon airport: an increase by more than 56 % between 2000 and 2006. Considering the last ten years, the traffic has even been multiplied by 20.

The airport is also served by some American full-service carriers (Continental Airlines with 600 flights to Newark Liberty airport, American Airlines with 283 flights to Boston, Delta Airlines with 235 flights to Hartsfield-Jackson Atlanta International and 190 flights to New York JFK airport, US Airways with 180 flights to Philadelphia and Air Canada with 105 flights to Toronto Pearson airport scheduled in 2006 according to OAG data). Finally, 8.5 % of all passengers were using charter flights.

Catania and Palermo airports: focus on national traffic

Catania and Palermo airports are both located on the island of Sicily. Both airports registered relatively high numbers of passengers (5.4 million passengers for Catania and 4.3 million passengers for Palermo airport) of which almost the same proportion was carried by low-cost airlines (31.5 % for Catania and 30.1 % for Palermo). Low-cost carries operate also intra-Italian routes.

In 2006, among the airlines serving Catania airport figure Air Berlin, Hapagfly, Hapag-Lloyd Express, LTU, MyAir, Volareweb, Windjet, Alpi Eagles... Later, Easyjet joined the airlines operating at Catania airport in order to offer flights to Milan Malpensa. Palermo airport is used by low-cost airlines such as Centralwings, Easyjet, Hapafly, Hapag-Lloyd Express, MyAir, Volareweb and Ryanair. Already in 2006 Easyjet served Milan Malpensa from Palermo with 391 departing flights scheduled. Since then, Easyjet increased the frequency of its flights and added Rome Fiumicino airport as second destination. In contrast, Ryanair serves Bergamo and Pisa airport.

Moreover, Alitalia offers high frequencies to Rome Fiumicino, Milan Linate and Malpensa from both airports.[449] In addition, Catania and Palermo handle some charter traffic corresponding to 11.5 % and 7.0 % respectively of their total passenger throughput in 2006.

[449] According to OAG data, Alitalia served Rome Fiumicino, Milan Linate and Malpensa with 3373, 1340 and 1095 departing flights scheduled in 2006 respectively from Catania and with 3233, 1038 and 1095 departing flights respectively from Palermo. (Half of flights to Milan Linate are operated by Alitalia Express, a subsidiary of Alitalia.)

8.3.1.5. *Very small airports depending entirely on low-cost carriers located mainly in remote areas*

The sixth group (★) refers to airports that are characterised by a very small traffic and a high dependency on low-cost traffic as almost all passengers (at least 93 %) are carried by low-cost airlines and mainly by one carrier, namely Ryanair. Among these airports figure the following: Forli, Carcassonne, Bergerac, Nimes and Tours. Their passenger throughput ranges from 83 000 to 621 000 passengers in 2006. These airports owe all their traffic to low-cost airlines and registered partly a considerable growth over the last years. Thus, the passenger throughput for Forli and Bergerac airport has been multiplied by more than 4 from 2002 to 2006 and more than doubled for Carcassonne, Tours and Treviso[450]. Nevertheless, traffic figures remain very low.

8.3.1.6. *Very small airports with a medium or relatively high proportion of low-cost traffic*

Finally, a last group (☆) includes airports which are very small (less than 500 000 passengers in 2006), too but handle much less low-cost traffic than the airports of the preceding group. The proportion of low-cost traffic ranges from 24 % to 68 %. To this group belong the following airports: Ancona, Pescara, Brescia/Montichiari, Parma, Limoges, Zaragoza and Vitoria. They handle much intra-European traffic (at least 47 %, up to 69 %). Only Ancona, Brescia and Zaragoza handle a relatively large proportion of extra-European traffic. Moreover, some of these airports register a relatively important proportion of charter traffic: Zaragoza with 17.1 %, Vitoria with 26.9 % and Brescia with 33.1 %. These airports also registered a significant increase in traffic thanks to low-cost carriers but it is below the traffic growth of the very small airports handling almost only low-cost traffic. However, just as in the preceding group, the numbers of passengers remain very small.

8.3.2. The territorial context into which airports with a strong low-cost traffic are embedded

The following figures illustrate the territorial context into which the different types of airports are embedded. As already explained in chapter 4.2, the catchment areas, where the most of the existing and potential traffic of an airport lies, were determined on the basis of kilometric distances having the form of circles with a radius of up to 50 km assigned to an access time of 30 to 60 minutes (maybe 1.5 hours) which corresponds roughly to short-distance scheduled flights, a radius of up to 100 km attributed to 1 hour to 1.5 hours (may be 2 hours) corresponding to medium-distance scheduled flights and radius of 150 km representing 1.5 to 2 hours (maybe 2.5 hours) which corresponds to long-distance flights but also to charter and low-cost flights. As regards charter and low-cost airlines, certain of their passengers would accept even longer access times (up to 200 km distance) but they are fewer; of course, nearby

[450] Traffic growth for Treviso airport refers to the period from 2003 to 2006.

zones outweigh distant zones. For this reason but also in order to assure their legibility, the following figures indicate only circles of a radius of 50 km, 100 km and 150 km.

Finally, it should be pointed out again that the relevance of the different zones depends on the access to the airport (and in particular on the existence of an own train station at the airport offering not only access to the city centre but also regional and long distance rail links) as well as on the flight offer and thus on the different market segments into which the airport is engaged in addition to low-cost traffic on which emphasis is put in this chapter. [451]

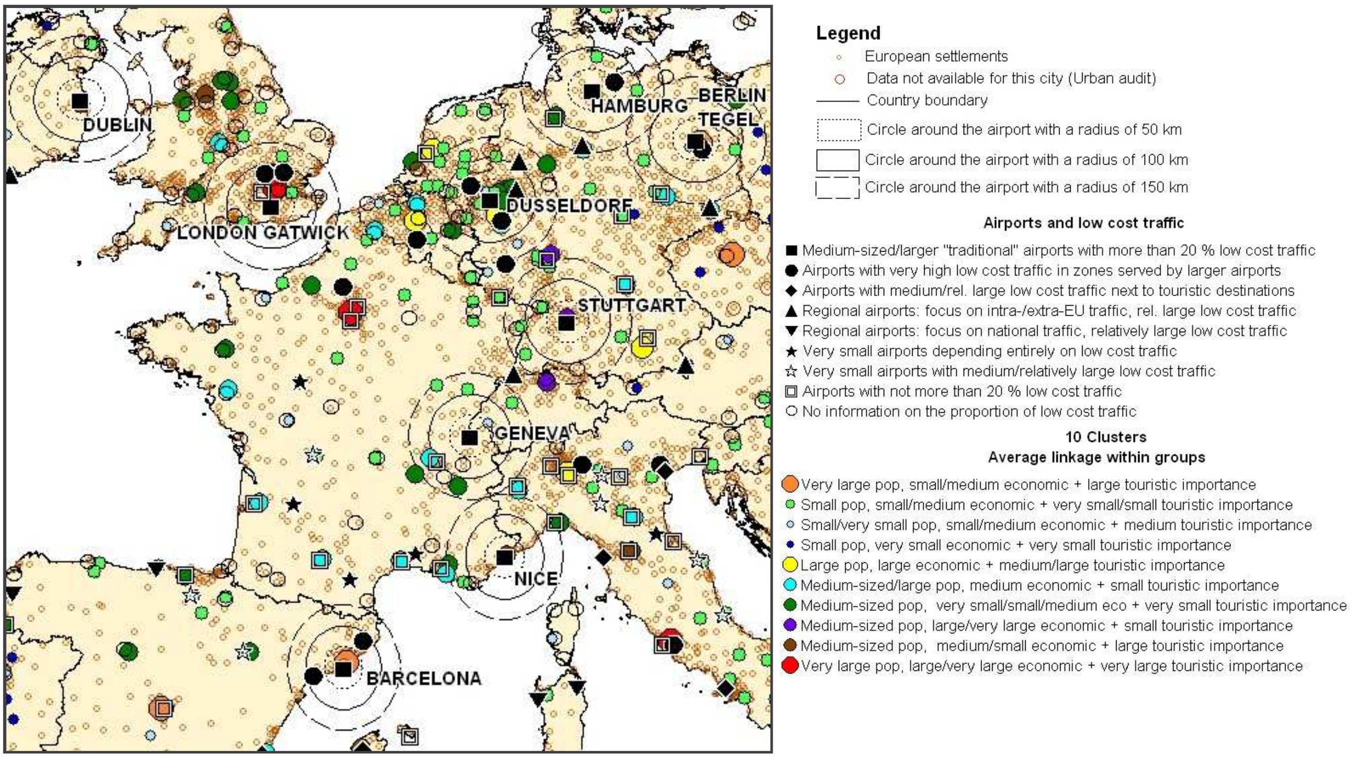
8.3.2.1. Proximity to medium-sized, large or even very large cities of a large economic or touristic importance in densely populated zones for medium-sized and larger "traditional" airports with more than 20 % of low-cost traffic

The figure 56 refers to the territorial context into which medium-sized and larger "traditional" airports with more than 20 % low-cost traffic are embedded. However, this figure does not consider the rather good access to public transport of most medium-sized and larger "traditional" airports. Actually, a number of them have their own train station, sometimes even with direct access to the airport's check-in and arrival level. London Gatwick airport, 45 km south of London, can be reached by the Gatwick-Express rail service in 30 minutes from central London and has also national rail links to destinations around Britain. Dusseldorf airport has its own train station, too, where more than 350 trains stop each day, from suburban railway to high-speed ICE. SkyTrain, a fully-automated cable railway brings the passenger from the railway building directly into the terminal. Geneva airport is also served by regional and long-distance trains, whereas Hamburg and Stuttgart are served only by suburban railway. At Nice airport, a train station is located within 15 minutes walking distance. However, there are no direct rail links to Berlin Tegel and Dublin airport.

Although this information on access to public transport is not taken into account in figure 51 as catchment areas had been drawn on the basis of kilometric distances, it may be useful when interpreting the figure as it allows to assess the relevance of certain kilometric distances. Thus, access times to an airport like Dusseldorf are certainly shorter than the zones with a radius of 100 or 150 km around an airport would suggest. Thus, these zones tend to be of a higher relevance for existing and potential traffic than it would be the case without access to rapid rail links.

[451] One could also consider the travelling motive (business travel vs. leisure travel). Unfortunately, this information is not available at a large scale.

Figure 56: The territorial context into which medium-sized and larger "traditional" airports with more than 20 % low-cost traffic are embedded



Own figure

London Gatwick is the second largest airport, after Heathrow, serving Greater London which is characterised by a very large population and a very large economic as well as touristic importance. However, London Gatwick focuses on low-cost and charter traffic whereas Heathrow is a generalist hub, mainly for British Airways. Moreover, Greater London is also served by Stansted and Luton, two airports which specialised in low-cost traffic.

Stuttgart and Dusseldorf airports are located in very dense zone and next to cities of a medium-sized population but of a large, even very large economic importance although their touristic relevance is small (both in purple). Moreover, Dusseldorf airport is situated in a very dense zone with a number of smaller and medium-sized cities at less than 50 km but also at up to 100 and 150 km around the airport. In addition, Cologne (yellow), a large city of a large economic and medium/large touristic interest, is at only 50 km distance of Dusseldorf airport and even served by ICE rail link. Bonn (azure) is located at about 75 km distance of Dusseldorf airport. The former German capital is a medium-sized city of medium (partly small) economic relevance and small (partly medium) touristic importance. At little more than 50 km from Dusseldorf airport are located Niederrhein/Weeze and Cologne/Bonn airports, both being specialised in low-cost traffic, as well as Dortmund airport, a regional airport with a rather large offer of low-cost flights. In particular, Cologne/Bonn airport, which is characterised by a relatively large passenger throughput, plays an important role; also because it is closer to Cologne and Bonn than Dusseldorf airport but both airports do not have the same flight offer. In contrast to Dusseldorf, Cologne/Bonn airport handles almost 70 % of low-cost traffic and is not served anymore by Lufthansa. For this reason, Dusseldorf airport's catchment area extends well easterly and Cologne/Bonn is rather making an additional flight offer without substituting Dusseldorf airport which handles a modest proportion of low-cost flights (22.6 % in 2006) but is well served by traditional full service airlines operating a rather large number of intra-and in particular extra-European flights (the latter representing 27 % of the airport's passenger throughput). Finally, the whole zone reaching from Dusseldorf over Cologne and Bonn to Stuttgart is also characterised by the presence of Frankfurt airport (less than 200 km of Dusseldorf and a little more than 150 km of Stuttgart) which attracts a large number of passengers thanks to the high number of destinations and airlines.

Barcelona and Berlin Tegel airports are both situated next to a very large city of a large (medium) touristic interest despite a small/medium economic importance (orange). Barcelona is the second Spanish city and as regards its economic and touristic importance rather comparable to Madrid. Moreover, the airport serves a number of smaller cities located along the Mediterranean Sea coast. Berlin Tegel is the main airport serving the German capital which is the biggest city in Eastern Germany. For scheduled long haul flights but also for low-cost flights (40 % of the total traffic in 2006), Tegel may even be an alternative for passengers coming from Leipzig and Dresden (both in azure) which are at 150 km distance and served by regional airports.

Dublin airport serves mainly Dublin (brown), a city of medium-sized population, of medium/small economic interest but large touristic importance, and its environs. This applies also to Nice airport serving mainly Nice (brown) and some smaller cities located along the Mediterranean Sea coast. Besides, at 150 km distance is located Marseille (azure). The city is served by Marseille airport but the latter is characterised by a very small low-cost traffic (only 6 % of the airport's total passenger throughput in 2006) for which reason Nice may be attractive to passengers coming from Marseille. However, the most important destination for Nice airport is Paris with CDG and Orly representing one third of the airport's total passenger throughput and Marseille is at only three hours from Paris by TGV which is a serious competitor for this busy destination.[452]

Geneva airport is located next to the city of the same name, in a zone which is still relatively dense and where some small and medium-sized cities are situated with a radius of 50, 100 and 150 km. As regards Geneva itself, it had been assigned to the light green group according to the cluster analysis. This decision is due to the wish to limit the number of clusters but might pose a problem as Geneva is certainly a small city but of a large economic importance and a medium touristic interest unlike most cities belonging to this group! Moreover, Geneva is a very important city from a political point of view with a number of international organisations maintaining a significant presence there, an aspect with is not taken into account by the Urban Audit statistics.

Hamburg airport is situated next to Hamburg which is concerned by the same problem as Geneva: It had been assigned to the light green group although being a very large city of a large economic importance and a medium touristic relevance. Moreover, Hamburg airport is

[452] Despite the competition from the TV, Paris is the most important destination for Marseille airport with 1.3 million passengers for Paris CDG airport and more than 550 000 passengers for Paris Orly airport in 2006.

located in a zone which is still relatively dense with other small cities (Kiel, Schwerin and Lubeck) as well as the medium-sized city of Bremen at less than 100 km distance. In addition, Hannover (azure), a medium-sized/large city of medium (partly small) economic importance is at 150 km of the airport. Hamburg is the biggest airport in the north of Germany where are only located some much smaller airports, including Bremen, Lubeck and Hannover.

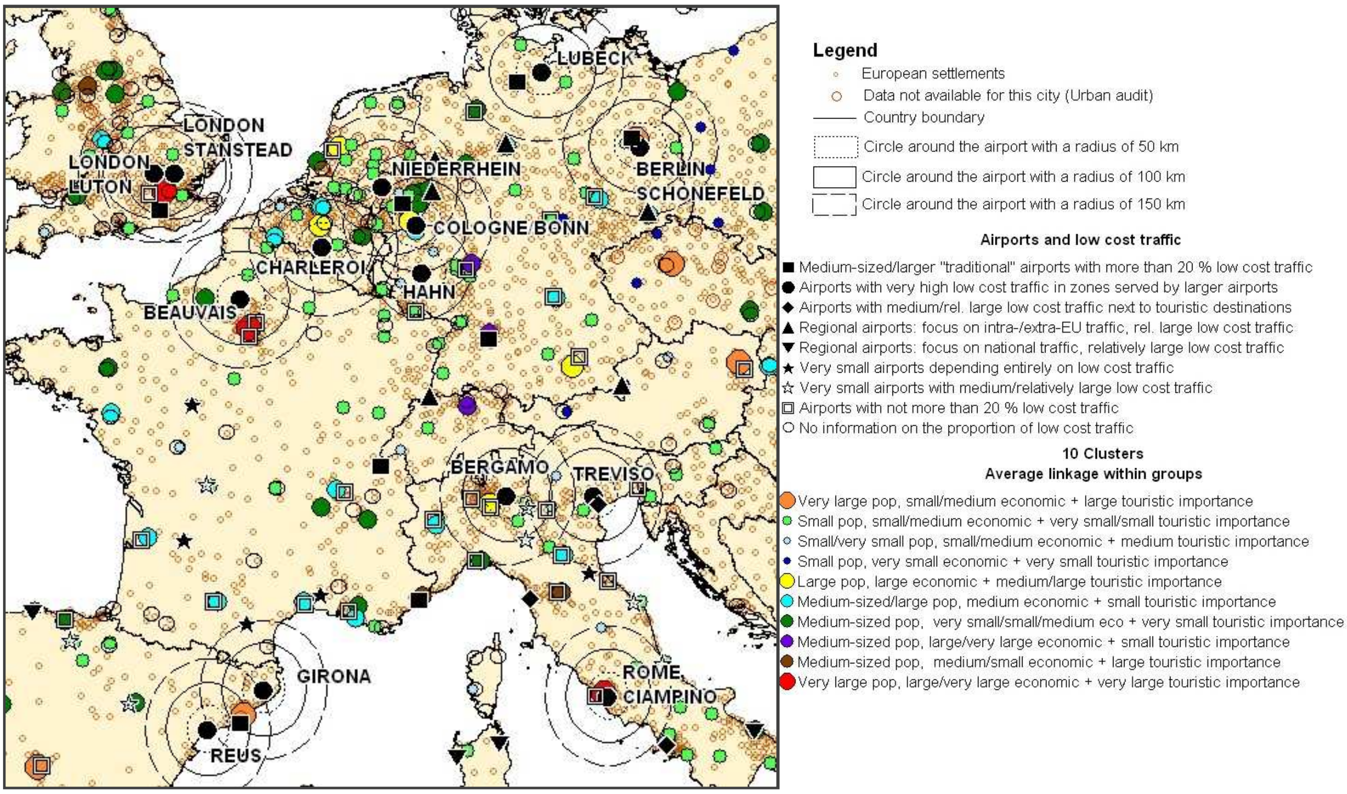
This analysis shows that the territorial context into which these medium-sized and larger "traditional" airports with at least 20 % of low-cost traffic are embedded is relatively homogeneous. All airports are located in densely or relatively densely populated zones and profit from their proximity to medium-sized, large or even very large cities of a large economic or large touristic importance. This is the case of Stuttgart, Berlin Tegel, Nice, Dublin and Barcelona but also of Hamburg and Geneva unlike figure 56 might suggest. Gatwick and Dusseldorf airports are located in zones which are even extremely dense but which are served by several airports.

8.3.2.2. Located outside of large urban areas, airports with a very large proportion of low-cost traffic provide an additional flight offer allowing them to outweigh remoteness despite the presence of larger airports serving already these metropolitan zones

Among the airports which are characterised by a very large proportion of low-cost traffic and located in a zone that is already served by larger airports figure some airports with a relatively large passenger throughput, namely London Stansted, Cologne/Bonn, London Luton, Berlin Schonefeld and Rome Ciampino airport. These airports have a good access to public transport and in particular to rail services as they have their own train station. Cologne/Bonn airport is served by the whole range of trains, from suburban and regional rail to ICE. London Stansted has a railway station below the terminal building which offers also regional and national rail services. In addition, Stansted Express allows to reach the city centre of London with 45 min to 60 minutes. London Luton and Rome Ciampino have also a railway station, the latter being connected to the airport by shuttle bus. At Berlin Schonefeld, the railway station is at walking distance. The smaller airports (including Bergamo) do not have rail links but bus services and a good access to the motorway network which is also the case of the already mentioned bigger airports.

The territorial context into which these airports are embedded is illustrated by figure 57. Although they all are serving a zone which is already served by larger airports (which was just the criterion for assigning them to this group), the analysis of the following figure reveals some differences.

Figure 57: The territorial context of airports with a very large proportion of low-cost traffic providing an additional flight offer for zones already served by larger airports



Own figure

Apart from Treviso, all airports are located next to large or very large cities that are characterised by a large, even very large, economic importance and/or large, even very large, touristic interest. However, they are rather situated outside of dense urban areas.

The only exceptions to this remote location are Rome Ciampino and Cologne/Bonn airports by force of specific circumstances. Rome Ciampino was the main airport of the Italian capital until the inauguration of Rome Fiumuicino airport. It is just the proximity of Rome Ciampino to the Italian capital (only 12 km south southeast of central Rome) which was the reason for constructing a new airport which is actually more distant from Rome (about 40 km). Handling much charter traffic (53.3 % of a rather modest total traffic of 676 000 passengers in 2001), the airport could multiply its passenger throughput by seven over the period from 2001 to 2006 by attracting low-cost airlines for which it is an alternative to Rome Fiumicino airport. Cologne/Bonn airport is situated in a very densely populated zone at 15 km southeast of Cologne city centre and 16 km northeast of Bonn. It handled already more than 5.5 million passengers in 2001 but could increase its passenger throughput by almost 75 % up to 2006 by developing low-cost traffic. Due to this new focus on low-cost flights (70 % of the airport's total passenger throughput in 2006), Cologne/Bonn got in fact an airport serving to a large extent the same metropolitan area already served by Dusseldorf airport, the more so as Cologne/Bonn airport is very well connected to Dusseldorf which is at 50 km northwest of the airport but much closer as regards access time than the kilometric distance would suggest thanks to the ICE rail link. Actually, both airports are rather complementary and compete only as regards a small part of their respective flight offer. The analysis of the airports' traffic patterns reveals that Cologne/Bonn airport is specialised in low-cost traffic and is not served anymore by Lufthansa[453] whereas Dusseldorf airport handles only a modest proportion of low-cost traffic (22.6 % in 2006) but is well served by traditional full service airlines operating a rather large number of intra-European and in particular of extra-European flights (the latter representing 27 % of the airport's total passenger throughput in 2006). Lufthansa served 43 destinations from Dusseldorf airport in 2006; among them figure eight German and seven European routes on which were scheduled more than 1000 departing flights according to OAG data.

As regards Treviso airport, it is situated at 20 km from Venice which is actually a rather small city in contrast to all other cities but Venice is characterised by a very large touristic importance in addition to a medium economic interest. However, being a small city in a medium dense zone, the distance of Treviso airport from Venice appears to be rather large.

All other airports are located outside of dense urban areas with large or very large cities of a large, even very large, economic importance and/or of a large, even very large, touristic interest. This is the case of Berlin Schonefeld, which was the major airport of the German Democratic Republic prior to the reunification, at 22 km southeast from Central Berlin. Moreover, Charleroi airport at 40 km from Brussels, Lubeck at 50 km from Hamburg, London Luton and London Stansted at about 50 km respectively north northwest and north northeast of Central London, Bergamo at 50 km northeast of Milan, Niederrhein/Weeze at 60 km northwest of Dusseldorf, Beauvais at 80 km north of Paris, Girona and Reus at 80 to 100 km from Barcelona and Hahn at even 120 km west of Frankfurt are in this situation. Regarding past traffic figures, these airports were clearly penalised by their remote location. The nearby dense metropolitan areas were almost exclusively served by larger airports benefitting from a better location. This was the case of Berlin served mainly by Berlin Tegel airport[454], of London served mainly by London Heathrow as well as by London Gatwick (in particular for charter traffic)[455], of Milan served by Linate and Malpensa airports, of Paris served by Paris CDG and Orly airports, but also of Barcelona, Brussels, Dusseldorf, Hamburg, Frankfurt and Venice.

By focusing on low-cost (i.e. low-fare) traffic, these airports provide an additional flight offer for metropolitan zones which are served by larger airports but not necessarily within this market segment. Thus, they manage to outweigh remoteness which allowed them to register

[453] In 2001, Lufthansa still operated more than 3043 flights from Cologne/Bonn to Munich airport and more than 2000 flights respectively to Berlin Tegel and Hamburg airports as well as 1384 flights to Zurich and 1228 flights to Paris CDG airport. Lufthansa also served Frankfurt airport from Cologne airport (1900 flights scheduled in 2001). Whereas the cancellation of the Cologne/Bonn-Frankfurt route is mainly due to the high-speed rail link between both cities, the complete withdrawal of Lufthansa can be explained by its focus on Dusseldorf airport.

[454] In addition, some 800 000 passengers used Berlin Tempelhof airport in 2000. The latter ceased operating in 2008 in the context of the decision to construct the new Berlin-Brandenburg International airport at Berlin Schonefeld. By the way, Berlin Tegel airport is scheduled to close in 2012, six months after the completion of the new airport that is designed for handling all commercial flights to and from Berlin.

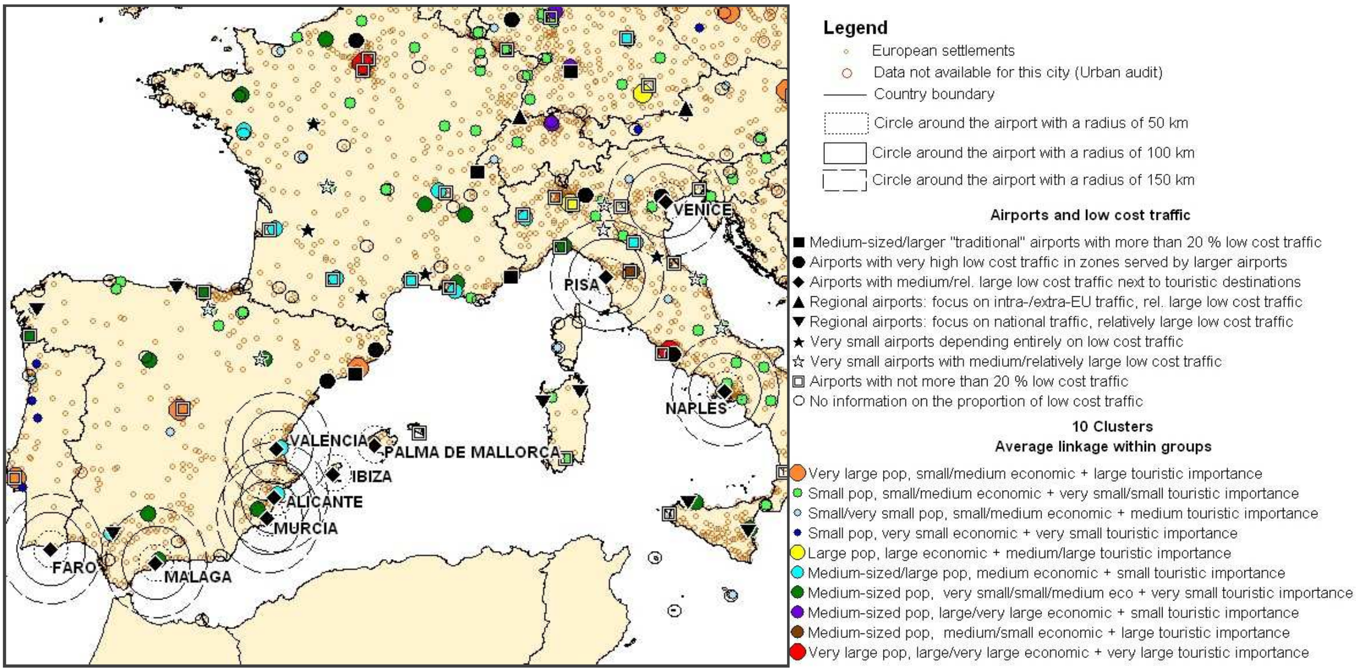
[455] Besides, some 1.6 million passengers used London city airport in 2000.

an impressing growth in traffic over the last year. Already in 2006, these airports handled a relatively large traffic which is out of all proportion to the population and the socio-economic characteristics of their environs and underlines the role they play for the air service to and from the nearby metropolitan areas.

8.3.2.3. Airports with a medium or relatively high proportion of low-cost traffic located in zones which are less densely populated and less important from an economic point of view but characterised by a large attractiveness for tourism

Low-cost traffic plays also an important role for some airports which are located in zones that are less densely populated and of a rather limited economic importance but next to touristic destinations. These airports are all located along the Mediterranean Sea coast or on the Spanish islands, such as Palma de Mallorca and Ibiza airport (including also Fuerteventura and Tenerife Reina Sofia airports situated south of Spain outside of the figure). Figure 58 illustrates their territorial context.

Figure 58: Airports with a medium or relatively high proportion of low-cost traffic in less dense zones but next to touristic destinations



Own figure

Most airports are situated next to medium-sized or larger cites but in zones which are generally less dense. Faro and Pisa airport are even located next to very small cities and Venice airport next to a small one. Nevertheless, some differences can be observed, in particular between Faro, Malaga, Murcia, Alicante and Valencia airports on the Iberian

Peninsula as well as Naples and Pisa on the Italian Peninsula on the one hand and Venice located in the Northern part of Italy on the other hand.

Venice airport is located next to Venice which is, despite its assignment to the light blue cluster, a small city of a very large touristic importance. In addition, Padova, a small city of large economic importance, although being attributed to the light green cluster, is located at less than 50 km from Venice airport. The circles of 100 and 150 km around the airport are probably of relatively small importance due to the proximity with Bologna and Verona airports which counted 4.0 and 2.9 million passengers respectively in 2006. The flight offer of Bologna and Verona overlaps partly. In contrast to Venice airport, low-cost traffic is less important (11.0 % and 7.0 % respectively of Bologna's and Verona's passenger throughput in 2006) and charter traffic is well developed (17.8 % and 40.3 % respectively of Bologna's and Verona's total traffic). However, Bologna and Verona are, just like Venice, not only served by Alitalia but also by other traditional full service carriers such as Lufthansa, British Airways and Air France which contributes to their attractiveness.

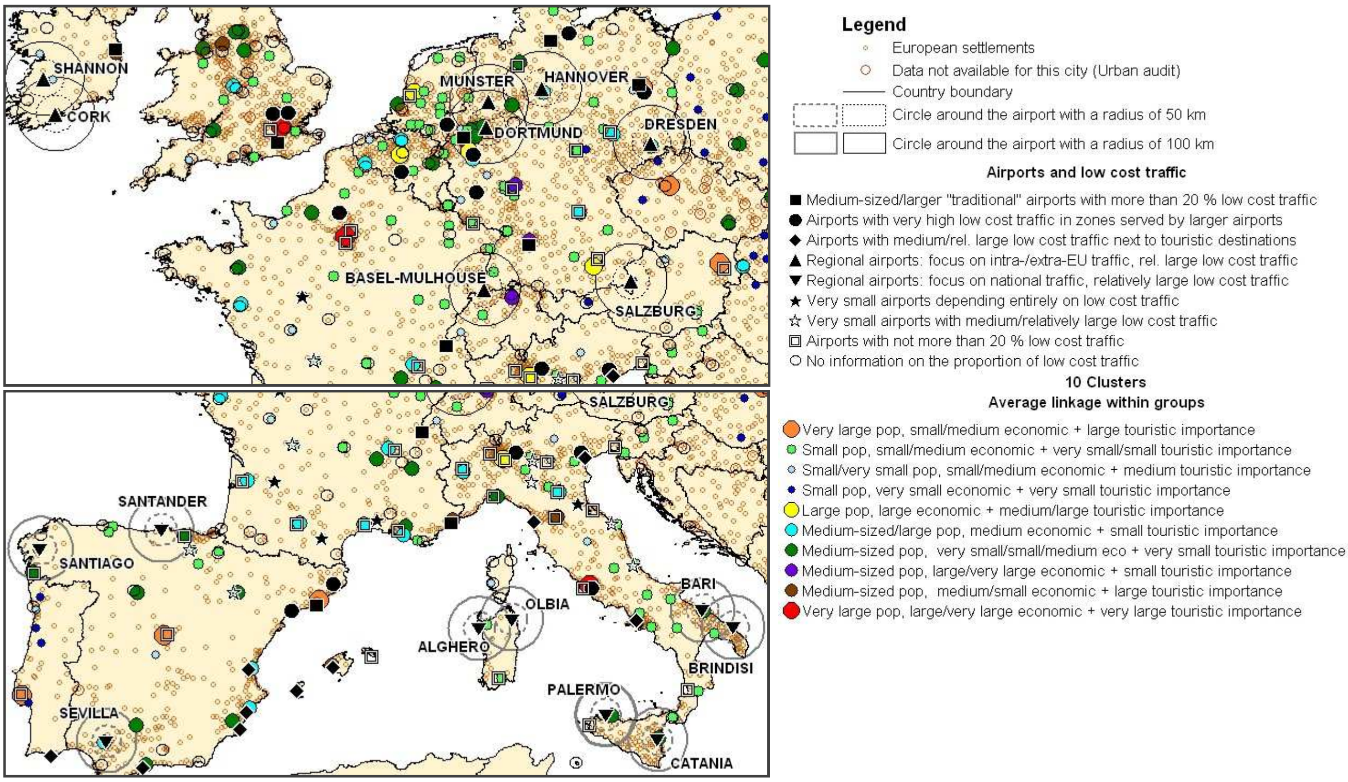
Faro, Malaga, Murcia, Alicante and Valencia airports are situated in a zone which is less populated and characterised by a relatively strong concentration of settlements along the coast. This coastal area along the Mediterranean Sea represents a large part of the touristic offer of Spain but it extends over a large number of small and very small towns and even villages which are not included into the Urban Audit statistics on which is based the classification of European cities. For this reason, figure 58 does not reflect sufficiently the large attractiveness of this region for tourism. This remark also applies, at least in part, to Naples and Pisa which are located on the Italian Peninsula. Naples airport is next to Naples, a large city of medium economic but only small economic importance, as well as to some other small cities but figure 58 does not reflect the large touristic attractiveness of the region served by Naples airport as tourism is not concentrated on one city but extends over a less populated zone with a relatively large number of smaller towns and villages in the surroundings of Naples and in particular next to the coast and which are not included in the Urban Audit statistics. Pisa airport is also located in a much less dense area with a number of smaller towns and villages in the surroundings being attractive for tourists but escaping the Urban Audit statistics. In addition, Florence, a medium-sized city of a very large touristic importance (not only large as the assignment to the brown cluster would suggest), is situated at only 70 km. Next to the city is located Florence airport but the latter, despite airlines such as Alitalia, Lufthansa and Air France fly in and out of the airport, counted only 1.5 million passengers in 2006. Indeed, Florence and Pisa airport are the two main airports in the Tuscany region and still in 2003 both airports registered the same traffic of about 1.4 million passengers but since then Pisa airport could double its passenger throughput and this largely thanks to low-cost traffic which represents 61.8 % of the airport's total traffic in comparison to 3.9 % of low-cost traffic for Florence airport.

8.3.2.4. Regional airports: relatively large distance from a country’s economic and political centres or next to small and medium-sized cites of some economic importance but also within reach of larger airports with an alternative flight offer

Another category of airports with a medium or relatively high proportion of low-cost traffic are airports which can be considered as regional ones as they serve a relatively small or less populated area. As regards their traffic patterns, two types of regional airports may be distinguished: those handling many intra- and extra-European flights and those focusing on national traffic. Apart from this difference, one could observe that the airports concentrating on intra- and extra-European traffic are slightly larger and low-cost traffic is slightly more important, just as charter traffic, than for the airports which handle almost only national traffic. Figure 59 shows the territorial context into which these airports are embedded. Due to their limited importance, only circles around the airports with a radius of 50 and 100 km are indicated.

The airports belonging to the first group are all located in Western Europe. Cork and Shannon airports are situated at the outside edge of Europe in a relatively lightly populated zone but next to cities of a medium touristic importance although being rather small. Munster airport is also located in a less populated zone, about 75 km north of Dortmund. Dortmund is situated at the outside edge of this extremely dense zone around Dusseldorf, Cologne and Bonn. In contrast to the latter, Hannover, Dresden but also Basel-Mulhouse are situated in zones which are less dense and less important from an economic point of view but they are located next to small or medium-sized cities of a certain, even if limited, economic and touristic importance. Salzburg airport is next to a small city of a very large touristic importance (although belonging to the dark blue cluster). Thus, these cities are somewhat in-between... neither small and insignificant nor large and sufficiently attractive from an economic or touristic point of view, all the more the cities that are served by these regional airports are located not too far from airports which serve mainly cities which are larger and economically more important but could also be an alternative for certain air services as they offer a large number of destinations and airlines, including also a relatively important low-cost traffic in certain cases. Thus, Hannover is at less than 150 km from Hamburg airport, Munster at about 175 km from Dusseldorf, Dresden at 150 km from Berlin Schonefeld and about 175 km from Berlin Tegel, Salzburg is a little more than 100 km from Munich airport and Basel less than 100 km from Zurich airport.

Figure 59: The territorial context into which regional airports with a medium or relatively high proportion of low-cost traffic are embedded



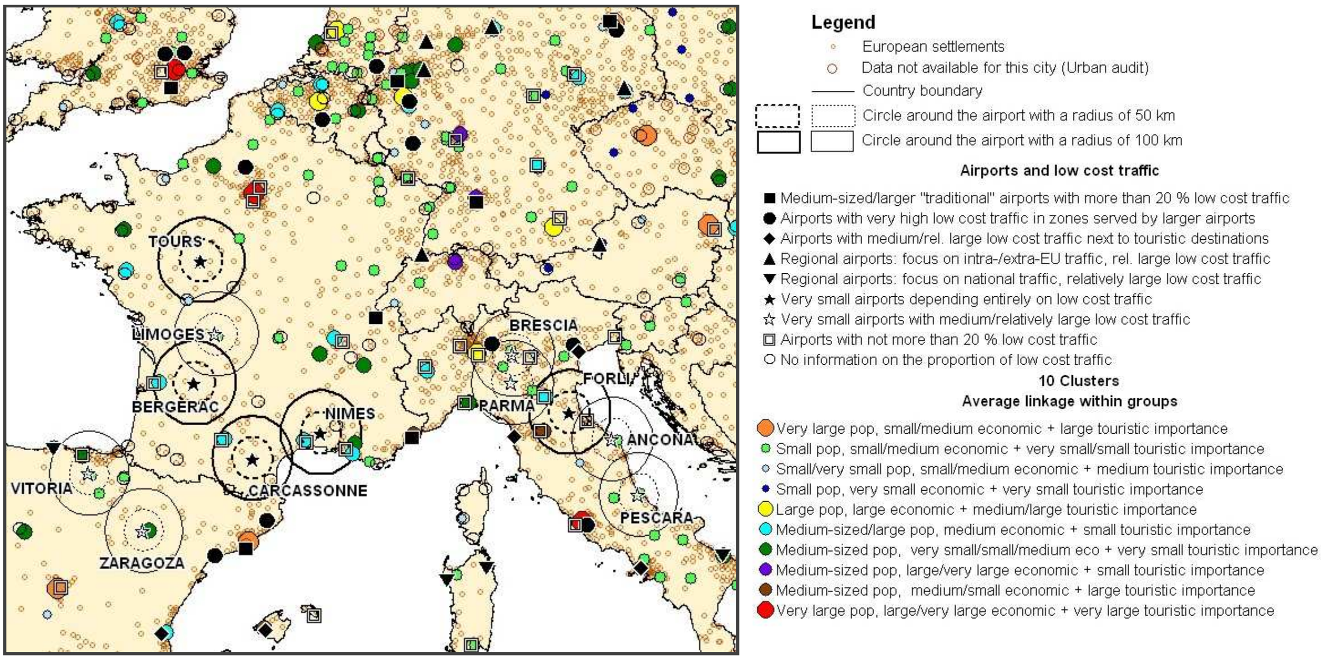
Own figure

The airports belonging to the second group are all located in Spain and Italy not only in less populated zones but most notably in zones which are relatively far from the country’s economic and political centres. This concerns Bari and Brindisi at the southern end of Italy but also Palermo and Catania on Sicily and Alghero and Olbia on Sardinia whose remoteness is reinforced by their location on an island. These airports assure mainly air links to Milan (yellow), the economic centre of Northern Italy as well as to Rome, the capital and economic centre in the central-western portion of the Italian Peninsula. In Spain, the airports of Santiago, Santander and Seville are in a similar position in comparison to Madrid and Barcelona, the two largest Spanish cities and the most important ones from an economic and touristic point of view.

8.3.2.5. Located in remote areas, some very small airports handle only low-cost traffic whereas others are characterised by a rather limited proportion of low-cost traffic

Finally, there are two groups of very small airports: one depends entirely on low-cost traffic but owing all their traffic growth to low-cost airports whereas the other is characterised by a rather modest or relatively high proportion of low-cost traffic.

Figure 60: The territorial context into which very small airports with some low-cost traffic as well as very small airports depending entirely on low-cost traffic are embedded



Own figure

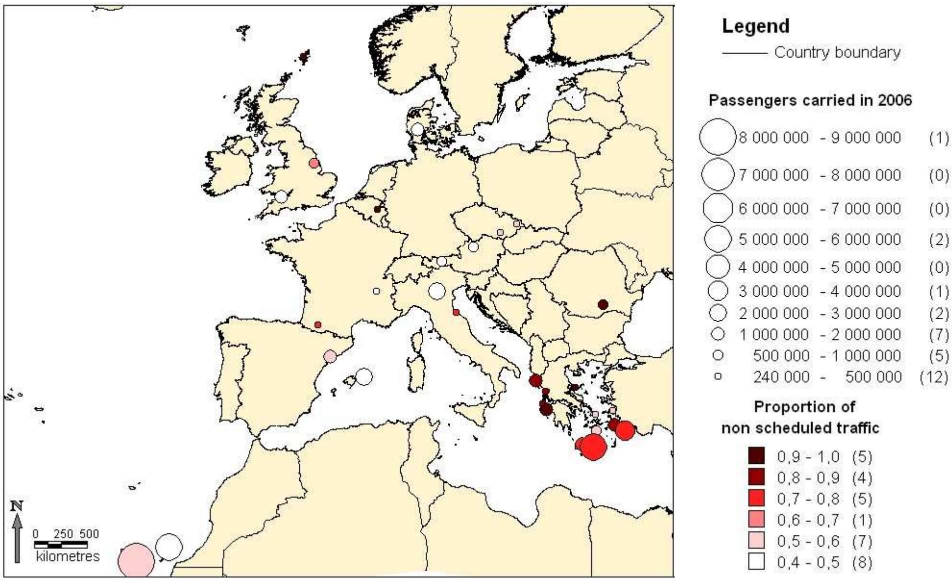
As illustrated by figure 60, the majority of these very small airports are located in remote areas, next to only small cities and also relatively far from zones of economic and touristic importance. This applies in particular to Tours, Limoges, Bergerac, Carcassonne, Vitoria, Forli, Ancona and Pescara but also to Nimes. Among these airports, Tours, Bergerac, Carcassonne, Nimes and Forli handle almost only low-cost traffic. However, what seems to be an advantage does not necessarily lead to a much higher total passenger throughput which remains relatively low despite the presence of low-cost airlines. Due to the remote location, the number of destinations and airlines are very small (in most cases Ryanair is not only the largest but also the only carrier) and frequencies low. Even the specialisation in low-cost traffic does not allow these airports to outweigh their remoteness.

As regards Brescia and Parma airports, they are also located in a less dense zone and with about 100 km distance from Milan relatively far away from the large economic centre of Northern Italy. In this respect, their situation is comparable to Frankfurt-Hahn which is located at 120 km from Frankfurt. However, the airports of Brescia and Parma fail to outweigh their remoteness due to Bergamo airport which is situated at only 50 km from Milan and attracts a large number of low-cost carriers which allowed the latter to specialise in this market segment.

8.4. Charter traffic driven by touristic attractiveness of certain regions, frontier between charter and low-cost traffic becoming blurred

In contrast to low-cost carriers, charter airlines have been operating for a long time. Just as most low-cost airlines, they operate point-to-point air links and serve destinations with relatively high volumes of traffic. However, their activity is much more concentrated on summer holidays. Figure 61 shows all airports having a total traffic of above 200 000 passengers in 2006 and at least 40 % charter traffic according to Eurostat statistics. All in all, 30 airports are concerned.

Figure 61: Charter traffic at European airports



Own figure

Twelve airports are situated on the Greek islands, for most of them the proportion of charter traffic is very high: Skiathos (93.5 %), Aktio (89.9 %), Kefallinia (86.6 %), Samos (57.7 %), Santorini (53.4 %), Mikonos (50.5 %), Zakynthos (97.0 %), Corfu (85.2 %), Kos (84.0 %), Heraklion (79.9 %), Chania (75.0 %) and Rodos (77.0 %). Further three airports are located on Spanish islands: Tenerife Reina Sofia (54.9) %, Arrecife/Lanzarote (47.4 %) and Menorca airports (41.2 %). In addition, Reus airport registers 51.3 % of charter traffic.

Moreover, 14 airports on the European mainland but also in the UK are characterised by more than 40 % charter traffic, including Scatsta (100 %), Humberside (62.2 %) and Cardiff (47.1 %) in the UK, Billund (47.0 %) in Denmark, Verona Villafranca airport (40.3 %) and Rimini (73.4 %) in Italy, Grenoble (50.0 %), Tarbes Lourdes Pyrenees (79.1 %) in France, Bucharest/Baneasa (99.9 %) in Romania, Brno (56.7 %) and Ostrava (59.7 %) in the Czech Republic, Innsbruck (48.7 %) and Linz (41.8 %) in Austria as well as Liege (100 %), the latter being specialised in freight traffic.

8.4.1.1. Traffic patterns

The airports being located on the European mainland may be distinguished from those being situated on the Spanish and Greek islands with respect to two characteristics: their size and the regional distribution of non-scheduled traffic.

Firstly, the airports with a large proportion of charter traffic which are situated on the European mainland handle relatively small volumes of passengers: 11 of the 15 airports handle less than 800 000 passengers in 2006. In contrast, all three airports being situated on the Spanish islands were used by at least 2.6 million passengers (even 5.5 and 8.5 million respectively for Arrecife de Lanzarote and Tenerife Reina Sofia airports). As regards the 12 airports on the Greek islands, Heraklion is the biggest with 5.3 million passengers, followed by Rodos airport with 3.5 million passengers and further four airports handling between 1 and 2 million passengers. Thus only 6 of the 12 airports located on the Greek islands handle less than 800 000 passengers.

Secondly, whereas national traffic is relatively small among all non-scheduled flights at all airports, except for Scatsta airport which handles 100 % national traffic, there is a considerable difference as regards the distinction between intra- and extra-European traffic. Whereas the Spanish and Greek airports are turned towards the EU with an extra-EU traffic below 9.5 % (with one exception, namely Chania airport where it reaches 19.6 %), the airports on the European mainland and in the UK handle a quite large proportion of extra-EU traffic representing more than 19 %[456] (with two exceptions, namely Tarbes Lourdes Pyrenees and Humberside airports where the extra-EU traffic corresponds to 1.3 % and 13.8 % respectively).[457] This difference is largely due to the North-South orientation of charter traffic. While Spanish and Greek charter airports focus on receiving passengers from the North of Europe as these islands are popular tourist destinations, the charter airports north of them send passengers to different holiday destinations around the Mediterranean Sea, including Spain and Greece but also e.g. Tunisia, Egypt, and Turkey, and even to the Caribbean.

The above-mentioned tendencies become even more apparent when considering only those 13 airports with a traffic of more than 1 million passengers in 2006. Only three airports are located outside of Spain or Greece: Cardiff, Billund and Verona/Villafranca airport, they all having a large extra-European charter traffic (19.0 %, 35.6 %, 43.9 % respectively) whereas the ten airports in Spain and Greece (except for Chania airport) have a rather small extra-EU traffic below 8.9 %. As regards Verona airport this may surprise but Northern Italians seem to resemble the people from Western and Northern Europe as regards their holiday behaviour...

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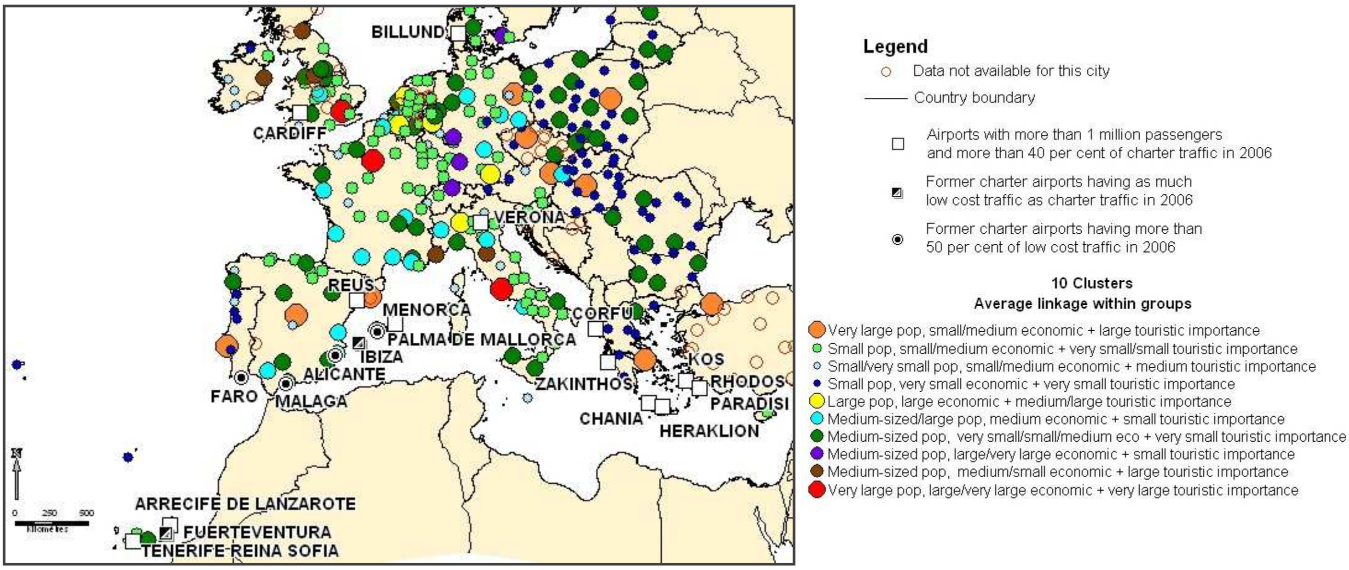
[456] Bucharest/Baneasa airport is not considered as all international traffic is extra-European since the airport joined only in 2007 the EU.

[457] A more detailed analysis is not possible for two reasons: Eurostat route data does not distinguish between scheduled and non-scheduled traffic but refers to the airport' overall traffic. Moreover, route data is not very complete for the Greek airports which register the highest proportions of charter traffic (covering only 57.6 % to 82.6 % of the airports' overall traffics).

8.4.1.2. The territorial context into charter airports are embedded

Figure 62 illustrates the territorial context into which are embedded the airports having at least 1 million passengers of which more than 40 % travel with charter airlines.

Figure 62: The territorial context into which airports with a large charter traffic are embedded



Own figure

In this respect it seems that the charter airports on the Greek islands, all having at least 75 % of charter traffic, are located in remote zones which are lightly populated and of very small economic importance but popular holiday destinations. The touristic attractiveness of this region is not sufficiently reflected in figure 62 for the same reason as it was the case of the Spanish, Portuguese and Italian coastal area along the Mediterranean Sea.[458] Beyond, it seems that the airports on the Greek islands are penalised by their location at the periphery of Europe and their large distance from the dense and economically powerful regions in Europe. For this reason, they could not profit from the growth of low-cost airlines in contrast to a number of airports in Spain and Portugal which handled a large proportion of charter traffic[459] in 1996 but are characterised by a relatively strong low-cost traffic in 2006.

This development concerns mainly Faro, Malaga, Alicante and Palma de Mallorca (◉) which had a proportion of charter traffic ranging from 66.1 % to 86.3 % in 1996 and could profit from the growth of low-cost airlines leading to a decrease in charter traffic (in absolute number as well as in percentage shares) thus handling today more than 50 % of low-cost traffic. A part of the low-cost traffic results just from a transfer from charter to low-cost traffic as a number of charter airlines started operating scheduled flights. Nevertheless, low-cost

[458] This coastal area along the Mediterranean Sea represents a large part of the touristic offer of Spain, Italy and Greece but it extends over a large number of small and very small towns and even villages which are not included in the Urban Audit statistics on which is based the classification of European cities used for this analysis.

[459] 99.4 % for Reus, 67.1 % for Lanzarote, 75.6 % for Tenerife Reina Sofia, 73.0 % for Ibiza, 44.7 % for Fuerteventura, 86.3 % for Faro, 75.1 % for Malaga, 75.4 % for Alicante and 66.1 % for Palma de Mallorca.

traffic allowed in particular Malaga and Alicante airports to increase their traffic by 39 % and 48 % over the period from 2000 to 2006 whereas Faro and Palma de Mallorca could register a growth of 11 % and 16 %. Over the same period, the traffic of most Greek charter airports remained stable or decreased slightly (+1 % for Kos, -1 % for Heraklion, -1 % for Corfu and even -3 % for Rodos); only Zakynthos and Chania airport saw their passenger throughput increase (+22 % and +23 %).

Other airports which profited from the growth of low-cost traffic are Ibiza and Fuerteventura (◩) which handled still 35.7 % and 37.4 % of charter traffic in 2006 but also as much low-cost traffic (33.5 % and 37.6 % respectively).

As regards Reus, Lanzarote and Tenerife Reina Sofia airports, they may still be considered as charter airports since the latter corresponds to more than 40 % of their total passenger throughput (□). However, they also receive low-cost airlines: For Reus airport, 51.3 % of its passengers travelled with charter airlines but the rest with low-cost carriers (46.6 %); Lanzarote and Tenerife Reina Sofia airports handled still 47.4 % and 54.9 % of charter traffic but low-cost traffic represented after all 17.4 % and 27.3 % of their total passenger throughput in 2006.

It is interesting to observe that Fuerteventura, Lanzarote and Tenerife Reina Sofia airports are also located at a large distance from the centre of Europe and actually low-cost airlines started only recently to serve these destinations. Nevertheless, one can also note that the Canaries concentrate with Santa Cruz de Tenerife and Las Palmas de Gran Canaria a small and a medium-sized city of medium economic importance. Thus the Canaries are economically more important than the very small Greek islands which may outweigh in part their peripheral location.

8.5. Regional specialisation of airports located at Europe's periphery but in zones that are relatively dense and of relative economic power

Certain airports do not specialise according to a particular function but pursue a regional specialisation.

8.5.1. Traffic patterns

8.5.1.1. Madrid as "the Atlantic door of Europe"

Madrid airport is developing as "the Atlantic door of Europe". Already 29 % of all passengers travelling from Europe (EU-25) to Latin America and the Caribbean come from Madrid. Madrid airport counted 45.1 million passengers in 2006 and was the fifth largest airports just behind Amsterdam airport. In return, Madrid registered only some freight traffic: With

342 000 t loaded and unloaded in 2006, the airport figured on tenth place of the airports handling the largest volumes of cargo.

The airport is served by at least 100 airlines offering more than 156 destinations[460] in 2006 but it is above all the hub of Iberia which handled almost 45 % of the airport's total passenger throughput. The analysis of routes operated from Madrid airport underlines the strong orientation towards Latin American destinations. According to OAG data, 27 destinations were served all over Latin America. Eurostat[461] covers 18 of them which are located in 13 countries. They represent 5.8 million passengers, i.e. 12.8 % of the airport's overall traffic. The most important destination was Ezeizo Ministro Pistarini airport in Buenos Aires with 965 000 passengers in 2006, followed by Havana, Mexico and Bogota airport with 508 000, 488 000 and 423 000 passengers respectively. Further seven destinations totalise 300 0000 to 400 000 passengers and five destinations still more than 100 000 passengers. The traffic of the two smallest routes represents 90 000 passengers. As regards passengers travelling to Latin America and the Caribbean, this means also that the only Madrid airport handled in 2006 as much as 87 % of the passengers travelling to Latin America and the Caribbean from Paris CDG, Amsterdam and Frankfurt together.

The role of the hub of Madrid has been strengthened the last years to the detriment of the other important airports in international tourism like those of Palma de Mallorca and Malaga as well as Barcelona. With Madrid having the lead, the new airport of Lisbon whose inauguration is expected for 2015 has hardly any chance to become the European hub towards Latin America and in particular towards the Brazil as the ambition had been phrased...

8.5.1.2. Athens seeking for the role as hub towards the Near and Middle East and Western Asia in general

Just like Madrid established itself as "Atlantic door of Europe", Athens, which counted 15.1 million passengers in 2006, seeks to play the role of a hub to the Near and Middle East but there is much competition for these traffics and neither Lufthansa nor Olympic Airways have invested in the airport to date as it had been hoped. Nevertheless, 9 destinations had been served in the Near and Middle East in 2006 according to OAG data. The only three destinations to the Near and Middle East (Dubai, Tel-Aviv Ben Gurion and Bahrain airports) for which data were collected by Eurostat totalised 360 000 but all in all 518 000 passengers were counted, i.e. 3.4 % of the airport's total traffic.[462] When considering Western Asia, the number of destinations reaches 15 according to OAG data (including Istanbul Ataturk, Izmir, Larnaca, Paphos, Tbilisi, and Yerevan) and the number of passengers triples almost with further 1 million passengers travelling to Larnaca and Istanbul Ataturk airports. All in all,

[460] Considering a traffic of at least 10 000 passengers, 94 airlines flew in and out of Madrid airport serving 156 destinations (AENA statistics).

[461] Eurostat statistics collected data on 100 destinations served from Madrid airport which totalise 43.0 million passengers in 2006, i.e. 95.4 % of the airport's total traffic.

[462] Only six routes to Western Asia are covered by Eurostat data. All in all, data is collected for 47 destinations representing however only 88.1 % of the airport's total passenger throughput.

Western Asia represents 9.1 % of all passengers. This means that the proportion of traffic to Western Asia in the airport's total passenger throughput is relatively high although this is not the case in the total numbers compared to the four generalist hubs and in particular to London Heathrow which counted 4.1 million passengers travelling to 20 destinations in the Near and Middle East (according to OAG data) and 4.9 million when considering all 23 destinations located in Western Asia, i.e. 7.5 % of its overall passenger throughput in 2006.

… and competing against Milan Malpensa airport

Apart from the big hub airports, Milan Malpensa airport is one of the most important rivals as regards traffic to the Near and Middle East.[463] Milan Malpensa (21.6 million passengers in 2006) served 11destinations in the Near and Middle East according to OAG data. As regards Eurostat, the Near and Middle East represented 807 000 passengers, i.e. 3.7 % of the airport's total passenger throughput. Including Istanbul Ataturk airport, one of the further three destinations served in Western Asia[464], the number of passengers amounts to 958 000 passengers, i.e. 4.4 % of the airport's overall traffic.

8.5.1.3. Vienna as hub towards Eastern Europe

Vienna airport, 16.8 million passengers in 2006, counts on the development of traffic to Eastern Europe (the former communist countries)[465] where 45 destinations were served. Only Frankfurt and Munich airports handled a similar number of destinations (52 and 44 destinations respectively in 2006) whereas other airports which might also seek for the role of a major hub in the traffic towards Eastern Europe handle fewer destinations: 38 destinations for Prague[466], 29 destinations for Budapest and 28 destinations for Warsaw according to OAG data[467].

The 11 most important routes operated from Vienna airport, according to Eurostat data, totalised 1.6 million passengers, i.e. 9.3 % of the airport's overall traffic. The busiest routes was Moscow/Sheremetyevo with 222 000 passengers, followed by Bucharest/Otopeni with 191 000 passengers and by Warsaw with 168 000 passengers as well as Sofia and Prague with 159 000 and 154 000 passengers respectively.

According to this strategy, Vienna airport holds a 50.1 % stake in "TwoOne" that applied to the Slovak state for a 66 % stake in Bratislava and Košice airport in order to develop and to manage both airports. Due to the objection of the Slovak Competition Authority the

[463] Another airport which wants to establish itself a hub towards the Near and Middle East as well as to Asia is Istanbul airport. However, there is not detailed data on the airport available as Eurostat data refers only to the European Union and OAG data only to Europe whereas Turkey is largely situated in Asia.

[464] No route data available for Larnaca and Baku from Eurostat.

[465] Including Croatia, Macedonia, Slovenia, Albania and the countries belonging to the former Yugoslavia which belong to Southern Europe as well as Lithuania, Latvia and Estonia that are located in Northern Europe according to the UN geoscheme.

[466] As regard s Eurostat statistics, route date for Prague is missing.

[467] See also Flughafen Wien AG (2007, p. 43).

privatisation of Bratislava airport has been cancelled in October 2006.[468] A successful acquisition of Bratislava and Kosice airport would have allowed Flughafen Wien AG to develop the three airports together, reinforcing the role of Vienna airport as a hub in East-West and long-distance traffic whereas Bratislava airport would have been dedicated to charter and low-cost traffic.

For which Budapest airport…

Budapest airport handled 8.2 million passengers in 2006. 29 destinations were served in Eastern Europe (including the former communist countries in Southern Europe) according to OAG data. For seven of these routes data are available from Eurostat[469]. These seven destinations totalise almost 700 000 passengers which is 8.3 % of the airport's overall traffic in 2006. The busiest route is Prague with 161 000 passengers, followed by Bucharest/Otopeni and Warsaw with 125 000 passengers each one.

…and Warsaw airport are also seeking

Warsaw airport registered 8.1 million passengers in 2006. All in all, 28 destinations in Eastern Europe (including the former communist countries in Northern and Southern Europe) are served from Warsaw airport. Their traffic corresponded to 1.3 million passengers, i.e. 15.5 % of the airport's total passenger throughput.

8.5.1.4. Stockholm, the regional hub in Northern Europe

Stockholm is in competition with Copenhagen and also with Helsinki for the role of a regional hub. The airport registered 17.5 million passengers in 2006 and offered a hundred destinations in Europe of which 45 were located in the Scandinavian countries, including Iceland, and further four in Estonia, Latvia and Lithuania (OAG data).

According to Eurostat[470], 23 destinations in the Scandinavian countries (including Iceland) represented 8.4 million passengers in 2006, i.e. 47.9 % of the airport's overall traffic. The two busiest destinations were Copenhagen Kastrup and Oslo Gardermoen airports with more than 1 million passengers each one. They are followed by the routes to Goteborg Landvetter, Helsinki Vantaa and Lulea, each one realising a traffic of more than 800 000 passengers.

The airport is served by all major full-service carriers. Moreover, frequencies are high for most destinations. For 2006, British Airways scheduled 2074 flights London Heathrow, Air France 1094 flights to Paris CDG, KLM 1929 flights to Amsterdam, Alitalia 365 flights to Milan Malpensa and 65 flights to Rome Fiumicino, Lufthansa 1460 flights to Frankfurt, 1405

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[468] Airwise News. 2006. *Slovakia Stops Bratislava Airport Sale*. http://news.airwise.com/story/view/11612 12078.html, accessed on 18 October 2006.

[469] Eurostat covers route data for 36 destinations whose traffic amounts to 5.8 million passengers which corresponds to only 70 % of the airport's total traffic.

[470] Eurostat data covers 52 destinations which totalised a traffic of 14.4 million passengers, i.e. 82.2 % of the airports total passenger throughput in 2006.

flights to Munich, 761 flights to Dusseldorf and 578 flights to Hamburg as well as Iberia 366 flights to Madrid according to OAG data. SAS uses Stockholm Arlanda as hub. In addition to 14 Scandinavian destinations, it operates flights to 27 destinations in Europe and three destinations outside of Europe.

In competition with Copenhagen airport…

Copenhagen airport was used by 20.7 million passengers in 2006. According to OAG data, 29 destinations in the Scandinavian countries (including Iceland) were served from the airport. Moreover, four routes were operated to Estonia, Latvia and Lithuania. According to Eurostat[471], the 16 most important routes to Scandinavia totalised a traffic of 6.4 million passengers which corresponds to 30.8 % of the airports total passenger throughput. Oslo Gardermoen was the largest destination with almost 1.3 passengers and further 1.2 million travelled to Stockholm Arlanda airport. All other routes realised a traffic below 700 000 passengers.

Just as Stockholm, Copenhagen airport is served by all major full-service carriers and destinations as well as frequencies are rather similar. Only Lufthansa operated considerably less flights to Copenhagen than to Stockholm although it still had scheduled 730 flights to Frankfurt and 728 flights to Munich in 2006 according to OAG data. In return, Air France served better Copenhagen than Stockholm with 1459 flights scheduled to Paris CDG and 541 flights scheduled to Strasbourg.[472] As regards SAS, it operates also a hub at Copenhagen airport serving 41 destinations in Europe in addition to 15 destinations in Scandinavia as well as nine destinations outside of Europe.

…as well as Helsinki airport

Finally, Helsinki airport counted 12.1 million passengers in 2006. The number of destinations in the Scandinavian countries (including Iceland) amounts to 27 according to OAG data for 2006. In addition, four routes were operated to Estonia, Latvia and Lithuania. Considering Eurostat[473] data, 18 destinations in the Scandinavian countries concentrated 4.6 million passengers which represent 40.0 % of the airport's total traffic in 2006. The most important destinations were Stockholm Arlanda, Oula and Copenhagen with 865 000, 763 000 and 663 000 passengers respectively while all other destinations counted less than 350 000 passengers.

The airport is also served by full-service carriers but the number of airlines, destinations and frequencies are generally lower. Thus Air France, Iberia, and Alitalia did not fly in and out of

[471] As regards Copenhagen airport, Eurostat data was collected for 72 destinations which represented 18.5 million passengers, i.e. 89.4 % of the airport's overall traffic.

[472] The other airlines are British Airways with 2085 flights scheduled to London Heathrow, KLM with 1881 flights to Amsterdam, Alitalia with 545 flights to Milan Malpensa and 63 flights to Rome Fiumicino as well as Iberia with 365 flights to Madrid according to OAG data for 2006.

[473] Eurostat data refers to 49 routes operated from Helsinki airport. They realised a traffic of 10.1 million passenger which corresponds to 82.8 % of the airport's total passenger throughput.

Helsinki in 2006 whereas British Airways operated 727 flights to London Heathrow and KLM 1077 flights to Amsterdam. In return, Lufthansa scheduled 1779 flights to Frankfurt and 785 flights to Munich. Finnair operates its hub at Helsinki Vantaa airport. In addition to 21 routes in Scandinavia, it served 54 destinations in Europe and 17 destinations outside of Europe.

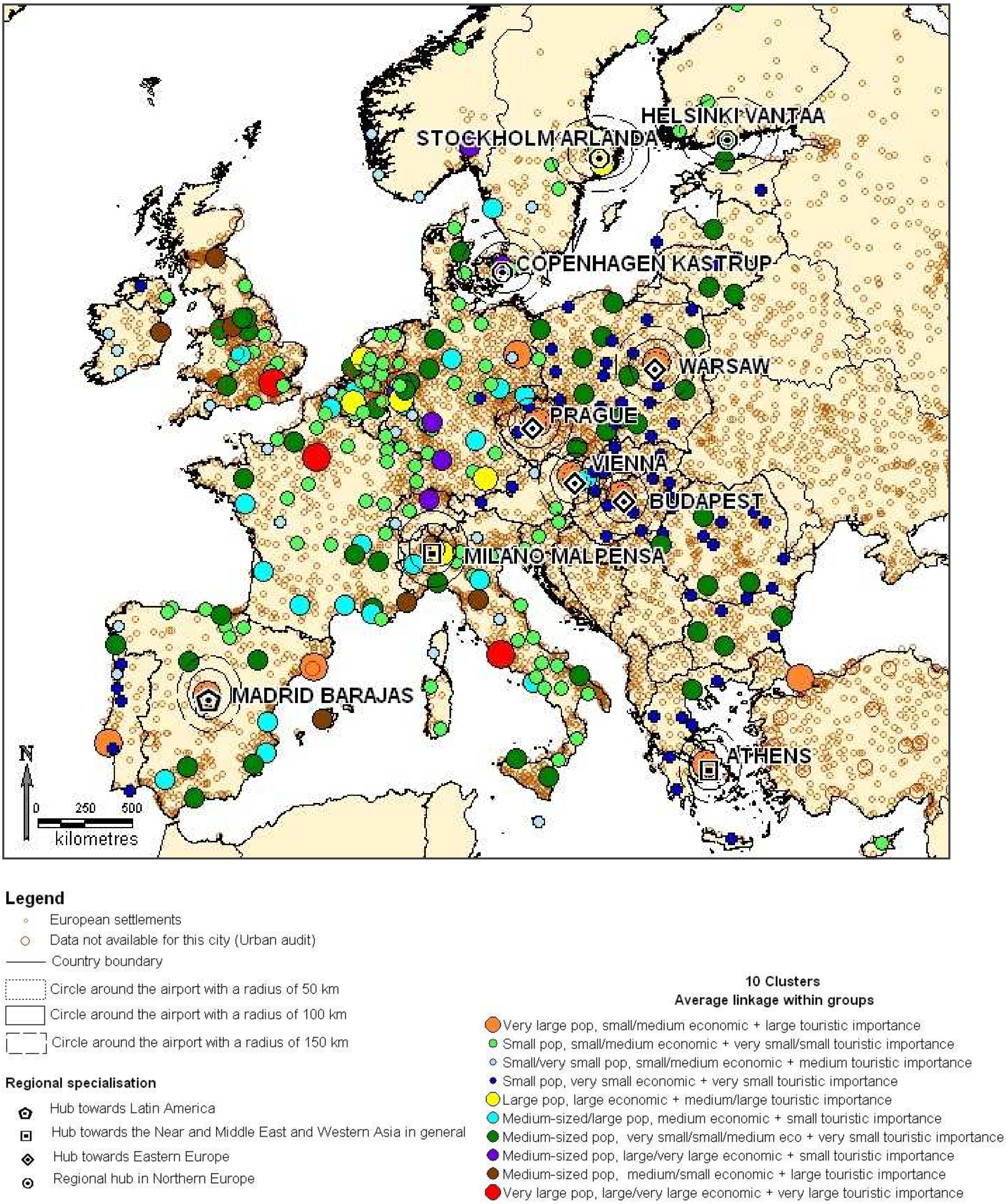
In particular, Stockholm and Copenhagen airports are well served by the traditional full-service carriers, such as Air France, KLM, British Airways and Lufthansa, in addition to SAS. Helsinki is still well served y traditional full-service carriers but less than the two airports already mentioned. In return, Finnair operates flights to a larger number of destinations from Helsinki. Thus, all three airports are very well connected to the rest of Europe and in particular to Western and Southern European destinations but the major destinations in Eastern Europe are served, too. Moreover, there are some routes operated to Asia and Northern America. In particular the large number of European destinations distinguishes Stockholm, Copenhagen and Helsinki from Oslo airport, 16.3 million passengers in 2006 of which 49 % travelled to Norwegian destinations and 22.6 % to other destinations within Scandinavia (including Iceland).[474] Of course, the main airports in the rest of Europe are served also from Oslo but the number of destinations and passengers is limited in comparison to Stockholm, Copenhagen and Helsinki airports. Thus, Oslo airport plays rather the role of a hub at national level.

8.5.2. The territorial context

As regards the territorial context into which these airports having a regional specialisation are embedded, figure 63 brings out their peripheral location. In this regard, two types of periphery may be distinguished: the periphery from a geographic point of view and the periphery with respect to former political boundaries.

[474] Eurostat data for Oslo airport refers to 39 European routes which totalised 14.3 million passengers, i.e. 87.8 % of the airport's total passenger throughput in 2006.

Figure 63: The territorial context into which airports with a regional specialisation are embedded



Own figure

8.5.2.1. *Located in the geographic periphery of Europe but in zones that are relatively dense and economically important*

Apart from Milan Malpensa, the airports pursuing a regional specialisation are located in peripheral regions of Europe which are less populated and tend to be less important from an economic point of view. Thus, the airports with a regional specialisation are next to the major cities that are located in these peripheral regions and which concentrate their economical and political power. This applies to Madrid and Athens but also to Stockholm and Copenhagen as well as to Helsinki which all are capital cities. Madrid and Athens (both in orange) have a very large population. Madrid is characterised by a medium economic and a large touristic importance. As regards it economic relevance, Athens is less important than Madrid. However, Athens is Greece's largest city and the most important economic centre.[475] Stockholm (yellow), a large city, and Copenhagen (purple), a medium-sized city, are the most important towns in Scandinavia from an economic point of view as they are the only cities of a very large economic importance. Stockholm is even more important than this would suggest the assignment to the yellow cluster. Helsinki, although belonging to the dark green cluster, is a large city of a large economic relevance. In contrast to the already mentioned airports, Milan Malpensa is not located in the periphery of Europe but next to Milan, the economic centre of Northern Italy, a large city of a large economic and touristic importance (yellow). Moreover, Turin and Genoa, two medium-sized cities, the first one of medium economic, the second of small economic interest, are located at 100 and 150 km respectively from the airport.

As regards Stockholm, Copenhagen and Helsinki, the peripheral location could well play a role for the regional specialisation. The Scandinavian countries are characterised by a large surface which is sparsely populated. Thus, there are only some medium-sized and smaller towns of a certain economic relevance in addition to the capital cities. Therefore, air transport demand is not high enough for operating direct air links neither between most Scandinavian towns nor between the latter and the rest of Europe. For this reason, it is useful for airlines to send passengers, but also freight, through a hub airport instead of operating a direct air service. As hub airport would be the most attractive airports already having a relatively large origin-destination traffic and thus those airports serving the largest and economically most important cities in this regions, namely Stockholm, Copenhagen and Helsinki.

As regards Madrid and Athens, the situation is different. However, as regards European airports, routes to Latin America and to the Near/Middle East are also characterised by a much lower air transport demand than those to North America and to Asia476 thus giving reasons for concentrating traffics on some hub airports instead of operating from a very large number of airports. As regards Madrid, there are of course also historic and cultural reasons explaining the strong link between Spain and Latin American countries and thus the

[475] According to the cluster analysis, Thessaloniki which is a major economic and industrial centre in Greece is even more important from an economic point. However, this ranking is based only on the number of headquarters as other data is missing.

[476] As regards the European Union (of 25 member states), 20.6 million passengers were travelling to Latin America and 18.6 million to the Near and Middle East in comparison with 33.9 million passengers for Eastern/Southern Asia and 56.9 million passengers travelling to North America.

specialisation of Iberia on traffics towards this region. And it is probably in this respect that the location of Span at the periphery of Europe has contributed to the emergence of Spanish seaman exploring the world... However, if a number of passengers originating from all over Europe choose to take a connecting flight at Madrid rather than at another hub airport this may also be due to the fact that other airlines do not develop traffics towards this region because demand is not sufficient and distances are rather long requiring special long-range aircraft (such as a Boeing 747-400 or an Airbus A 340).477

Historic reasons and flight distance do not allow to explain the specialisation of Athens airport or Milan Malpensa on traffics to the Near/Middle East and to Western Asia in a more general way. Besides, this specialisation is just under way since traffics towards the Near and Middle East have been emerging only for some years although they register today the highest growth rates. For this reason, a number of airports try to take part in this development. Moreover, efforts are being made in order to establish Dubai as a major hub with respect to passenger and freight traffic which could influence the ambitions of European airports to become a hub for traffics towards the Near and Middle East. Actually, Dubai is attractive due to its location halfway between Europe and Asia. Although long range aircraft may cover this distance, a number of airlines prefer to stop over at Dubai (in particular with cargo aircraft) allowing them to replenish kerosene instead of filling up the tank for the whole distance thus reducing the weight of the aircraft. As regards an analysis of the territorial context into which airports specialising in traffics towards this region, it is too early to observe which airports manage to establish themselves as hub... However, one may reasonably expect that the peripheral location does rather little contribute to this specialisation.

8.5.2.2. Located in the periphery of Europe with respect to former political boundaries

Vienna, Prague, Budapest and Warsaw airports are also located in the periphery of Europe, not from a geographic point of view but with respect to the former political frontier with the ex-communist countries which besides had been the former external frontier of the European Community for about 15 years until Poland, the Czech Republic, Slovakia, Hungary etc. joined the EU in 2004. This former frontier is still visible on figure 63 when comparing in particular the very small (partly small) economic importance of cities located in Eastern Europe (in dark blue for small and very small cities, in dark green for medium-sized cities) with cities situated in Western Europe. Vienna, Prague, Budapest and Warsaw are not only the largest cities in this part of Europe; they are also the most important ones with respect to touristic and economic relevance although their economic interest remains small or medium.

Due to the limited economic but also touristic importance of Eastern Europe, air transport demand from and for Eastern Europe remains relatively low. For this reason, airlines rather propose the passengers to take a connecting flight at a hub airport, such as Vienna, but also at

[477] About 10 000 km from Madrid to Buenos Aires (Argentina) compared with 12 000 km from Frankfurt. This is also a reason why Lufthansa serves rather Sao Paulo airport (about 10 000 km) and cooperates with TAM for offering flights from Sao Paulo to Buenos Aires instead of offering direct flights.

Budapest, Prague and Warsaw, instead of having direct air services to a much larger number of airports. The airlines are mainly serving these airports because of their proximity to the most important cities in Eastern Europe generating a relatively large air transport demand. This strategy is based on the cooperation with the former flag carriers of Austria, Poland, the Czech Republic and Hungary, all having joined the big airline alliances: Austrian Airlines has been member of Star alliance since March 2000, the airline even has been taken over by Lufthansa at the end of 2009; LOT joined Star Alliance in October 2003; CSA Czech airlines became a member of SkyTeam in March 2001 and Malev Hungarian Airlines joined Oneworld in April 2007.

Conclusion: Emerging specialisations may allow certain airports to take advantage of a favourable situation or to outweigh the disadvantages arising from an unfavourable position but other factors have also an influence

The analysis of airports according to their profiles, their specialisations, reveals a differentiation of airport strategies according to their commitment to certain market segments, which follows the differentiation of air services emerging from the distinction between different types of airlines, namely traditional full-service carriers, charter and low-cost airlines in passenger transport as well as general cargo and freight express carriers in goods transport. This differentiation has progressed considerably and is not a marginal phenomenon concerning only some airports since about 100 of them were characterised according to their traffic profile.

Emergence of airport specialisations

With respect to the different airport profiles, the most impressive is maybe low-cost traffic which affects a larger number of airports than one would have supposed. All in all, 103 airports were examined: For 31 airports (i.e. 30 %) low-cost traffic represents more than 50 % of their total passenger throughput and for further 33 airports (32 %) still more than 20 %. Among the remaining 38 airports, only 18 are characterised by a proportion of low-cost traffic below 10 %. Due to the growth of low-cost traffic over the last years, an increasing number of airports handle a growing proportion of no-frills traffic. A number of smaller airports owe all their growth to low-cost airlines. For certain airports (e.g. Beauvais, Frankfurt Hahn, Bergamo, Girona), this increase in traffic is out of all proportion in comparison to the territorial context into which they are embedded. Most of these airports are located outside of urban areas although still close enough so they manage to outweigh their remoteness by proposing an additional, attractive flight offer in a zone which however is already served by larger airports, but not necessarily within this market segment. Largely unnoticed against this background, a number of larger airports are also concerned by the development of low-cost airports as well as regional airports which serve a relatively small or less populated area and increase their attractiveness thanks to this type of air service whereas the former flag carrier often limits the number of destinations offered from these airports by operating flights mainly to its respective hub airport. Finally, a number of airports in zones, which are less populated and also less well developed economically but are next to popular touristic destinations, profit also from the development of low-cost traffic. For some airports, low-cost traffic generates a new demand for air transport (e.g. Pisa); others (e.g. Alicante or Malaga) were specialised in charter traffic in the past and benefit from the tendency among these airlines to commit to scheduled and thus low-cost flights (e.g. Air Berlin, Condor, LTU, Thomsonfly). Finally, one may also observe that even low-cost traffic does not allow certain airports located in remote areas, far from the large metropolitan zones and far from touristic destinations, to outweigh their remoteness for which reason passenger numbers remain low. At the same time, other airports such as Brescia and Florence are in a territorial context which is similar to that of Frankfurt Hahn, Beauvais or Pisa but they do not manage to attract more traffic. In this case, the only territorial context is not sufficient as explanation. One can observe that nearby airports (Bergamo in the case of Brescia, Pisa in the case of Florence) manage to attract airlines, new air services and passengers. This comparison shows well that the only territorial context is not sufficient: Certain airports may take advantage of a good situation while other may not; certain airports manage to outweigh remoteness while others may not. This confirms that the development of an airport is not automatic but depends on to the dynamics arising from the interactions between the different parties involved, on strategies that are not defined in advance.

As regards charter airports, their concentration on the Greek islands suggests that these remote areas, despite their touristic attractiveness, are penalised by their location at the periphery of Europe and by the large distances to the dense and economically powerful regions in Europe. This is a disadvantage since charter traffic is highly concentrated on the summer holidays and on a certain type of customer while low-cost airlines manage more easily to generate induced traffic.

As regards the regional specialisation as hub in Northern Europe or as hub towards Eastern Europe, the peripheral location (as regards Europe’s geography for the first and with respect to former political boundaries for the second) seems to contribute to this type of airport profile because both regions, although for different reasons, are characterised by a relatively small demand for air transport for which reason a regional specialisation may emerge. Whereas Northern Europe is characterised by a very large, sparsely populated surface and a large part of the population being concentrated in a small number of larger and economically important cities, Eastern Europe still falls behind Western Europe as regards its economic development. The airports pursuing a regional specialisation are all located next to the largest and economically most important cities in these zones. Finally, Latin America generates also only relatively small traffic volumes which, once again, may favour the concentration of traffic from Europe to Latin America on a few airports among which performs Madrid very well, probably also due to historic reasons and to flight distance, that is already very large when departing from Madrid airport which is located at the periphery of Europe.

With respect to the four generalist hub airports, it is not surprising that they are all located in the very dense and economically powerful heart of Europe. Nevertheless, a difference may be observed as London Heathrow and Paris CDG airport are located next to very large cities, of a very large economic and touristic importance, which by the way seem to dominate the surrounding areas, whereas Frankfurt and Amsterdam are embedded in a dense urban area where, in addition to Amsterdam and Frankfurt (the first being a large and the second a medium-sized city but both of large economic relevance), are more evenly spread other small or medium-sized cities of a certain economic importance thus generating a large air transport demand. Nevertheless, it is just the proximity to these dense urban areas which may limit future development...

Finally, freight traffic is also concentrated on a small number of airports. Among them figure the generalist hub airports: London Heathrow, Frankfurt, Paris CDG and Amsterdam concentrate 44 % of the volume of cargo handled at European airports[478]. This can be explained by the strong link between passenger and freight transport as about half of worldwide air cargo is carried on board of normal passenger aircraft. Besides, some airports have specialised in freight transport of which certain airports have established themselves as hub for an express freight company. The latter are all located in a very small zone next to the urban area of Paris or Frankfurt, which is necessary due to very tight delivery times. As regards the other cargo airports, they may also handle express freight but do not work as hub, and thus focus rather on general cargo. In this case, it is still necessary to be close to densely populated and economically important urban areas but they may be located outside thus allowing to reduce nuisances.

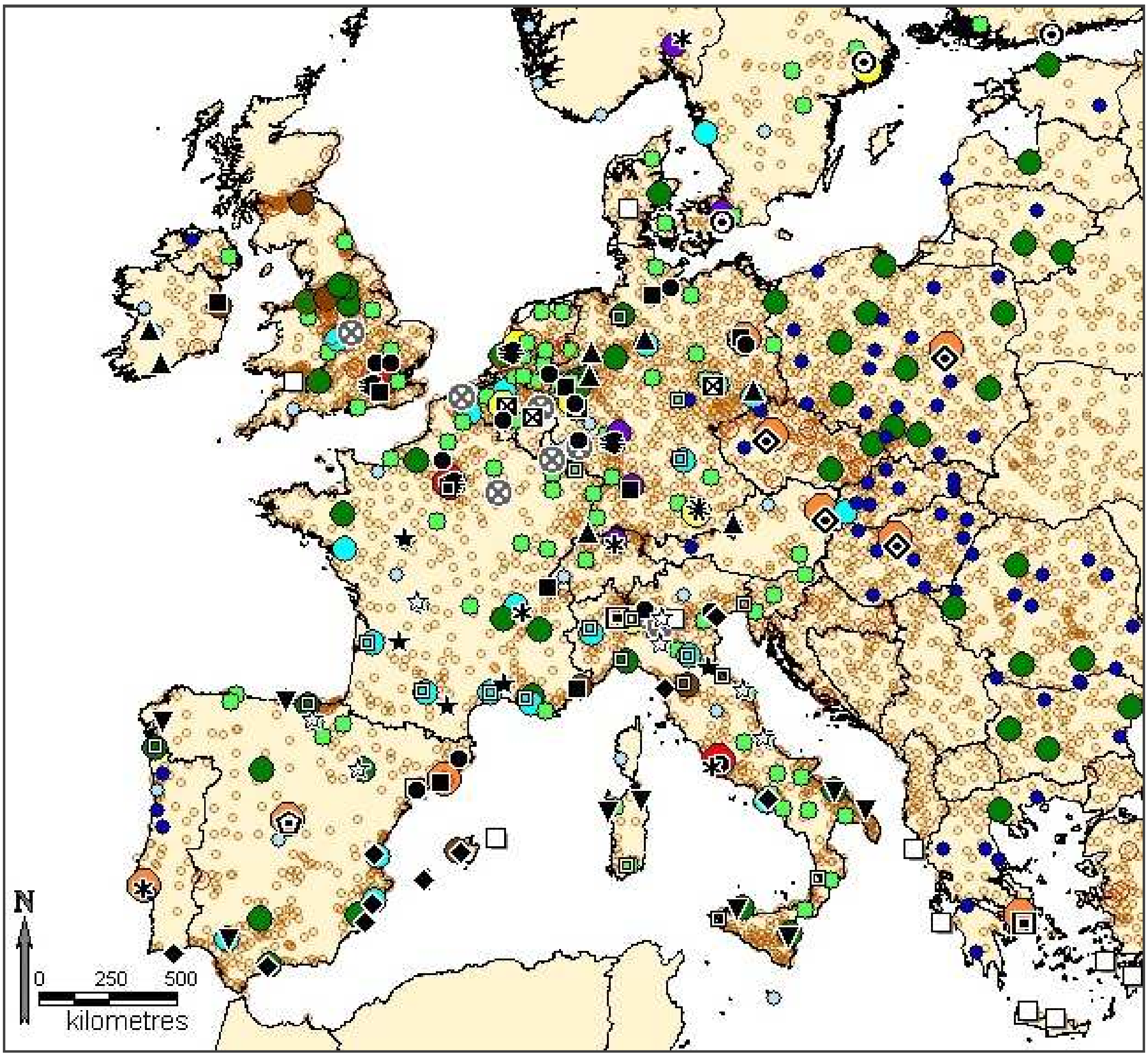
Subject to the territorial context but also to the dynamics arising from the interaction between different actors

The analysis has shown that the territorial context into which the different airports are embedded influences to a certain extent the type of profile developed by an airport. Certain specialisations are to a larger degree subject to this territorial context, such as the role as generalist hub airport or freight airport (whether focusing on express freight or on general cargo). This also seems to apply to charter airport but the other way round since these airports are characterised by a certain touristic importance but due to its peripheral location they are less attractive to other carriers. As regards low-cost traffic, the territorial context seems to be less restricting. Nevertheless, most airports benefiting from the growth of low-cost traffic are still relatively close to nearby metropolitan zones or popular touristic destinations.

Besides, the airport's relative position with respect to the location and the specialisation developed by other airports is also of great importance. Certain airports may take advantage of a good situation while other may not; certain airports manage to outweigh remoteness while others may not... revealing that the development of an airport is not automatic but subject to the dynamics arising from the interactions between the different actors, to strategies that are undefined in advance. Accordingly, the figure 64 draws a picture of the landscape of European airports.

[478] This figure refers to the total volume of cargo handled by all airports with more than 1000 tons of freight loaded and unloaded in 2007.

Figure 64: The landscape of European airports – subject to the territorial context and to the dynamics arising from the interaction between different actors



Legend

- European settlements
- Data not available for this city (Urban audit)
- Country boundary

Airport types

Hub airports

- Generalist hub airports
- Munich airport, Lufthansa's second hub
- Smaller hub airports

Freight transport

- Airports being hub for express freight company
- Airports being specialised in general cargo, may also handle express freight

Low cost traffic

- Medium-sized/larger "traditional" airports with more than 20 per cent low cost traffic
- Airports with very high low cost traffic in zones served by larger airports
- Airports with medium/relatively large low cost traffic next to touristic destinations
- Regional airports: focus on intra-/extra-EU traffic, relatively large low cost traffic
- Regional airports: focus on national traffic, relatively large low cost traffic
- Very small airports depending entirely on low cost traffic
- Very small airports with medium/relatively large low cost traffic
- Other airports having less than 20 per cent low cost traffic

Charter traffic

- Airports with more than 1 million passengers and more than 40 per cent charter traffic in 2006

Regional specialisation

- Hub towards Latin America
- Hub towards Eastern Europe
- Hub towards the Near/Middle East and towards Western Asia in general
- Regional hub in Northern Europe

10 Clusters
Average linkage within groups

- Very large pop, small/medium economic + large touristic importance
- Small pop, small/medium economic + very small/small touristic importance
- Small/very small pop, small/medium economic + medium touristic importance
- Small pop, very small economic + very small touristic importance
- Large pop, large economic + medium/large touristic importance
- Medium-sized/large pop, medium economic + small touristic importance
- Medium-sized pop, very small/small/medium eco + very small touristic importance
- Medium-sized pop, large/very large economic + small touristic importance
- Medium-sized pop, medium/small economic + large touristic importance
- Very large pop, large/very large economic + very large touristic importance

Own figure

In this respect the European airports may be considered to form a system in which everyone plays a role; a role that may evolve of course but which is to a certain extent conditioned by the airport's location, with respect to the characteristic of the territory into which it is embedded. Despite the constraints and opportunities due to a less or more favourable position, some airports seem to perform better or worse leading one to assume that airports themselves may contribute to the development of a particular specialisation but that they are also subject to the dynamics that result from the interactions between different actors.

The position of an airport may be affected by the profile developed by other airport. Moreover, the airport's capacity to negotiate with airlines for offering new air services is an important aspect although airlines apply specific criteria for the choice of an airport, and finally also take into account the territorial context into which an airport is embedded. Besides, the airport's way of dealing with certain difficulties, such as restrictions to its activity, which may be technical (due to runway or terminal capacity) but also political or environmental (such as night curfews), may affect its development. This applies in particularly to restrictions arising from a growing public interest for the airport activity because of its nuisances, which depend also on the airport's capacity to deal with local authorities and residents. For this reason, this analysis will be completed by some elements referring to further aspects which influence the development of airports. They will be presented in chapter 9.

9. Airports between the necessity to meet airline requirements and the consideration of a growing public interest

The development of an airport depends on the territorial context into which it is embedded, including the specialisations of by nearby airports, but it is also subject to other constraints. Decisions taken in the past and public policies have an influence on the airport's activity: Chapter 9.1 deals with the airlines' behaviour and concentrates on the factors determining their airport choice, in particular for low-cost and cargo airlines. As regards the former flag carriers, historical choices affect largely the airport's present strategy. Then, chapter 9.2 focuses on the growing public interest in airports: Positive and negative impacts of the airport activity come to the fore illustrating the large public interest in air transport and the airport activity as well as giving a first insight into problems with which the airport operator has to deal. Finally, chapter 9.3 deals with the management of scarce capacity. This aspect is important as investment in extra capacity is not only expensive but also characterised by indivisibilities[479] in addition to political restrictions which may prevent the extension of capacity.

9.1. Consideration of the airlines' requirements for the choice of an airport

Studies on the criteria according to which airlines choose an airport underline the differences between traditional full-service carriers which operate according to a hub and spoke model and charter and low-cost airlines but also with respect to freight transport. In particular, secondary airports could profit largely from the deregulated market which brought the opportunity to develop business with the new market entrants rather than remain underutilised.

9.1.1. As hub airports

For an airport that wants to establish itself as a hub, it is important to have already a high origin-destination traffic volume and a large number of passengers with a relatively high price inelasticity, such as business travellers. Network airlines prefer in general, despite operating a hub and spoke network, to offer also direct air services if the traffic volume is sufficient. In particular business passengers are disposed to pay a higher price for such direct flights because of shorter journey times and lower risk of missing connections or losing baggage (Bauer, 1987). Moreover, the airport should be located next to the airlines' markets, i.e. near to regions where passengers start or end their trips in order to reduce flight distance (Bauer, 1987; Butler & Huston, 1991; 1993). This diminishes the number of airlines that might be interested in setting up a hub at a given airport.

[479] See chapter 6.1 on the economic characteristics of airports.

9.1.1.1. Requirement of a high level of airport services

Besides, the hub function requires a very high level of airport services in order to reduce the inconveniences of transfers for travellers and to avoid that passengers might switch to other airports or towards other transport modes.

Due to the spatial and temporal concentration of air traffic flows (Burghouwt, Hakfoort, & Van Eck, 2003; Burghouwt & De Wit, 2005), hub airports have to meet peak load requirements with respect to the handling of aircraft, passengers and baggage. In particular, the airport has to assure that delayed flights disturb the least possible the functioning of the hub. The airport has to guarantee fast transfers which necessitate often the reorganisation of activities, the development or modification of airport installations and even a reconfiguration or redesigning of the layout of airport facilities in order to improve passenger processing through the terminal. At the same time, the airport needs to be equipped with a high-performance baggage handling system (ADV, 1997, p. 55).

The minimum connecting time corresponds to the minimum time necessary for a transfer and is therefore often considered to be a good quality feature of airport services. The objective is to reduce this minimum connecting time in order to increase the number of possible connecting flights. The connecting time depends on several factors: Flights schedules set the maximum load for airport capacity; the airport's total traffic volume influences the probability of delays; process organisation and operating procedures contribute to the efficiency of passenger, baggage and aircraft handling; the layout of airport facilities affects largely the possibilities to compensate delays on short notice (ADV, 1997, p. 55).

9.1.1.2. The influence of historical choices on current airport strategies

The setting up of a hub demands from airport and airline large location-specific investments. If the airline would decide to transfer its hub to another airport, it had to renounce the investments made for the existing hub, in addition to significant specific investment related to the new location. For this reason, the decision of an airline to establish a hub represents a large commitment to the airport, in particular if location-specific investment is high. Thus, historical choices have a considerable influence on current airport strategies, in particular in Europe, where the former flag carriers had, at least to a certain extent, concentrated traffics on their respective national bases (like Frankfurt airport in the case of Lufthansa) already before the liberalisation of air transport. This is due to bilateral air service agreements which determined the few airports, or even the only one, from which could be operated air services by the designated carries, i.e. the two national carriers in most cases. As only a few airports were allowed to handle traffic to/from foreign airports, a number of passengers used the national bases for changing planes although schedules were not necessarily coordinated in order to facilitate transfers thus explaining the absence of a wave structure at the hub and baggage was not checked though to the final destination. For this reason, these national bases were not hubs in terms of the hub and spoke model but the airlines just relied on these airports when they started to restructure their networks after the liberalisation of the air transport. For this reason, a number of hub airports benefit largely from the fact, that they already served as national base to their respective national carrier before the introduction of hub and spoke networks. Once the large location-specific investments made in order to set up the hub, the airline has committed to the airport and it will be difficult for other aerodromes to convince the airline to transfer its hub.

9.1.2. As low-cost airport

9.1.2.1. The emergence of low-cost carriers

Low-cost airlines (also called no-frills airlines or low-fare airlines) have entered the European market only since the liberalisation of air transport. They developed a business model that differs significantly from those of other airlines, especially from full-service carriers. Like charter airlines, low-cost carriers operate primarily point-to-point traffic and choose routes that are characterised by high volumes of traffic. The basic idea is to offer lower fares at the expense of a simpler service. Therefore, low-cost carriers focus on cost restrictions and a rise in productivity.[480] Production is increased by the densification of seats; higher load factors[481]; intensive use of aircraft by limiting distances (about 1000 to 1500 km, i.e. 2 hours flight at maximum) in order to maximise daily flights and thus turnover; fast turnarounds (about 25 minutes between landing and take-off being the low-cost carriers' reference); a unique class for making boarding procedures easier and expanding aircraft capacity and no seat assignment allowing faster check-in procedures. In general, transits are not offered as the latter complicate the airlines' operations due to complex coordination between flights that is required to efficiently fulfil transfer needs. In order to reduce costs, staffs have to be polyvalent and see their duties expanded (including also check-in and boarding procedures, aircraft cleaning etc.); wage scales are also lower. Low-cost carries focus on on-line sales for tickets. The price structure is simple: There is only a one-way price category although this price may increase when the departure approaches. On-board services are limited for the purpose of reducing or simply cutting costs for food, drinks and newspaper and even generating additional income as the customer has to pay for. Besides, this contributes to reducing cleaning. The fleet is homogenous in order to reduce maintenance cost but also to facilitate the resource scheduling of fleet and staff. There are no frequent flyer programs. Low-cost airlines also prefer airports with low charges and regional aids available.

Despite these characteristics, low-cost carriers are a relatively heterogeneous group as underlined by Garriga (2004). Their business model has evolved, in particular with the increase in low-cost traffic and the emergence of new carriers but also airlines acquiring some low-cost features while trying to maintain their business model. Network structure got more complex with small low-cost carriers operating a small number of routes, linking a group of

[480] See Garriga (2004) but also Francis, Humphreys, Ison and Aicken (2006) on characteristics of low-cost models, Dobruszkes (2006) in particular on the geography of low-cost networks as well as Graham M. (2009) underlining the differences in spatial models employed by low-cost carriers.

[481] In 2006, Easyjet and Ryanair registered relatively high load factor (84.6 % and 82 % respectively) in comparison with Lufthansa (75.2 %), Air France (75.6 %), British Airways (78.6 %), Swiss (79.8 %), SAS (74.7 %) and Iberia (79.8 %).

origin airports with their destinations (e.g. V-Bird) whereas some airline operate radial networks where all destinations are served from one base (e.g. Virgin Express). Finally, polycentric networks have emerged for a number of low-cost carriers as they gradually added new bases from which air services are operated to smaller destination airports.[482] However, transfers are in general not offered (except for e.g. Air Berlin), thus the transfer risk is assumed by the passenger. Larger airports are also served. In the USA also longer coast-to-coast routes are served but in Europe the still growing short-haul market deters the low-cost carriers' interest in longer flights. The only exceptions are airlines like Air Berlin and Monarch Airlines which have evolved from charter airlines to a hybrid low-fare scheduled branch. Open skies agreements will create new possibilities for long-haul flights but the expansion of the low-cost model to cover long haul flights would also require an adjustment of flight services. However, a number of low-cost carriers already contributed to a differentiation by offering booking options (such as priority boarding or additional piece of luggage), although the price is still the most decision-making element due to increasing competition from network carriers and other low-cost carriers.

In 2006, 50 low-cost carriers could be counted in Europe, 12 of them operating 50 to 100 daily flights and 11 of them even more than 100 flights per day (Eurocontrol, 2007, p. 17).[483] As regards the distribution of low-cost flights, 22 % of aircraft movements are operated at airports having less than 50 daily flights arriving but half of low-cost flights are operated out of bigger airports counting 100 to 500 daily arrivals (Eurocontrol, 2007, p. 11). According to the number of flights, the low-cost traffic accounts for 16 % market share in 2006 (Eurocontrol, 2007, p. 6). This market segment registers the highest proportions in Ireland (42 %), in Slovakia (38 %), in the United Kingdom (33 %) and in Spain as well as in Poland (both with 24 %). In Germany, being on the 6th place, market share of no-frills airlines is 19 % whereas it amounts to only 10 % in France. In absolute figures, the United Kingdom constitutes the most important market with about 2000 daily aircraft movements what means that low-cost traffic concentrates half of daily flights (Eurocontrol, 2007, p. 18). As regards traffic figures, Ryanair and Easyjet were the largest airlines carrying 40 and 34 million passengers respectively, i.e. a total of 74 million passengers in 2006 (DGAC, 2007b, p. 58). Low-cost carriers represent already 24 % of total intra-EU traffic (DGAC, 2006, p. 56). For the next years, low-cost traffic will certainly continue growth but evidence suggests further consolidation (Rheinhardt-Lehmann, 2004).

Facing low-cost competition, some of the traditional European airlines adapt by introducing and increasing promotional offers. Some airlines try to participate in the low-cost growth by launching their own low-cost subsidiary or by taking a stake in a low-cost airline. Thus, Lufthansa had, through Eurowings, a 49 % stake in Germanwings and took over entirely the airline as from 1 January 2009. Air France-KLM has launched in summer 2007 with Transavia its own low-cost subsidiary. Dennis (2007) analysed the reactions of traditional

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[482] Ryanair established bases e.g. at London Stansted, Dublin, Bergamo, Charleroi, Girona and Rome Ciampino airports whereas Easyjet uses e.g. London Luton, Berlin Schonefeld, Dortmund and Geneva as bases. However, these bases cannot be considered as hubs as they have no linking function; they result only from cost savings due to concentration.

[483] Figures refer to the period from July to December 2006.

European airlines to the competition from low-cost carriers: They include different measures such as a rise in labour productivity and the growing outsourcing of services, an increased aircraft utilisation, the use of smaller regional aircraft to a certain extent, the reduction or renouncement of secondary hubs and point-to-point services while focusing on feeding their main hubs, the revision of pricing and conditions such as minimum stays, the introduction of charges for catering, the abandon of business class and the reduction of distribution costs.

9.1.2.1. Factors of airport choice

The growth of low-cost traffic has been very impressive, especially as many smaller airports profit from the development of this market segment, suggesting that airport choice factors may be different from those of other airlines, and in particular of traditional full-service carriers operating hub and spoke networks. This is also what results from surveys among European low-cost carriers.

Barrett (2004b) analysed Ryanair's airport choice behaviour and found that the airline selects airports according to six factors.[484] The most important factor are low airport charges, followed by quick turnarounds reducing time at the airport to only 25 minutes (against one hour on average for traditional network carriers) allowing Ryanair two extra rotations per day. Simple terminals are a third factor as they allow the airline to simplify operation with arriving and departing passenger on the same level which is easier to handle. If an airport prices certain facilities (e.g. airbridges) separately, it does not use them. Finally, Ryanair wants rapid check-in facilities, good passenger facilities and accessibility but no business class lounges. Thus, smaller airports, even if situated at a certain distance from the next city, are very interesting for Ryanair. At these airports, low-cost airlines are often welcomed and Barrett concludes from information on Ryanair's airport charges that low-cost airlines, and especially Ryanair, are "obviously tough negotiators with airport managers" (Barrett, 2004b). Moreover, Ryanair's pricing policy consisted in reducing fares by as much as 8 % per year and in seeking cost reductions from very high staff productivity growth but also from all suppliers of services to the airline. Thus, low-cost airlines expect that airports contribute to cost reductions by offering customised services, adapted to the airlines' requirements. In this respect, some low-cost carriers take advantage of the competition between both airports and airlines and negotiate with as many as five airports, despite having the stated intention of introducing a lesser number of routes (Gillen & Lall, 2004). It is interesting to observe that the airport's localisation did not figure among Ryanair's airport choice factors, even though the analysis of destinations illustrates that the airline operates to a large extent air links with relatively high traffic potential. Actually, Ryanair is considered to be a "market making" airline (Warnock-Smith & Potter, 2005). This results from low prices that are very attractive even to passengers who would never have considered flying before (Gillen & Morrison, 2003). Nevertheless, most low-cost carriers look for airports which are already characterised by a high demand for this type of traffic or which are located in a region that has a positive economic forecast allowing the low-cost carrier to increase demand for point-to-point traffic (Scheers, 2001). On

[484] See also Barrett (2004c) on the sustainability of the Ryanair model.

the other hand, as flights are cheaper, most customers of low-cost airlines accept longer travel times to reach the airport. This is promising for both airline and airports. It means for the airport that accessibility gets more important but allows the airport to extend its catchment area (Humphreys & Francis, 2002). The low-cost airline can take advantage of a bigger potential demand for air transport and consider a less restricted number of airports when making its choice. Moreover, demand can be increased by convenient slot times, along with spare airport capacity. Attractive departure times are important if the airline wants to serve the leisure and the business market.[485] This also improves operational efficiency by increasing the utilisation of aircraft (Calder, 2003).

In order to take into account the heterogeneity of low-cost carriers, Warnock-Smith and Potter (2005) carried out a survey[486] among several airlines allowing them to provide a ranking of airport choice factors. Results indicate that low-cost airlines consider a high demand for low-cost services within the airport's catchment area, quick and efficient turnaround facilities, convenient slot times and good aeronautical discounts as most important. Positive forecasts for business and tourism constitute a fifth factor in the airport choice of low-cost carriers which suggests that low-cost airlines are conscious of creating markets and inciting passengers to travel by plane who did not before. So, they rely on a large potential demand. Four factors are considered to be less important in airport choice[487]: The first one is a high level of non-aeronautical revenues at the airport which is surprising since non-aeronautical revenues may be used to subsidy aeronautical charges. It is not important either that the airport has some experience in dealing with low-cost carriers, which confirms according to Francis, Fidato and Humphreys (2003) the existence of first mover advantages for the low-cost carriers establishing a route thus creating barriers to entry for new airlines. Another factor which is of little importance is a high level of airline competition illustrating the small interest in competing with others. Warnock-Smith and Potter (2005) underlined that it was surprising to observe that aeronautical charges, which are often perceived by airport managers as the most important factor (Francis, Fidato, & Humphreys, 2003), do not play a more important role in airport choice. Aeronautical charges are less important for airlines that converted from full service to low-cost carrier and operate already at primary airports; cost of moving to another airport outweighs the higher aeronautical charges. A more detailed analysis according to the airline origin, airline size and the date of entry[488] in the low-cost market showed some

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[485] Business travellers constitute today an important share of low-cost customers. According to Easyjet, over 50 % of its passengers are business travellers on certain routes. For Go, up to 40 % of all passengers are business travellers. See Mason (2001); the latter analysed the UK short haul business travel market and concluded that that business travellers using low-cost airlines do not constitute a distinct market segment from business travellers using traditional network carriers.

[486] Through literature, the authors (Warnock-Smith & Potter, 2005) established a list of 15 factors likely to influence the low-cost airlines' airport choice. Survey included airlines offering services to UK which is the case of most European low-cost airlines (but no charter airlines). Responses refer to 8 airlines out of 23 that had been invited to participate in the survey.

[487] The following factors are of a medium importance: cost conscious airport management, high airport competition, good surface access, spare airport capacity, good environmental policy, ambitious expansion plans, privatised and deregulated airport.

[488] According to literature, there may be some advantages for early entrants (Francis, Fidato, & Humphreys, 2003). For this reason, airports were also categorised according to an early market entry (before 2000 which means during the first five years following the introduction of the Third Package of liberalisation of air transport

deviations from the average importance which can be explained by several factors. As regards the airline origin, newly founded airlines consider spare capacity and airline competition as relatively more important than airlines which converted from full-service airline or charter carrier to low-cost airline. Newly founded airlines want to take market share and airline competition indicates that a market exists. For airlines which converted to the low-cost model airport competition is quite important as this could be one reason for conversion (low-cost carriers look to leverage a better deal from the airports they serve). As regards airline size, smaller airlines prefer airports having good experience with low-cost airline as this helps to guarantee passengers for the services they provide, good non-aeronautical revenues which may reduce the risk of an increase in aeronautical charges and a good accessibility allowing passengers to get easily to the airport as they are more likely to use the small carrier. For larger carriers, airline competition is more important. As to the date of entry in the low-cost market, airlines have been categorised according to a market entry before 2000 and after 2000. Airlines figuring in the first group chose airports with high demand for their services and offering quick turnarounds whereas airline competition was no issue. Airlines that entered the market after 2000 are mostly averse to airline competition and consider as important to secure convenient slot times.

9.1.2.2. Necessity to know and understand the customer becomes even more important for the airport

The results from surveys on airport choice factors have direct implications for airports that want to attract low-cost airlines. Airports should be aware of the relatively high bargaining power of low-cost airlines which is due to two reasons mainly: They have no specific interest in a particular geographic market and given the characteristics of their passengers, they may easier transfer their activity to another airport without taking a high risk of losing passengers (Starkie, 2008). This explains why they are relatively volatile, ready to launch a promising air route but also to cancel it on short notice if the traffic volume is not sufficient. For this reason, the airport's capacity to adapt to the requirements of low-cost carriers is even more important.

First, the surveys show that aeronautical charges are not necessarily the most important factor of airport choice although they play a role. However, authors like Barrett (2004b) or Poungias (2003) underline that airports in negotiation with low-cost airlines will be immediately realise that there is no possibility of achieving the aeronautical revenues that hub airports get from full-service airlines: Low-cost carriers ask for only passenger related charges, facility oriented charges (2nd best), much lower charges and "marketing support"[489]. In addition, airport managers should insist on the sufficient demand to justify the provision of air services, quick turnaround facilities and slot availability as well as on low airport costs.

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in the EU, see also chapter 5) and a later market entry (after 2000). Warnock-Smith and Potter (2005) considered that low-cost carriers that were established after 2000 were founded in reaction to changes in the market.

[489] In its decision on aids granted by Charleroi airport to Ryanair, the Commission of the European Communities (2004b) authorised certain forms of aid which permit the development of new routes under clear conditions in order to prevent the distortion of competition. See also e.g. Dobruszkes (2008, p. 72ff) on hidden financing of low-cost carriers and in particular of the Ryanair case at Charleroi airport as well as the EU's position.

Secondly, airport managers should be conscious of the existence of different low-cost airline models having different requirements. In this respect, the length of time the carrier has been in the market seems to justify most differences in the weighting of airport choice factors even though there are also differences as regards airline size and origin.

A number of authors, e.g. Barrett (2004b), underlined that in making deals with low-cost airlines, airports trade off a reduction in aeronautical revenues in return for extra non-aeronautical revenues. However, commercial revenue development opportunities are limited[490] for which reason low aviation charges must primarily derived from (relative) cost reductions (Poungias, 2003). Therefore, airports aiming to attract low-cost operators focus on reengineering their whole production chain for the purpose of minimising cost and thus prices to airline operators (Jarach, 2001). According to Poungias (2003), terminal and pier have the main airside cost cutting potential since apron, air traffic control and runways are safety driven and subject to national and international obligations. In return, the airport may renounce boarding bridges and bussing, simplify the baggage system and customise check-in desks/system. The airport's design should be functional. Landside cost cutting may result from one level terminal and one level parking allowing e.g. to reduce walking times; the passengers of low-cost airlines require only a simple airport product since they are on simple point-to-point journeys (Barrett, 2004b). Moreover, the airport company itself should be organised according to lean management principles.

Due to requirements of low-cost airlines, there is no attraction in having low-cost airlines except at off-peak periods for airports operating close to capacity limits. Besides, since low-cost airlines require very short turnaround they may not want to serve busy airports even if costs were reduced... In return, if capacity is available, low-cost airlines are welcomed business partners who may generate additional traffic with a positive effect on non aeronautical revenues.

9.1.1. As charter airport

The principal business of charter airlines is holiday and leisure traffic. When the air transport was liberalised, they represented about 60 % of intra-European market (Perry, 1994, p. 254).

9.1.1.1. A very competitive market for charter flights already before the liberalisation

At that time, the majority of charter airlines operated as part of a vertically integrated tour operation. Despite these corporate ties, they were operating, already before the liberalisation

[490] Poungias (2003, p. 11) based his argument on figures from the Airport Retail Study 2001 which indicated the average retail income per passenger at selected airports (Copenhagen 3.22 EUR/passenger, Amsterdam 2.73 EUR, Frankfurt 1.59 EUR, Vienna 1.28 EUR). According to him, an expected average retail income of 1.00 to 1.50 EUR per passenger is already ambitious when focusing on low-cost traffic. In particular the traditional product mix has to be changed to lower price concept.

of air transport, in a very competitive and almost deregulated market[491] since the strict regulation of the air transport referred to scheduled services. Due to competitive pressure, charter airlines had to operate in a low yield, low-cost environment with high aircraft utilisation, high seating densities and high load factors together with low overheads (Perry, 1994).

9.1.1.2. New opportunities but also competition from low-cost airlines

With the liberalisation of the air transport, charter airlines could take new opportunities such as flying on new routes, including routes that do not touch their home country. They also may offer the capacity and fares they wish – without seat-only restrictions and establish majority-owned subsidies in other EU states (Lobbenberg, 1995). Thus, a number of charter carriers started to convert some of their charter flights into scheduled services. There is no accurate data on seat-only proportion of traffic but according to estimations it represented about 20 % in 1999/2000 (DVB, 2001a, p. 6; Williams, 2001, p. 285).

According to a study of the Cranfield Air Transport Group, cited by Mason, Whelan and Williams (2000), charter airlines operate at a significantly lower cost per passenger carried than low-cost airlines; a difference that is due to a combination of larger aircraft, large flight sectors, great aircraft and crew utilisation and higher load factors. In contrast, recent publications underline the superiority of the business model of no-frills airlines: Their costs are lower as highlighted by e.g. Kurth (2007, p. 16); a difference in operating costs of up to 30 % in comparison with charter carriers could be observed according to Monitor Group (2004) although the authors consider that charter airlines may reduce the difference in particular when using modern CRS which allow to improve pricing strategies and reducing effects from seasonal fluctuations.

Williams (2001) recognised that charter airlines are particularly vulnerable on the seat-only element of their business but he considered also that charter airlines would not be replaced by low-cost carriers, at least not that charter airlines which belong to vertically integrated organisations, including today not only tour operators but also travel agency chains, airlines and even hotels and providers of ground transport. Nevertheless, already 10 years ago, charter traffic had almost disappeared on routes which were also served by low-cost airlines, e.g. London - Pisa/Florence or London - Nice. Recent figures from Eurostat provide evidence that this tendency has even reinforced over the last years.[492] This is also what can be seen from Kurth (2007) who estimated the market share of charter traffic at 23 % of the intra-European traffic in 2003, at 15 % in 2006 and at 12 % in 2007. With changes in the travellers' buying behaviour, low-cost airlines "Eating into Charter Markets" (Kurth, 2007, p. 27) and cooperating with tour operators (Monitor Group, 2004) on the one hand and charter airlines increasing seat-only proportion of traffic and converting charter flights in scheduled services

[491] Charter airlines "have historically been subject to a far lighter regulator touch" (Lobbenberg, 1995, p. 86). See the author for more details on the regulation of charter airlines.

[492] See also chapter 8.4 on charter airports.

on the other hand, hybrid business models emerge and some authors rather see charter and low-cost airlines getting closer.

9.1.1.3. Requirement of low-cost airport services

Charter airlines have always operated in a very competitive, low yield, low-cost environment where they reduce costs thanks to a high aircraft utilisation, high seating densities and high load factors together with low overheads (Perry, 1994). For this reason, they have more or less the same requirements of airport services than low-cost airlines. For example, in order to keep airport charges low, they make a great use of secondary airports and at primary airports, they avoid peak time operations.

9.1.2. As freight airport

Airports that want to attract cargo airlines[493] need to operate at any time of the day or night. 24-hour airport access in particular without restrictions on night flights (including night weather report) is vital for cargo airlines. In addition, other facilities are required such as airfield capacity including runway, apron and transit building. In particular, airports need adequate runway systems in order to facilitate large cargo aircraft (DVB, 2001b). For this reason, prior to the extension of its runway, certain airlines had reduced their freighter operations at Hahn airport because the runway was too short for allowing B747 freighter to take off with full load capacity. Adequate space is also required for ground handling. Moreover, airports need excellent access to highway/railway systems and adequately sized and skilled labour force (no restrictive practices by airport labours) as well as a high degree of reliability in respect of weather conditions and air traffic control. Full airport services also include security and customs authorities (for extra-European flights). For example, Federal Express cooperates with French customs authorities, which established an office on site in order to reduce time lags due to customs control.[494]

The integrators have even higher exigencies for the establishment of a hub. Since traffic is concentrated on very limited time windows, the airport has to meet peak load requirements with respect to the handling of aircraft and of freight.

[493] Air freight and cargo airlines have attracted relatively little attention in scientific publications. For more information see e.g. Dillingwater (1994), Zimmer (1995), Windisch (1996), Becker (1999), DVB (2001b), Barrett (2005) and Grandjot, Roessler and Roland (2007).

[494] Information from a visit of the Federal Express hub at Paris CDG airport on 11 February 2010.

9.2. Restrictions to airport activity due to a growing public interest in airports being source of economic growth at regional and national level but also of conflicts at local level

"The community has always viewed transport with mixed feelings" (Hensher & Button, 2003). On the one hand, transport facilitates the movement of goods and people and contributes thus to economic development. On the other hand, transport gives cause for serious concern about environmental degradation. Whereas noise pollution, land-take, soil contamination at airports and emissions of pollutants into the air by aircraft while at airports or during landing and take-off cycle are felt rather at local level, the emissions of carbon dioxide[495], the main greenhouse gas, and global warming are a global problem. These concerns have become more pronounced with the growth of air transport in general and with the temporal and spatial concentration of air traffic on certain airports[496] in particular. However, as Graham B. (1995, p. 246) underlined: "Any consideration of the environmental impacts of air transport has to be placed within the context of the wider concerns expressed about the harmful environmental effects of transport in general" resulting from a growing ecological awareness (Button, 1993b).

Therefore, the delicate question is how to reconcile both economic growth and respect for the environment? The large discrepancy between the various actors' interests and objectives results also from the different scales to which the various positive and negative effects are assigned to. Chapter 9.2.1 examines the positive effects of air transport on economic growth of which benefit mostly the regional and national level, while the local level suffers from its nuisances as illustrated in chapter 9.2.2. At local level, this regards most notably express freight, which is handled during the night, but also hub airports since their traffic is very dense during peak hours. Beyond, most airports face these problems as soon as their traffics increase and they become subject of discussions of environmental constraints. Those who benefit from air transport are not necessarily those who suffer from. This applies also to CO_2 emissions and the dangers of climate change on which focuses chapter 9.2.3. This topic regards the whole world as all will be concerned by the consequences of global warming, even though – at least for the moment – some countries seem to be hit more by environmental disaster than others. In contrast, the circle of developed countries is so far responsible for almost all CO_2 emissions.

[495] Other emissions concern pollutants like nitrogen oxides (NO_x), sulphur dioxide (SO_2), carbon monoxide (CO), hydrocarbon and volatile organic compounds (VOC).

[496] See Nero and Black (1998) on environmental externalities at hub airports, arguing that the implementation of hub and spoke networks has contributed to a spatial redistribution of externalities: The focus is on aircraft noise, aircraft emissions and increased ground access traffic which are even more important at hub airports and which have an impact on airport communities through greater annoyance and reduced amenity thus contributing to a decrease in property values.

9.2.1. *Economic growth at regional and national level*

A number of studies deal with the social and economic impact of airports and in particular over the last years the interest in this subject has increased. This tendency can be explained by the growth of air traffic creating income and employment opportunities but also reinforcing nuisances, despite technical innovation, and a at the same time growing environmental consciousness. It is also reflected in the cost-benefit-analyses which have become widespread which are carried out regularly when new infrastructure projects are discussed.

As regards the economic and social impact of airports at regional and even national level, studies distinguish, in general, four types of effects, namely direct, indirect and induced effects in terms of employment and income and in addition so-called catalytic effects resulting from a better access to the region (York Aviation, 2004; Klophaus, 2006).

9.2.1.1. Direct, indirect and induced effects on employment and income

While direct employment and income refer (wholly or largely) to the operation of an airport, indirect employment and income are generated in the economy of the study area in the chain of suppliers of goods and services. Both can be measured relatively well. In contrast, induced employment and income are related to spending of wages and salaries by the direct and indirect employees. These induced effects are often estimated using multipliers which are taken e.g. from studies made at other airports.[497]

Airports concentrate employment

A study realised on behalf of ACI Europe (York Aviation, 2004, pp. 31-33)[498] estimates that in 2001 around 1.4 million jobs[499] are directly related to the airport activity, of which 1.2 million is on-site employment and further 0.2 million located off-site. As regards on-site employment, 64 % of all jobs are generated by airlines, handling agents and aircraft maintenance. Further 14 % of all employees work for the airport itself. 12 % of all jobs are related to in-flight catering, restaurants, bars and retailing activities at the airport. Air traffic control and control agencies represent 6 % of all jobs. Finally, 1 % of all jobs are related to freight and 3 % to other activities (like fuel companies or ground transport companies). However, there are differences following the airport's size and nature. Moreover, even though a variety of jobs are proposed and in particular over the last years new professions emerged (Cherradi, 2004), most employees are relatively low qualified, have consequently relatively low salaries and work unsocial hours (early in the morning, at night, also during the week-end) which requires measures regarding e.g. the transport between residence and place of

[497] See e.g. Roger Tym & Partners (2006) on a discussion about the pertinence and accurateness of multipliers.

[498] This study is based on a questionnaire answered by 41 airports and further reports on the economic and social impact from 35 airports. All in all, 59 airports in Europe participated in the study. For a list of these airports see York Aviation (2004, pp. 59-60). Figures on indirect/induced employment refer to only 25 airports having undertaken primary research on this subject.

[499] These figures do not refer to full-time equivalents and thus include also seasonal and part-time working.

work. As regards Paris CDG airport, the different actors, including the airport operator and local municipalities, have worked on a local area plan for job training in order to better coordinate measures taken in terms of employment, job training for the different activities performed at the airport and transport services (Cherradi, 2004).

Some figures as to the employment resulting from the airport's traffic volume and nature

Regarding on-site employment, approximately 950 jobs are generated on average by traffic of one million passengers per year (or workload units for airports having much freight traffic). According to a previous study in 1998 the same annual traffic creates 1000 jobs. Despite this difference, which may be explained by cost reduction and productivity increases realised by airports as well as by the development of low-cost carriers and a general tendency towards saving of costs, airports have continued to create jobs (York Aviation, 2004). At the three airports of Paris, namely CDG, Orly and le Bourget, about 30 000 jobs were created between 1990 and 2001 bringing the total number of jobs to more than 100 000, i.e. 2 % of the overall employment in the region, over a period when total regional employment remained static (Berthon, 2004a, p. 149).

As said above, the number of created jobs depends strongly on the airport's size and nature. In respect of their on-site employment densities (i.e. number of jobs per one million passenger), York Aviation (2004) distinguished four groups of airports: airports with a low density of employment (e.g. Edinburgh, Malaga, Nice or Cork airport) where around 350 to 600 jobs are created per one million passengers, airports with a medium density of employment (e.g. Budapest, Lyon, London Stansted and Luton airports) generating 600 to 900 jobs, those with a high density of employment (e.g. Paris CDG, Amsterdam, Frankfurt and Vienna airports) employing 900 to 1200 persons, and finally those with a very high density of employment (e.g. Shannon, Cardiff, Hamburg airports) achieving more than 1200 jobs per one million passengers per year. This disparity in employment densities can be explained by differences in the size of the airport, the extent and the diversity of the services (including also the provision of associated activities), the type of operators attracted by the airport, the physical capacity to accommodate jobs, etc. Thus, airports with a low density of employment have low and medium passenger/freight traffic volumes which consist mostly of domestic, charter and low-cost traffic; in general they do not serve as airline base. Airports with a medium density of employment are characterised by medium and high traffic volumes. Their traffic is mostly scheduled and international; some airlines use the airports as base. High employment density airports have high passenger but also freight traffic volumes; they are the base for major airlines. The very high density airports have relatively lower freight and passenger traffics but in return they mostly have been chosen for accommodating airline headquarters and maintenance facilities (York Aviation, 2004, pp. 34-36).

Finally, York Aviation (2004) estimated the average number of indirect/induced employment and concluded that every million passengers (or workload units) create, in addition to 950 direct, on-site jobs, around 2950 jobs at national level, 2000 jobs at regional level and 1425 jobs at sub-regional, local level. As regards the geographical distribution of jobs occupied by residents, at the airports of London Gatwick, Stansted, Frankfurt, Paris CDG, Amsterdam and Brussels, on average only 30 % of employees reside within a radius of 10 km around the airport while 35 % of all employees live at more than 25 km from the airport (IAURIF; ADP, 2001). It seems that more distant areas profit more from urban dynamics such as the north of Seine-et-Marne and the South of Oise in the case of Paris CDG. It is even more significant to note that many households living previously near to the airport and that obtain a work a job connected to the airport activity move in order to get further away from the airport, mainly to the north.[500]

In general, unemployment rates are lower than on average[501] (IAURIF; ADP, 2001, p. 79). However, around Paris CDG airport unemployment rates are higher: Large-scale subsidised housing is concentrated in this area, so that surrounding zones are not prevented from high unemployment even though the airport is the most dynamic region employment centre. For this reason, specific activities are conducted, including the *GIP Emploi Roissy CDG* public interest group and *Airemploi*, an association promoting work in air transport.

Airports as economic motor at regional, national and local level

Airports are considered as important economic motors at regional and national level, but also at local level. Oxford Economic Forecasting estimated the impact of the aviation growth on the output of the UK economy was of about £ 550 million per year corresponding to 3 % of the trend increase in GDP (Oxford Economic Forecasting, 1999).

Furthermore, airports generate income and tax revenues for the areas in which they are located as the following examples indicate. Manchester Airport generated an income of £ 1.7 billion in 1998 of which £ 600 million benefited to the North West Region.[502] In 2005, the airport generated £ 938 million for the regional economy.[503] As regards Nice airport, on-site companies spent about 388 million EUR on supplies of goods and services in 2001, of which 166 million EUR benefitted to the Alpes-Maritimes region (York Aviation, 2004). The companies accommodated by the airports of Paris CDG and Orly generated in 2001 about 16 billion EUR being composed of investments (2 billion EUR), consumption (8.9 billion EUR), labour costs (4.7 billion EUR) and different taxes[504] (a total of 321 million EUR of which 176 million EUR trade tax). About two thirds of this spending benefit directly to the region (Berthon, 2004a, p. 150).

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[500] According to ADP and Mission Roissy (1997), cited by Faburel and Barraqué (1999a, p. 22).

[501] This is in part natural as peripheral zones of many European metropolises (where airports are usually located) have lower unemployment rates than central zones which tend to have concentrations of populations who often find it difficult to gain access to job. However, airports areas have employment rates even lower than in peripheral zones on average. This could not be proven for Frankfurt airport which has a very central location in a polycentric regions and a good accessibility so that the region as a whole benefits from economic impacts (IAURIF; ADP, 2001, p. 79).

[502] According to York Consulting (1999), cited by York Aviation (2004).

[503] See http://www.manchesterairport.co.uk/manweb.nsf/Content/Facts-OnePageAtAGlance, accessed on 18 October 2008.

[504] See Berthon (2004c) for more details.

As regards the economic impact at local level, only few studies are available. The lack of precise studies on the distribution of local effects is a real problem for airports as residents feel often to be the only one to suffer from the nuisances of air transport while positive effects benefit mostly to regional and national level. Nevertheless, airports have a large effect at local level.

They generate for example trade tax income: 174 million EUR paid in 2002 by enterprises belonging to the scheduled and non-scheduled air transport as well as to airport services in the Ile-de-France region. These enterprises are concentrated in about 20 municipalities and alone 60 % in the two municipalities of Roissy-en-France (Paris CDG airport) and Paray-Vieille-Poste (Paris Orly airport). 45 % of the trade tax income benefit directly to municipalities around the airport; another 7 % go to the different financial equalization funds between municipalities of a department.[505] For the five municipalities of Paray-Vieille-Poste and Orly (Paris Orly airport) as well as Mauregard, Roissy-en-France and Tremblay-en-France (Paris CDG airport) the trade tax income from these enterprises represents respectively 90 %, 58 %, 87 %, 84 % and 51 % of their total trade tax income. Another tax benefits also to local municipalities: the real estate tax which represents 13 million EUR in the Ile-de-France region in 2002 (Chauvel, 2004, p. 159).

As regards Paris CDG airport, hotel industry illustrates how an airport may contribute to local development: 35 hotels offering 6700 rooms are located in the heart of *Roissy pole* (7 municipalities), which corresponds to 1.5 % of hotels in the region but 5 % of hotel rooms and even 12 % of four stars hotel rooms (Berthon, 2004a, p. 152).

The effects on local development can be illustrated using the example of Paris CDG and Orly airports: While the activity of the first increased considerably over the last years and benefitted from the setting up of the Air France hub within its SkyTeam alliance, the second saw its activity being restricted by a ceiling on the number of takeoffs and landings. Thus, local effects were quite divergent (Lartique, 2004). It seems that the presence of an airport leads to a social and spatial differentiation of the territory and not all municipalities nearby the airport benefit in the same manner from the airport's presence.

Airport as motor for tourism development

Airports play an important role in inbound tourism and facilitate to residents the movement at a worldwide scale. Besides, for residents, the proximity of an airport facilitates the access to the world, a factor which seems to contribute largely to the residents' acceptability that however seems to depend on the extent to which residents use the airport and thus on its flight offer (i.e. airlines, routes, frequencies, prices).[506]

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[505] See Chauvel (2004) for more details on the functioning of this financial equalization scheme.

[506] According to an informal talk at the "1st International Scientific Conference: Competitiveness and Complementary of Transport Modes – Perspectives for the Development of Intermodal Transport" organised by the University of the Aegean, 10-12 May 2007, Chios with Professor Cullam Thomas, Centre for Air Transport and The Environment, Manchester Metropolitan University.

Regional accessibility of remote areas

Airports play a particular important role for improving the regional accessibility of remote areas, such as parts of Greece, Spain, Scandinavia and Scotland. In this case, airports contribute largely to the growth of local economies, the maintenance of local services (like health and education) and in supporting sport and cultural links. For this reason, a certain number of air services between regional communities and major cities, that are not economically viable, are subject to public service obligations. In this respect, air services may even contribute to a better quality of life as illustrated for example in a study on the impact of the Easyjet air connection between London Stansted and Inverness. The new route to Inverness had not only a positive effect on inbound tourism but 50 % of passengers coming from the region considered that this air link made the Highlands of Scotland a better place to live, for 75 % the area became less remote and for 40 % it was more likely to stay there.[507]

9.2.1.2. Catalytic effects due to an increase in the region's accessibility

Airports constitute the infrastructure that is necessary for performing a wide range of economic activities. Thus, airports contribute to economic and tourism development at regional level. This impact may even go beyond the regional level and extend to the national one as an international airport works as gateway to the worldwide trade network. These catalytic effects on employment and income result from the wider role of the airport in improving the productivity of business and in attracting economic activities such as inward investment and inbound tourism. Catalytic effects are also summed up as 'networking argument'[508] which refers to the increased accessibility of a region and thus its better integration into the worldwide network stimulating the region's economy. However, this effect is difficult to quantify as it is quite diffuse and not automatic (York Aviation, 2004).

A better accessibility may improve business efficiency and productivity

The catalytic impact results from a better accessibility which may improve business efficiency and productivity, in particular over medium and long distances. The airport allows access to the regions' suppliers and customers and to its external markets. Thus, airports are a factor in favour of location and investment decisions. For this reason, a high-performance airport improves considerably the competitiveness of the region served by the airport by improving its accessibility.

The importance of air transport to certain industries is reflected in the composition of passengers at the Parisian airports as 40 % of them travel for professional reasons. Some industries are particularly dependent on air service accessibility and use air transport more frequently, therefore also called "air-intensive" industries according to York Aviation (2004), such as insurance, banking and finance, printing and publishing, communication, computer

[507] According to SQW Ltd (2002), cited by York Aviation (2004).

[508] "*Vernetzungsargument*" in German, see Thiessen (2005).

activities, manufacturing (precision and optical instruments, etc.) and research and development. Air transport has become important to freight, too. About 25 % up to one third of world trade in merchandise value travels by air (even though this represents only 1 % in weight) as air freight is in general high value, low weight and urgent.[509]

With the purpose of reinforcing advantages arising from a better air service accessibility, airports having enough land on their disposal create business parks, conference centres and even logistics platforms. Examples include Paris CDG, Frankfurt, Hamburg, Nice and Helsinki airports.

The catalytic effects are often described in qualitative terms illustrating the link between airports, access to air services and the functioning of the wider economy (York Aviation, 2004). Surveys of attitudes to business locations or key business location factors bring these impacts to the light.[510] However, their quantification is difficult. In order to better understand the impact of the airport on the operation of the whole economy, it would be necessary to isolate what could be directly be assigned to the airport from what might result from a wider range of other factors.

The extension of Frankfurt airport: catalytic effects called into question

Catalytic effects are often cited when justifying the extension of an airport. Thus, a study of the Regierungspräsidium Darmstadt[511] had estimated that 95 000 additional jobs could be created by the extension of Frankfurt airport, including 18 000 direct jobs, 25 000 indirect and induced jobs but also 52 000 jobs in terms of catalytic employment. These catalytic effects were put forward by the supporters of the extension of Frankfurt airport during the project approval procedure.[512] In particular two studies were largely contested: According to Hujer, Kokot, Zeiss, Rürup and Mehlinger (2004) a significant direct, indirect/induced and catalytic employment would be created when the airport was extended; Baum, Esser and Kurte (2004) examined, using different examples, the airport as location factor and its relevance for the economy power of a region and concluded that there would be a direct and linear relationship. Both studies were largely contested.

[509] Among air freight figure perishable products (like newspapers, mail, flowers, and fruit), shock-, temperature- and moisture-sensitive products as well as urgent products (like pharmaceutical products and spare parts) but also expensive products like luxury or high-tech articles (e.g. perfume, electronic and electrical devices, textiles, shoes, machines, engines).

[510] The study on the social and economic impact of airports in Europe (York Aviation, 2004, p. 64ff) contains a summary on different surveys.

[511] According to Thiessen (2005).

[512] In 1998, the government of the state of Hesse initiated a mediation process for the extension of Frankfurt airport. After the mediation group had recommended, under certain conditions, the extension of Frankfurt airport, the official approval procedure was opened. Its first stage, the regional planning procedure (*"Raumordnungs-verfahren"*), had been completed by June 2002. Its second stage, the project approval procedure (*"Planfeststellungsverfahren"*) had started in autumn 2003. It resulted in the official, legally binding approval of the plans for the construction of a fourth runway and a third passenger terminal through the Hessian Ministry of economics, transport and land development in December 2007. See www.ausbau.fraport.de, www.dialogforum-flughafen.de or www.widema.de for more details.

Certainly, airports create employment and income for the surrounding regions, in particular in comparison to regions without an airport at proximity. However, it seems that these catalytic effects are overestimated and in particular do not necessarily justify the extension of an already existing airport. Hujer, Kokot, Zeiss, Rürup and Mehlinger (2004) were accused of methodological errors, distortions of the results through answers given by Lufthansa and Fraport[513] and of largely overestimating multipliers used for calculating additional income and employment (Rhein-Main-Institut e.V., 2007, pp. 10-18, 32-34). Baum, Esser and Kurte (2004) aimed at providing evidence for a causal relation between the quality rating of an airport and the economic power of the surrounding region but their study was heavily contested, in particular because other factors determining a region's economic power were not taken into account (Rhein-Main-Institut e.V., 2007, pp. 19-31, 34-38).

Actually, the impact of the quality of an airport (in terms of air connections) on the surrounding region has not yet been studied extensively. Therefore, Thiessen (2005) examined, using the example of Germany, to which extent a region with a smaller airport and thus fewer air connections would be disadvantaged in a globalised world and thus would be squeezed out of the market for the benefit of regions with a bigger airport.[514] Of course, bigger airports are characterised by a higher performance but Thiessen (2005) found only little difference in comparison with smaller airports. This can be explained by an efficient hub and spoke network allowing smaller airports to offer almost the same destinations as the biggest airports. Moreover, feeder flights to the hub airport are often timed in order to reduce waiting times. Although overall travel times are longer for smaller airports relying on indirect flights, Thiessen (2005) found that smaller airport were less disadvantaged than one could think, in particular when their range of feeder flights was completed by a certain number of well placed direct flights allowing them to reduce significantly overall travel times.[515] Thus, travel times to European destinations differ on average by less than 1 hour between bigger and smaller airports. Towards destinations outside of Europe, the difference in overall travel times accounts even for less than 10 % which is, expressed in labour costs, absolutely insignificant, even for companies that consider themselves as frequent fliers.[516] Thiessen (2005) drew the following conclusions: Smaller airports and regions benefit mostly from hub and spoke networks while hub airports suffer from redundant flights as, above a certain

[513] Lufthansa and Fraport are the two biggest companies on-site for which reason their answers had serious consequences on the outcome of the study (representing about 75 % of later calculations). Moreover, this study, for which Fraport furnished essential data, was carried out on its behalf without the authors putting into perspective the results. This could also explain the use of very different multipliers as regards income and employment effects for Germany and the Hesse region. At least as regards Fraport, strategic information should be expected.

[514] Thiessen (2005) considered five German airports of different size (Dusseldorf, Frankfurt, Hamburg, Leipzig, Munich and Stuttgart) and their air connections to 21 cities (Athens, Bahrain, Buenos Aires, Chicago, New Delhi, Helsinki, Johannesburg, London, Los Angeles, Madrid, Mexico City, Moscow, New York, Paris, Peking, Prague, Rio de Janeiro, Santiago de Chile, Singapore, Sydney and Tokyo) on the basis of the summer 2004 flight schedule (including flight time, departure/arrival times, days of the week for departure). If there was no direct flight, the indirect one with transfer at another airport was considered.

[515] E.g. Klophaus (2006) emphasised the economic benefit from regional airports.

[516] Such as the consulting firm Arthur D. Little which considers itself as "frequent flier" with on average one flight per week and per employee (Thiessen, 2005).

number of flights, the marginal economic benefit from an additional flight for a region is only small. This concerns in particular hub airports which have only a little catalytic impact for their surrounding regions; these regions benefit little from the extremely high number of flights.

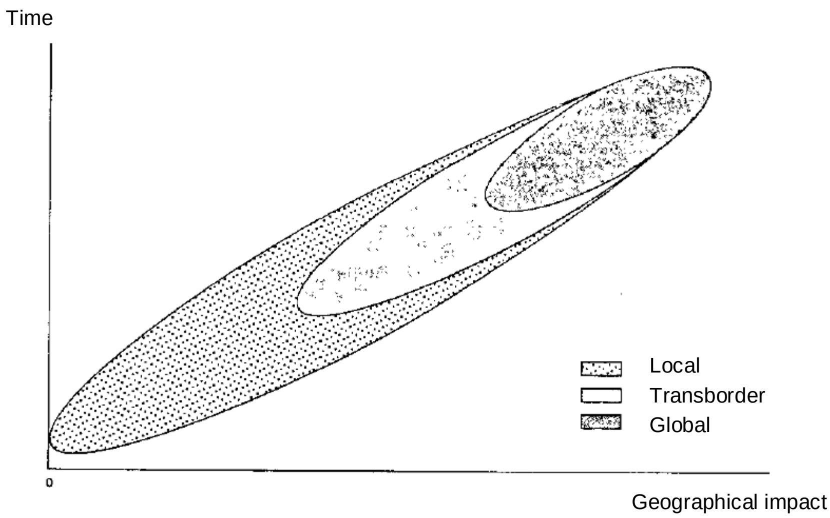
In general, infrastructure is considered to be necessary for a region's development, even though it would not be sufficient. However, this maybe does not apply to the extension of an already large airport: In this case, infrastructure is maybe not even necessary for a region's development (Thiessen, 2007). For this reason, the importance of catalytic effects has to be put into perspective.

9.2.2. Airports as source of conflicts at local level

Airports generate employment and income at regional level but also at local level. However, airports involve at the same time nuisances like air and soil pollution, noise nuisance, accidents but also consequences on nature and landscape by which in particular residents are adversely affected.

In order to deal with the undesired effects of transport on the environment, their analysis and understanding is indispensable. The effects on the environment can be quite diverse and fall into three spatial/temporal categories: local, transboundary and global effects. While local effects concern residents and workers as well as property in the area immediately adjacent to the transport activity (e.g. noise nuisance, local air pollution, vibration, community severance, traffic congestion), transboundary effects affect adjacent areas but in the medium term rather than immediately (e.g. low level ozone, acid rain). Finally, global effects influence the atmospheric composition in the long term. In this respect, carbon dioxide emissions are a major concern as they seem to contribute largely to a lasting to a global increase in temperature.

Figure 65: Spatial/temporal categories of environmental effects



Source: Button (1994, p. 9)

This diversity of impacts involves problems in policy initiation since different levels of decision-making are concerned. Moreover, difficulties arise in particular from forecasting longer term effects. They can be explained by two reasons: prediction problems resulting from the uncertainty of future situations[517] and a lack of complete knowledge about the exact cause-and-effect chain, such as the link between the original emission and for example the eventual global warming. Finally, the impacts of environmental effects are often non-linear (Button, 1994).

As regards the operation of airports, noise pollution seems to represent the main problem (ARIC, 2003, p. 3; Thomas, Hume, & Hooper, s.a., p. 1). According to a survey carried out by the French DGAC (2007a) 40 % of interviewed persons cited noise as the most important nuisance (even 50 % among residents)[518]. Furthermore, aircraft noise is one of the greatest barriers to airport expansion and new airport construction (Girvin, 2009). By way of example, noise nuisance has been the main reason for the relocation of DHL hub from Brussels to Leipzig airport. In the USA, 29 of the 50 busiest airports consider noise to be "the greatest environmental concern"[519]. A large number of European airports are the cause for dispute or themselves in conflict with residents and local representatives.

For this reason, the reader's attention will be directed to noise pollution which is rather concentrated at the points of arrival and departure but minimal along the journey[520] (Somerville, 1993) and thus concerns particularly the local level. Aircraft noise is subject to public policies and gave reasons for a relatively severe regulation but still continues to mobilise the opponents of air transport, and in particular in the case of airport extensions and modifications of flight paths. Recent works carried out around the airports of Paris CDG and Orly pointed out effects that are much more subtle, more localised and less positive on the airport surrounding territory (Faburel, 2004a). Local protests around airports have grown and hardened in a number of countries. The generalisation of these conflicts represents today a considerable pressure on the future development and often even on the functioning itself of the airport (Faburel, 2003b).

Before going deeper into the problem of noise nuisance, we will have a short look on the consideration of environmental effects within economic theory.

9.2.2.1. *The economic concept of environmental effects*

In economics, environmental effects are often considered within the concept of externalities. "In simple economic terms, an 'externality' exists when there are either individuals or firms whose welfare depends upon the behaviour of others who do not take this interactive effect

[517] In principle, the future situation due to the impact of environmental effects should be compared to the future situation without these effects as there would have been an evolution anyway.

[518] In comparison with local air pollution and CO_2 emissions by aircraft and greenhouse effect (DGAC, 2007a).

[519] Cited by Girvin (2009, p. 14) according to the US General Accounting Office (2000, p. 31). According to the same source, water and air quality come in second and third, cited by respectively 12 and 6 airports as the most important concern (US General Accounting Office, 2000, p. 31).

[520] With the exception of Concordes.

into account in their decision-making" (Button, 1994, p. 3).[521] Due to the effect imposed on third parties, the latter's welfare can increase as well as decrease. In the first case, the external effect is positive (external benefit), in the second negative (external cost).

Whereas external benefits, which by the way may be large in the short term, tend to be taken into account quasi-automatically in the long term, there is less incentive to consider external costs.[522] The process of internalisation aims at bringing the persons responsible for an externality to take it into consideration. By integrating externalities into the market process, the objective is to achieve better use of resources leading to an economically efficient level of environmental effects and thus to optimise costs. Nevertheless, this does not necessarily mean that the environmental costs resulting from transport are entirely eliminated.[523]

The term "internalisation" is commonly used, even though imprecisely, to include strict internalisation, according to which market participants start negotiating the level of environmental effects without state intervention [theorem of Coase (1960)], but also instruments leading to quasi-internalisation. In the latter case, the state intervenes in order to incite the persons responsible for external effects to reduce them. However, this is not internalisation in the strict sense since it does not result in the creation of a market for this external effect where both price and quantity are free in the beginning and fixed only in the course of negotiation.

All in all, four basic mechanisms allow the internalization of external effects, including negotiation without state intervention (strict internalisation), setting of emission standards (command-and-control instruments) allowing to fix the maximum possible quantity e.g. of pollution (like in the case of the catalytic converter) whereas emission charges [taxes and subsidies according to Pigou (1920)] and marketable permits initiate a market process in the course of which quantity or price are formed. In the case of emission charges, quantity demanded depends on the unit price fixed by the state; in the case of marketable permits, the price is formed according to the number of permits available (i.e. the total quantity of pollution accepted by the state). All mechanisms allow to restore efficiency but their implementation may involve to different degrees, depending on the concrete situation[524], information asymmetries, costs and time required for their introduction, transaction costs and the need for control. The major difference consists in the distribution of benefit between the different parties involved.

Noise abatement strategies are one of the fields where economic instruments have played an important role for quite a long time. Already in 1991 the OECD published a report on economic incentives for noise reduction in road transport (OECD, 1991). There were only a few cases, where these economic instruments were applied at that time, but they had shown their effectiveness for which reason the OECD advocated their more general use. One

[521] See also Schipper, Rietveld and Nijkamp (2001) for a short review of the concept of externalities as well as Coase (1960) and Pigou (1920).

[522] The concept of external costs is also applied to congestion at airports; see chapter 9.3 for the management of scarce capacity.

[523] See e.g. Lévêque (2000) and Button (1994).

[524] See e.g. Button (1994, pp. 12-14) on policy options and the suitability of the different instruments.

argument was that taxes or charges would allow to achieve environmental policy goals at a lower cost than through regulations (OECD, 1997). The first airports to introduce a noise-related component as part of landing fees in the 1970s were located in Europe. According to a survey by ACI Europe (1995), in the mid-1990s, already 29 of 99 interviewed airports applied noise-related airport charges and further 27 airports intended to introduce such a charge in the near future. Morrell and Lu (2000) indicated that over 60 airports in 16 countries applied noise taxes.

Internalising external environmental effects requires their evaluation in monetary terms. This calls for a good knowledge of the impact of noise on the community surrounding airports. Basically, three different methods can be used to estimate the social costs of external effects[525]:

- revealed preferences approach using replacement (or secondary) markets such as hedonic price methods, travel cost method and the evaluation of expenditure on protective measures,
- contingent evaluations (stated preferences approach) being based on asking the economic agents how much they would be disposed to pay (willingness-to-pay) in order to eliminate a nuisance or how much they would accept (willingness-to-accept) in order to tolerate a nuisance,
- indirect methods according to which first the consequences of a nuisance in physical terms are evaluated and then the costs of the corresponding damage estimated.

Even though much progress has been made on evaluation methods for environmental effects in general, Faburel and Mikiki (2004) estimated that no airport defines the noise tax[526] amount according to noise effects and their social costs. This observation was already noted by e.g. Morrell and Lu (2000) who showed in a case study on Amsterdam airport that actual noise charges do not cover social cost from noise.

9.2.2.2. Noise pollution: a nuisance at local level

"Noise is unwanted or unpleasant sound" (Nelson, 2004, p. 4). Permanent noise pollution has heavy consequences on the residents' everyday life. For people living next to the airport noise pollution is perturbing and has an impact on their well-being in general but it can also cause sleep disturbance, sleep deprivation (Franssen, Van Wiechen, Nagelkerke, & Lebret, 2004) and be harmful to health through stress and hypertension for example (Jarup, et al., 2005). However, the perception of noise depends much on the person, on their personal sensitivity and varies accordingly. Beyond these individual effects, permanent noise pollution influences residential mobility and local property markets, land use patterns around airports as well the

[525] See Button (1994), Quinet (1994) and Faburel, coll. Mikiki (2003, pp. 33-43) on different evaluation methods of social costs of external environmental effects, including their pros and cons, and in particular Quinet (1994, pp. 8-13) on the social costs of noise. See also Morrell and Lu (2000) for a review of methods of measuring externalities, and especially the hedonic price method which seems to be, together with contingent valuation methods, the most commonly used ones (Lu & Morrell, 2006, p. 47). For further explanations on the application of the hedonic price model see also Nelson (2004) and Faburel and Maleyre (2007).

[526] See e.g. Lu and Morrell (2001, pp. 379 Figure 1, pp. 383-385) on the functioning of environmental charge mechanism.

way residents appropriate the territory. These collective effects have attracted attention only over the last years, mainly from French researchers and can be divided into direct, indirect and induced effects. As noise pollution is in the centre of local protest, noise abatement measures are imposed at a growing number of airports. Nevertheless, local protest continues and raises the question of how increasing the airport's social acceptability.

Studies carried out around Paris CDG and Orly airport illustrate very well the far-reaching consequences of permanent noise pollution. In this respect, Faburel (2003b; 2004a) proposed a taxonomy analogue to that generally used for describing the positive impact of an airport on income and employment, namely direct, indirect and induced effects of noise using the example of Paris CDG and Orly airports.

Direct effects of noise pollution using the example of Paris CDG and Orly airports

Direct effects refer mainly to the wish to move and to residential mobility which can modify the population's social structure. In fact, one could expect that residents suffering from noise move to somewhere else. This was the case for example of Villeneuve-le-Roi and Ablon-sur-Seine, two municipalities next to Orly airport where the population decreased of about 10 % over the last 20 years. Moreover, a survey of 70,000 persons being exposed to the airport's noise showed that 43.9 % of them intended[527] to move somewhere else and noise pollution was cited as the principal reason (Faburel, 2001).

Nevertheless, around a number of airports, a different development becomes apparent. The population of the neighbouring municipalities remains unchanged or even increases. However, the point is not the moving in or out of residents but a slow social selection having got under way at the same time resulting primarily from a decrease in property prices due to noise pollution.[528] Among the households living next to an airport, those that can afford to leave, move to somewhere else in consequence of a depreciation of living conditions. At the same time, modest and often younger households that had already lived in the larger surroundings are attracted by low real estate prices allowing them to become house owners without losing their relationships, in particular professional ones, and without complicating everyday life.[529] This evolution towards a social polarisation is not specific to France as Faburel (2004a) reminded.[530] Faburel (2004a) pointed out that more than thirty-five times such a decrease in property prices due to noise pollution had been observed abroad. These studies show also that this fall in real estate prices seems to be on average of 0.4 to 0.6 % per each additional dB(A) above the equivalent of an average noise during the day of 58-60

[527] Note that an intention is not necessarily put into practice.

[528] A loss in property values had also been observed in the vicinity of undesirable facilities such as waste sites or electric utility plants (Farber, 1998).

[529] According to Martinez (2001), cited by Faburel (2003b; 2004a), see also Faburel and Barraqué (2002).

[530] This evolution had also been observed in the USA around some airports (Cidell & Adams, 2001), cited by Faburel (2004a).

dB(A)[531], irrespective of the employment and income produced by the airport (Faburel, 2004a). A large number of studies indicate an even higher average reduction of 0.7 to 0.9 % per additional decibel (Faburel & Maleyre, 2007).

However, there are large variations in Noise Depreciation Index (NDI)[532] values. Relating to recent works (Schipper, Nijkamp, & Rietveld, 1998; Bateman, Jones, Lovett, Lake, & Day, 2002; Navrud, 2002; Nelson, 2004), they may be explained to a large extent by variables referring to the spatial and temporal context, the type of property market, their degree of segmentation, the applied acoustic index, the specification of the econometric function, etc. (Faburel & Maleyre, 2007). For instance, samples with higher relative average house prices show higher noise depreciation indices (Schipper, Nijkamp, & Rietveld, 1998).

Over the last 20 years, the loss of property values due to noise was even rising and stabilised around 1 % per additional decibel (Faburel & Maleyre, 2007). An increase in NDI was also observed around Orly airport where a recent study on eight municipalities near to the airport estimated the depreciation of real estate prices amounting to 0.86 % over the period from 1995 to 2000 and even 1.48 % for the period from 2001 to 2003 (Faburel & Maleyre, 2007), in comparison with a decrease of 0.5 % for four nearby municipalities according to a survey in 1978 (Faburel, 2004a). The growing depreciation of property values, whereas noise exposition remains constant or diminishes, is a sign of increasing noise sensitivity involving a modification of residential behaviour. This implies also that physical dimensions of noise, in particular sound intensities and spectra, do not explain entirely annoyance, even only 30 % of declared annoyance according to Faburel and Maleyre (2007).

Indirect effects of noise pollution using the example of Paris CDG and Orly airports

Beyond the direct effect resulting from the daily lived experience of noise, indirect effects refer to preventative measures taken in order to manage the exposition to noise. This includes urban planning tools such as the French PEB[533] determining the zones around airports that are

[531] For a review of estimates of the impact of noise nuisance on property values see also Button and Stough (2000, p. 327), Nelson (1980; 2004), Schipper, Nijkamp and Rietveld (1998) and Faburel and Maleyre (2007). Among cited studies figure Uyeno, Hamilton and Biggs (1993) who note that noise depreciation seems to be far higher for vacant land than for family houses or freehold apartments. Pennington, Topham and Ward (1990) considered that depreciation of property values next to Manchester International Airport may be due rather to neighbourhood and other characteristics of the properties and consequently they could still be expected to command a lower price even if there would be no noise nuisance.

[532] NDI is defined as the percentage depreciation of properties per unit of noise (Schipper, Nijkamp, & Rietveld, 1998).

[533] The French noise exposition plan ("*Plan d'Exposition au Bruit*") is a planning document created by the law of 11 July 1985 relating to urbanism in the vicinity of airports. It defines the restrictions and obligations on urban development imposed upon municipalities close to one of 270 national airports. Constraints increase when approaching the airport. The document fixes future levels of noise according to traffic forecast with the purpose of preventing urbanization near to airports in the medium- and long-term. Noise curves split the space into several zones and thus may cut certain areas due to restrictions on their construction and rehabilitation, sometimes confining these areas in a process of degradation and deterioration. This maybe one reason why the local communities continue to grant building licences despite noise nuisance. This type of planning instrument exists also in other countries such as England, in the Netherlands and in Switzerland but their application is not

subject to urban planning restrictions. These tools may block local dynamics by restricting the use that can be made of the territory. Moreover, they may facilitate the location of power lines and infrastructure necessary for the good accessibility of the airport (e.g. motorway, railroad lines). Thus, the territory may be cut into separated areas isolating certain communities.

Induced effects of noise pollution using the example of Paris CDG and Orly airports

Finally, the induced effects relate to the emergence of territories of protest in order to defend the local identity and to preserve the community shaped by noise nuisance. The daily experience of noise pollution influences also the representations made by the individuals living on the territory as well as their social relations. Being dissatisfied with measures taken by public authorities in order to protect the residents from noise, a feeling of differentness and political abandonment arises. Certain social relations split off reinforcing local sociability networks. These representations and practices, which result from the collective experience of noise pollution, can even strengthen the community and shape a territorial identity, or at least a sense of belonging on a local scale (Faburel, 2003a). The defence and protection of this belonging participate in the construction of real territories of protest. Thus, the reason for the protest is not longer the defence of an individual interest but that of a localised general interest (Lascoumes, 1994).[534] In this protest, associative movements, which have become much better structured, and more recently coalitions of elected local representatives play an important role. The impact of noise pollution on the construction of a sense of belonging and the emergence of territories of protest can be considered as an induced impact (Faburel, 2004a).

9.2.2.3. Noise-abatement strategies

Aviation noise policy first concentrated on reducing noise at the source by introducing new, more severe technical standards for aircraft leading to the definition of chapter 2, 3 and 4 standards for aircraft as cited in the Annex 16 of the Chicago Convention of 1944. The older and most noisy Chapter 2 aircraft were already banned from the EU airspace from April 2002 onwards. While new aircraft entering service since 1 January 2006 has to meet stricter Chapter 4 noise limits[535], no timetable is set for withdrawing Chapter 3 aircraft from circulation.[536] Despite stricter noise standards, the majority of current production aircraft already comply with chapter 4 standards. In fact, only 17.0 % of the European total fleet and

always compulsory (as it is the case in France) but recommended thus allowing more latitude to local communities (Faburel & coll. Mikiki, 2003, pp. 18-19).

[534] Cited by Faburel (2003b).

[535] As regards Chapter 4 aircraft, their cumulative margin of the three certification values (flyover, lateral, approach) has to be 10 dB better than Chapter 3 limit value. Noise limits for individual aircraft types during take-off and landing are specified in terms of effective perceived noise level (EPNL) in dB(A), which depends on the aircraft take-off gross weight and the number of engines at take-off.

[536] Without other restrictions, the phase-out of Chapter 3 aircraft will depend on life expectancy of aircraft which is of about 25 to 30 years.

19.4 % of the worldwide total fleet are certificated Chapter 3 aircraft (Commission of the European Communities, 2008b, p. 10). Thanks to quieter aircraft technology, the noise level of a current production Boeing 737-700 has dropped below one third of that of an equivalent aircraft with 1965 technology (Girvin, 2009).

As a consequence, the noise footprint of aircraft around an airport has been reduced (Cordeau & Moulinié, 2004; Girvin, 2009) and thus, the size of the territory primarily exposed to aircraft noise. In comparison with a 1970s-technology aircraft, the noise footprint of a modern plane has been reduced by a factor of about seven (Cordeau & Moulinié, 2004) or even 9 (Commission of the European Communities, 1996b).[537] Moreover, a number of airports require pilots to follow precise operational procedures for take-off and landing in order to reduce noise pollution (e.g. to follow predefined inbound and outbound tracks in order to fly always at maximum altitude, in particular during take-off which is even noisier than landing, use of preferential runways)[538]. However, the increase in air traffic, in particular during peak hours, continues to give cause for serious concern to residents and has led to calls for further operating restrictions at individual airports, especially in order to limit the use of older and noisier aircraft among those complying with chapter 3 standards (so called “marginally compliant aircraft”)[539].

Since 2001, the International Civil Aviation Organization (2004, pp. I-39, I-40) adopted a multipronged or “balanced approach” according to which all the available measures allowing to reduce aircraft noise have to be considered, namely noise reduction at the source, land-use planning and management in the vicinity of the airport, noise abatement operational procedures and operating restrictions. However, ICAO indicated that operating restrictions in particular should not be the first solution but be balanced against other measures.

At the large European airports whole sets of different noise-abatement measures have been implemented over the last years. Pressure on airports for taking action for noise suppression depends much on the local and national context as law governing aviation noise control falls in the EU member states’ sphere of competence. In order to harmonise regulation, the EU

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[537] For big aircraft, the reduction in noise is less important (Cordeau & Moulinié, 2004).

[538] See Girvin (2009, pp. 19-20) for examples.

[539] The group of Chapter 3 aircraft covers a wide range of types, including those that barely meet requirements, which therefore are referred to as “marginally compliant aircraft” such as former Chapter 2 aircraft that had been re-certificated as Chapter 3 aircraft through hushkitting. This procedure “involves a combination of strategies designed to reduce aircraft noise… [such as] new technologies, redesigned engine enclosures, replacement engine components, entirely new engines, or a combination of any of the above” (Fischer, 2000). Re-certification of some Chapter 2 aircraft is even possible without any physical modification just by operation in a “low noise” configuration which includes e.g. reduction in take-off weight, use of specified flap settings. (Department of Transport and Regional Services, 2005) Although meeting Chapter 3 standards, some of these aircraft are considerably noisier than modern Chapter 3 aircraft. However, this procedure allowed airlines to continue to use former Chapter 2 aircraft after their phase-out. The EU already tried in 1999 to ban re-certificated aircraft from its airspace by adopting the highly controversial Regulation 925/99/EC (so-called Hushkit Regulation). See Fischer (2000) for more details on this conflict. Finally, Regulation 925/99/EC was abandoned in favour of Directive 2002/30/EC which allows airports to interdict marginally compliant Chapter 3 aircraft in part or totally. However, note that total chapter 3 aircraft represents only 17.0 % the European total fleet and 19.4 % of the worldwide total fleet. The share of marginally compliant Chapter 3 aircraft is even smaller adding up to 6.1 % of the European total fleet and 5.6 % of the world-wide total fleet (Commission of the European Communities, 2008b, p. 10).

adopted two directives related to noise reduction: Directive 2002/30/EC[540] adopting ICAO guidelines on the "balanced approach" for introducing new noise-related operating restrictions at airports throughout the EU and Directive 2002/49/EC[541] providing a common methodology for the preparation of airport noise exposure maps.

For airports that had already under national law the possibility to introduce operating restrictions (like German and UK airports), Directive 2002/30/EC rendered the process of noise management more complex due to consultation requirements and the need to evaluate costs and benefits of alternative measures for reducing noise. Apart from that, the majority of airport operators indicated that "the Directive had not directly influenced the noise management around their airport" (Commission of the European Communities, 2008b). As a consequence the European Commission could propose to strengthen the 2002 framework directive on airport noise.

Operating restrictions for noisy aircraft

Measures introduced as a result of Directive 2002/30/EC include restrictions for marginally compliant chapter 3 aircraft (partial restrictions in most cases, including Brussels National airport where marginally compliant Chapter 3 airplanes are forbidden at night from December 2008 onwards, and Paris CDG airport where these aircraft were prohibited at night from March 2004 onwards and during the day from October 2008 onwards[542]). E.g. at Cologne/Bonn airport, aircraft not figuring on the "bonus list"[543] is forbidden to take-off or to land between 10 p.m. and 6 a.m. In addition to official ICAO standards, some airports set noise limits for daytime and night time operations per aircraft such as Leeds, Dusseldorf, Salzburg, and Prague airports.

Noise budgets

In addition to noise limits per aircraft movement, a number of airports draw up noise budgets (such as Frankfurt airport[544]) or quotas (like many UK airports[545], such as London Heathrow,

[540] Directive 2002/30/EC of the European Parliament and of the Council of 26 March 2002 on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Community airports.

[541] Directive 2002/49/EC of the European Parliament of the Council of 25 June 2002 relating to the assessment and management of environmental noise.

[542] Marginally compliant Chapter 3 aircraft refer to aircraft that meet the certification limits laid down in Volume 1, Part II, Chapter 3 of Annex 16 to the Convention on International Civil Aviation by a cumulative margin of not more than 5 EPNdB (Effective Perceived Noise in decibels). (See Directive 2002/30/EC Article 2d) Moreover, Paris CDG airport introduced a night ban for Chapter 3 aircraft with a cumulative margin of more than or equal to 5 EPNdB and less than 8 EPNdB. See www.boeing.com/commercial/noise/listcountry.html for an updated list of noise restrictions at airports (accessed on 16 June 2010).

[543] "Bonus list" is a list defined by the Federal Ministry of Transport and contains notably quieter Chapter 3 aircraft. However, environmental activists consider the bonus list to be not strict enough as almost 97 % of all aircraft operating in Germany figures on this list, including aircraft such as Boeing 747 (Schwarze, s.a.).

[544] See www.fraport.com/cms/environment/rubrik/3/3007.noise_abatement@en.htm, accessed on 16 June 2010 as well as Fichert (2006) for more details on the noise budget system at Frankfurt airport that has been used since summer 2002.

Birmingham, Bristol, and Manchester) for the traffic at night. They can also apply to both daytime and night time as in the case of Amsterdam Schiphol, Brussels National and Copenhagen Kastrup airports. Applying to the fleet as a whole over a given time period, they are also called cumulative noise limits. Being conceived to favour less noisy aircraft, they contribute to reducing aircraft noise.

Restrictions to night flights

Finally, some airports introduced restrictions to night flights and impose penalties for airlines violating these stipulations. However, there is no uniform definition of night time. Moreover, most airports do not apply a general night curfew as often exceptions exist. Nevertheless, these restrictions lead in most cases to a quasi-ban on night flights.[546]

At Paris Orly airport take-off is forbidden between 11:15 p.m. and 6:00 a.m. and landing between 11:30 p.m. and 6:15 a.m. As regards Dusseldorf[547] airport, there are restrictions to night flights but no general ban due to many exceptions. Chapter 3 aircraft not figuring on the “bonus list” are not permitted to land or to take-off between 10:00 p.m. and 6:00 a.m. Aircraft on the “bonus list” are also forbidden to take-off between 10:00 p.m. and 6:00 a.m. but an exceptional permission can be granted until 11:00 p.m. if aircraft is delayed; landing is not permitted between 11:00 p.m. and 6:00 a.m., but an exception is possible until 11:30 p.m. for the same reason. Moreover, there are further exceptions for home based carriers (having their local maintenance facilities recognised by the approving authority at Dusseldorf airport; eight carriers such as Air Berlin, Lufthansa, Blue Wings, LTU) that are authorised to land until midnight and also between 5:00 a.m. and 6:00 a.m. if a flight is delayed. They only need to ask for permission if a delayed flight is arriving after midnight. At Zurich and Geneva airport, night flights are not banned in general but there are restrictions for flights between 10:00 p.m. and 6:00 a.m. leading to a quasi-ban on night flights. Take-off is forbidden from midnight to 6:00 a.m. whereas between 10:00 p.m. and midnight only aircraft operating non-stop long-distance flights of more than 5000 km and having a noise index[548] of 98 or less and aircraft with a noise index of 96 or less are permitted to take off. Landing is forbidden from midnight to 5:00 a.m. In the case of delay, aircraft are authorised to take-off or land until 0:30 a.m.

As Girvin (2009) underlined the ban on night flights is very effective for avoiding noise and local protest concerns to a large extent missing or insufficient restrictions on night flights or the disregard of such measures. However, its cost is estimated to be high, including the operators’ lost revenue, consumers’ schedule delay costs and possible job losses. The already mentioned night time quota system allowing a certain number of operations at night but inciting airlines to use less noisy aircraft may provide a more acceptable compromise between

[545] See Girvin (2009) for details on noise quotas at London Heathrow airport.

[546] See Girvin (2009) for night curfews at North American airports.

[547] See *Nachrichten für Luftfahrer* Part I (NfL I-251/07) of 11 October 2007.

[548] See RS 748.131.1 *Ordonnance du 23 novembre 1994 sur l’infrastructure aéronautique (OSIA)* Article 39 (last modification in March 2008) for regulation on night flights and Article 39c for the calculation of the noise index. (www.admin.ch/ch/f/rs/748_131_1/a39c.html, accessed on 17 June 2010).

the residents' noise concerns and aircraft and airport utilisation but its ability to ease the conflict depends on the concrete situation.

Noise charges

In addition to individual or cumulative noise limits, a number of airports impose noise charges or taxes for noisier aircraft and/or grant discounts for quieter aircraft. Different noise charges exist. In general, noise-related charges increase with aircraft noise but sometimes with aircraft weight as heavier aircraft tend to be noisier. The noise charge may apply as a noise surcharge per operation when aircraft noise is above a defined maximum per-aircraft threshold or to all aircraft according to the aircraft noise categories (each with its corresponding charge or discount) to which the aircraft belong. Some noise charges depend also on the time of operation. The noise fee may be charged on arrival only, on departure only or on both. Despite these differences, the structure of noise-related fees is in general destined to encourage airlines to use quieter aircraft (Girvin, 2009).[549]

This is the case of Frankfurt airport, which introduced noise-related fees for landing and take-off in 2001. Noise-tariffs[550] are strongly differentiated: the noise charge is respectively of 0 EUR, 12 EUR, 31 EUR, 75 EUR and 270 EUR for aircraft of categories 0 to 4 whereas it amounts to respectively 610 EUR, 6,750 EUR and 14,250 EUR for aircraft of the categories 5 to 7. In addition, aircraft have to pay a surcharge when taking-off and landing in the night. During the night time 1 (11:00 p.m. to 11:59 p.m. and 5:00 a.m. to 5:59 a.m.), the surcharge is ranging from 35 EUR for aircraft of categories 0 and 1 to 310 EUR for category 4 aircraft and amounts to respectively 1,250 EUR, 13,500 EUR and even 28,500 EUR for aircraft of categories 5 to 7. During the night time 2 (11:00 p.m. to 4:59 a.m.), the surcharge varies from 43.75 EUR to 387.5 EUR for the categories 0 to 4, whereas it accounts for 1562.50 EUR, 16875 EUR and 35.625 EUR for the categories 5 to 7.

Other airports like Dusseldorf and Cologne/Bonn apply higher noise charges for aircraft not figuring on the "bonus list". Paris Orly and Paris CDG airports both apply noise taxes with strong penalties for noisy aircraft which are increasing for flights taking-off from 6 p.m. to 10 p.m. and even higher for those from 10 p.m. to 6 a.m.[551] However, at some airports noise

[549] See Morrell and Lu (2000) on noise surcharges and discounts applied at airports in 11 European, 3 Asian countries and the USA. Both concentrating on noise charges at hub airports, Nero and Black (1998) proposes to consider a tax per passenger as well as a tax per aircraft while Hsu and Lin (2005) consider two different noise charge methods for a noise levy per landing for aircraft. Noise charges incite airlines to adjust aircraft types, flight frequencies and flight routes. If noise charges are too high, airlines may decide to operate more direct non-stop flights instead of passing by the hub airport. Moreover, airlines may use larger aircraft and reduce frequency leading actually to an increase in social costs, which is by the way in line with previous studies (Nero & Black, 2000).

[550] See www.fraport.com/cms/environment/rubrik/3/3007.noise_abatement@en.htm, accessed on 16 June 2010 and Fraport AG (2007a) for more details on aircraft categories; Gordijn and Hornis (2007).

[551] The noise tax at French airports is part of a general tax on polluting activities. It was revised as to 1 January 2008 in order to distinguish in addition to daytime and night time a third period of time which is the evening see *Décret N° 2007-1825* of 24 December 2007. It has to be paid in addition to a landing fee which also varies according to the aircraft's acoustic group and the time of day (06:01 a.m. to 11:29 p.m. and 11:30 p.m. to 06:00 a.m.). See Boeing (2008) for the calculation of this tax and more details on the following example: At Paris Orly airport, the take-off of a B747-400 (chapter 3, 395 t, 4 engines, acoustic group 2) would be subject to a tax of

taxes seem to be too low in order to influence the airlines' behaviour, e.g. at London Heathrow, Amsterdam, Milan Malpensa and Rome Fiumicino airports (Gordijn & Hornis, 2007).

While an analysis of world-wide fleet data[552] of 1996 and 2006 showed the gradual replacement of older aircraft by more modern aircraft, there is no evidence from the comparison of traffic at 15 European airports according to three noise categories for aircraft that these taxes would be particularly efficient in order to reduce the share of noisy aircraft in the traffic operated by a particular airport. Noise taxes contribute to the phasing out of the oldest and noisiest aircraft even though there cannot be presumed proportionality between noise taxes and fleet modernisation. However, they allow to "get rid of the most irritating airplanes" (Gordijn & Hornis, 2007).

Noise taxes are often part of a set of different measures, including noise budgets and night curfews, their direct contribution to noise reduction being difficult to evaluate. In a context of increasing noise-sensitivity from residents, curfews are certainly the most severe and most effective measure in order to avoid noise. However, taxes allow the internalisation of external costs by inciting airlines to use more silent aircraft or to pay an additional fee. In this case, the decision is up to the airline. In the short term, this may lead to a concentration of more silent aircraft at airports applying noise-related fees whereas noisier aircraft is used for serving airports without noise taxes. Maybe, there are even airlines abandoning an airport that applies noise surcharges. From an economic point of view, this is not a problem, unless the noise tax would be too high leading to a suboptimal noise level. In the long term, the measures taken by the large airports in noise-sensitive communities may be for the benefit of other airports not taking special action for reducing noise as the spread of noise taxes (but also of other noise reducing measures) may incite airlines to modernise their fleets more rapidly than they would do otherwise. This could explain why in the study of Gordijn and Hornis (2007) airports, which do not apply noise-related fees, such as Madrid or Palma de Mallorca (the latter also profits from the absence of intercontinental destinations as shorter flights to European destination are not operated by very large and thus noisier aircraft), are characterised by a large share[553] of most silent aircraft, too.

When assessing the effects[554] of noise charges for aircraft, conclusions are not uniform. Whereas different German studies point out that these charges contributed to accelerating the use of more modern aircraft, other studies consider the efficacy of noise charges to be low. In addition to its function as controlling tool, the money collected from noise taxes often serves

1464 EUR from 6 a.m. to 6 p.m., of 4393 EUR from 6 p.m. to 10 p.m. and of 14 645 EUR from 10 p.m. to 6 a.m. while a quieter A320-200 (chapter 3, 73.5 t, 2 engines, acoustic group 4) would pay respectively 176 EUR, 527 EUR and 1054 EUR. At Paris CDG airport, the noise tax for the same B747-400 would amount to 592 EUR, 1776 EUR and 5920 EUR in comparison with 71 EUR, 213 EUR and 426 EUR for an A320-200.

[552] Fleet refers only to scheduled services and includes all aircraft with a MTOW of more than 100 tons. As chartered particularly noisy full freighters are not considered, the number of noisy aircraft is rather underestimated.

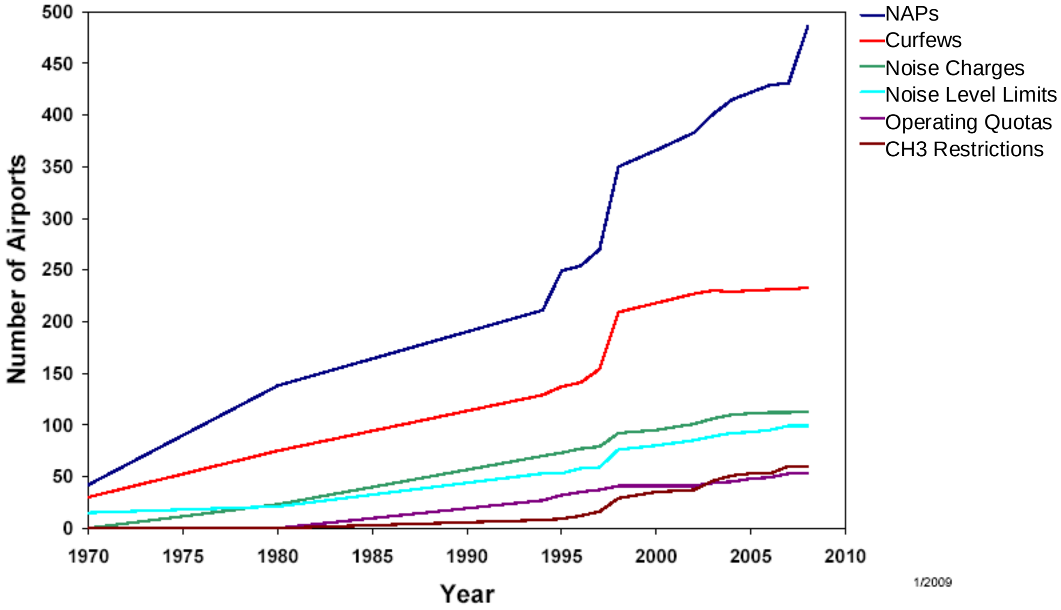
[553] See Gordijn and Hornis (2007).

[554] See Lu and Morrell (2001, p. 379) for an illustration on the environmental charge mechanism.

also to finance[555] acoustic insulation programmes round the airport (Commission of the European Communities, 1996b). This is particularly true as airports until now do not seem to determine noise charges according to noise effects and their social costs (Morrell & Lu, 2000; Faburel & Mikiki, 2004).

In summary, the following figure 66 illustrates the spread of noise abatement measures at airports since 1970 and in particular for the last 10 years.

Figure 66: Trends in airport noise restrictions



Source: http://www.boeing.com/commercial/noise/charts_all.html, accessed on 16 January 2009

Recent articles, e.g. Girvin (2009), underline that the demand for further technical progress in reducing noise level of aircraft below ICAO standards is driven by some airports in noise-sensitive communities, in particular in Europe. Although recognising the progress in noise abatement, the need for further efforts in order to reduce the conflict potential of noise is underlined. This is e.g. the case of Cordeau and Moulinié (2004, p. 196) who considered that further efforts should also concern night flights. Some airports tend to act as mediator between the air transport industry and residents, such as Frankfurt airport which proposed during the mediation process a night curfew in return for the approval for the construction of the fourth runway against, in order to meet demands of residents and in opposition to Lufthansa that underlined the importance of night flights, especially for freight traffic.[556]

[555] See Morrell and Lu (2000) on how the money generated from noise charges is used in the case of six European countries (including France, Germany and the Netherlands).

[556] As regards the introduction of a night curfew at Frankfurt airport and its consequences on air traffic and employment see Jünemann, coll. Fränkle et al (2001) and Öko-Institut e.V. (2003).

Strategic noise maps

Directive 2002/49/EC[557] established a common methodology for maps indicating exposure to noise around major airports (so called “strategic noise maps”, see Article 7) allowing to monitor noise exposure and to assess the number of people annoyed and sleep-disturbed. On this basis, competent authorities are required to take further action to reduce noise (Article 8) and to inform the public by making strategic noise maps as well as action plans available (Article 9). This idea has been implemented at a number of airports such as Frankfurt, Paris CDG and Orly, Manchester and London airports. As the example of Paris CDG and Orly airports illustrates, noise maps are also used to monitor the consequences of the reorganisation of air traffic flows in the Ile-de-France region carried out in 2002. According to ACNUSA (2006), a total of more than 2.46 million persons are concerned by overflying, without distinguishing between different flight approach and take-off directions.[558]

Growing local protest

Over the last 20 years, noise pollution has been subject to relatively strict regulation. Thus, the level of noise measured on ground has all in all stabilised, even decreased around several big airports (including Paris CDG and Orly airport) and this despite the considerable growth of traffics. Nevertheless, noise nuisance continues to structure airport conflict and contributes to public dispute, even around aerodromes where public authorities believed they had already taken appropriate action. (Faburel, 2004b) Local protests and oppositions can be observed in a number of countries and represent currently one of the major constraints for airport development (Faburel, 2003b; Bickenbach et al, 2009; Girvin, 2009).

The following examples illustrate this conflict between residents on the one side and the air transport industry as well as government authorities on the other side. Thus, the construction of the new terminal 5 at **London Heathrow airport**, which was finally opened in 2008, had been discussed over more than 10 years, including a public inquiry of almost four years, including demonstrations, lawsuits... The opposition to the expansion of London Heathrow airport continues as the construction of a third runway and a sixth terminal are planned. Greenpeace even bought a piece of land on the site of the future third runway and hopes by subdividing and selling it to hundreds of individual owners, it may prevent the construction of the runway. At **Frankfurt airport**, the construction of a fourth runway was authorised by the Hessian Government in December 2007 after many years of dispute and contrary to the mediation process without imposing a strict night curfew as 17 flights would still be approved during the night. This decision provoked further opposition demanding in particular the

[557] Directive 2002/49/EC of the European Parliament of the Council of 25 June 2002 relating to the assessment and management of environmental noise.

[558] Two wind configurations can be distinguished: the westward and the eastward configuration with respectively 1.26 million persons (238 000 in the case of Orly airport and 1.02 million in the case of CDG airport) and 1.54 million persons (236 000 for Orly airport and 1.30 million for CDG airport) concerned by overflying. For 334 000 persons, the wind configuration is irrelevant as they are concerned by overflying the whole year. These figures include all aircraft of less than 3000 meters altitude and refer to two days in 2005: 1 July for the westward configuration and 10 June for the eastward configuration (ACNUSA, 2006).

postponement of the immediate start of construction of the runway but in January 2009, the Hessian administrative tribunal dismissed all petitions in this respect. Even though this decision shall be final, the tribunal did not agree with the restriction on night flights considering it to be insufficient, especially after a total curfew between 11 p.m. and 5 a.m. had been negotiated during the mediation process. Therefore, the noise prevention concept, one condition for the construction approval, shall be revised during the main proceeding from June 2009 on. The construction of **Berlin Brandenburg International Airport** was approved in 2004 after many years of dispute. Nevertheless, more than 4000 residents brought an action against this decision. In March 2006, the federal administrative court dismissed these claims but it imposed conditions for noise protection and flight restrictions between midnight and 5 a.m. In France, the construction of **a new airport in the Paris region** was discussed controversially and finally abandoned. For more than 30 years, aircraft noise has influenced relations between Germany and Switzerland as aircraft fly regularly over Southern Germany for landing at **Zurich airport** (90 % of all arriving flights before 2002) located at only 15 km from the frontier. Thus landing procedures had been subject to an agreement since 1984.[559] In the 1990s, the Swiss decided the expansion of Zurich airport without consulting the German communities suffering from aircraft noise leading to the cancellation of the agreement on landing approach over its territory by the German government in 2000. A lasting solution to this conflict has not yet been found...[560]

In addition to an increasing environmental consciousness and higher expectations as regards noise control and abatement, the comparison of different airport conflicts reveals some similarities.

The growing local protest concentrates mainly on the impact of noise pollution, such as discomfort, sleep disturbance and damages to the health, but also on effects on social and spatial dynamics of the territories next to the airport. Besides, in all observed cases, opponents call into question the representative character of acoustic noise indices and noise standards. They consider that the different devices, such as noise measurement, modelling, and cartography, are not adapted to reflect the experience of annoyance due to noise (Faburel, 2004b). By the way, a number of complaints come from persons living in the public authorities' eyes far enough from the airports so that they would not be concerned by the different devices used by public authorities in order to understand and bring under control noise exposure (such as acoustic insulation claims from the local plan of noise disturbance[561]).

[559] This agreement resulted from legal procedures following the start of operation of a new runway in 1976 which increased noise nuisance from arriving flights for Southern German communities.

[560] See Faburel (2003b) for more examples on airport conflicts, Jones (2004) for airport conflicts in England, Prins (2004) for the Netherlands and Subra (2004), Awada (2004) for Paris region, the latter including restrictions introduced on the pressure from residents and local representatives as well as weaknesses of the current mode of consultation.

[561] Local plans of noise disturbance (*"Plan de gêne sonore"*), set up by the law of 31 December 1992, are applied to the ten biggest airports. They indicate different zones according to which households living there may ask for financial aid for sound insulation, depending also on the date of taking up residence and acoustic data on which zoning is based. Acoustic data does not reflect the lived experience of noise. Recently, restrictions in granting of funds were relaxed (Faburel & coll. Mikiki, 2003, p. 18). See also Cordeau and Moulinié (2004, pp. 191-193) on the local plans of noise disturbance applied around Paris CDG and Orly airports.

For this reason, residents ask for studies on the spatial conformity between zones affected by noise nuisance and the effective annoyance and consequently on the justification of zoning used for restricting town development and for entitling residents to financial aid for noise insulation (Faburel & Barraqué, 2002, p. 38).

In fact, research already done on the spatial and social differentiation due to the airport's presence suggests that certain zones, which are not necessarily covered by environmental regulations, would be concerned by noise. This can be explained by the rather technical and historical approach for noise levels on which are based environmental regulations. Thus, the local protest addresses the problem of an insufficient consideration of the multiple and intricate effects of aircraft noise on the population and the territories, which is also reflected in a gap in literature on noise where evaluations of these effects are missing for the benefit of works on acoustic measurement in IP, Leq or Lden (Faburel, 2004b). In fact, the local level plays a particular role in the airport noise conflict. Noise nuisance sheds new light on this scale which already had been considered in the past but only from certain points of view and which emerges as another spatial scale of reference in addition to the widely studied global, national and regional ones. Thus the articulation between the airport and its surrounding spaces comes to the fore, the locale scale not referring any longer only to the question of the functional territory allowing access to the airport as economic resource or to the legal and political space of the technicians' and representatives' competence, in particular with the question of amalgamation of communities and hierarchy of power (Faburel, 2003b).

According to Faburel (2003b), the influence of the lived territory on the noise annoyance declared by residents is one sign for this evolution. A survey showed (Faburel, 2001) how the households' residential paths and ambitions or how the feeling of being politically neglected can affect the declared annoyance. The acceptation of a lived territory involves different values. Identity, cohesion or coproduction and partnership[562] may federate local energies and even structure and strengthen oppositions to airport projects thus leading to socio-political alliances working on the redefinition of certain principles and criteria relating to town planning. In this respect, opposing expertise gains in importance. Its purpose is to consider the project on a larger scale thus pleading for a reformulation and a new approach to the conventional objectives of the project at stake. Another instrument is the institution of legal proceedings which may lead to a radicalization of the conflict. Failures in the technical evaluation according to the regulation as well as of certain scientific positions backing it up are progressively underlined.[563] Finally, even the utility of the project with regard to the regional transport offer may be called into question. The public debate on a new airport in the Paris region illustrates very well this development: alliances established between representatives of the communities considered to be suitable for the choice of location, local associations, national federations, certain institutions were committed to raise the question of the complementarities between the air transport offer on the scale of the Paris region and of a modal shift of passenger and freight traffics at national level from the air to other transport modes, implicating gradually the critical analysis of the utility of new airport. Alternative

[562] See Lajarge and Roux (2000) cited by Faburel (2003b).

[563] See Jasanoff (1995) according to Faburel (2003b).

projects came up such as the transfer of certain productive functions of Paris CDG airport to other airports, e.g. of general freight and express freight to Vatry airport[564] (Faburel, 2003b).

Territorial stakeholders such as residents and local representatives as well as their associations play a growing role. Residents stress their right to live in peace and quiet and denounce consequently the increase in air traffics, the disregard of predefined flight paths or night curfews, and the impact on their real life but also local representatives counting on the income from the airport activity. However, territorial stakeholders get closer and exchange ideas even though there was a large gap between them previously as they were following different logics. Networks and allied groups (power coalitions) emerge thus leading to a reconstruction of the stakeholders' system (Faburel & Barraqué, 2002).

As regards the attitude of associations, to a certain extent a development from "Not In My BackYard" (NIMBY)[565] to "Build Absolutely Nothing Anywhere Near Anybody" (BANANA) can be observed (Humphreys & Francis, 2002; Bickenbach, Kumkar, Sichelschmidt, Soltwedel, & Wolf, 2005). The NIMBY effect "may be defined as social rejection of facilities, infrastructure and services location, which are socially necessary but have a negative connotation" (Pol, Di Masso, Castrechini, Bonet, & Vidal, 2006, p. 44). However, most researchers on the NIMBY effect now seem to agree that the 'selfish' element is only one reason why people may oppose a particular local project and that consequently this phenomenon is rather complex (Van der Horst, 2007).[566]

The BANANA effect implies a higher degree of rejection. Just like in the case of the expression "Not In Any BackYard" (NIABY), rejection does not refer to a specific location but rather it may be ideological, a matter of principle. It is characterised by the calling into question of the project's general utility and by a sense of justice being based on a wider solidarity with the concerned population (Marchetti, 2005, p. 13). It is just this attitude explaining the redefinition of certain principles and criteria of urban and transport planning, especially the consideration of a much larger scale of reference than the project's spatial perimeter.

Coalitions of different stakeholders may sometimes take advantage of more or less visible strategies of certain environmental administrations that seek to distinguish themselves in respect of competencies on the question of noise. In the past, environmental ambitions were carried only by the associations in defence of living conditions which remained quite isolated even though they were sometimes supported by political positions of local representatives. Action taken by local representatives remained little coordinated, torn between the pros and cons of the airport. Nowadays, requests are much more territorial, considering the diversity of

[564] For more details on the public debate on a new airport in the Paris region see the basic document for the discussion (DUCSAI, 2001), the final report summarising the principal observations (Zémor, 2001), the contributions of Duron (2001), Zagury (2003) and Barraqué (2002) as well as a history of discussion published by the Association Ville et Aéroport (s.a.) and an analysis of the debate made by the Laboratoire Communication et Politique, COSTECH (2005).

[565] See Pol et al (2006) for more information on the NIMBY reaction even though not referring exclusively to air transport.

[566] See Marchetti (2005, pp. 11-14, 16-18) for a definition of the NIMBY effect in a narrower and a broader sense but also on the different types of facilities concerned.

the communities' social and spatial characteristics. Requests are supported by larger groups, sometimes associating local representatives, associative movements and experts. By their size, they reach a critical mass and a certain suggestion force allowing them in a number of countries to take a place in public on the question of airports (Faburel, 2003b).

Wester-Herber (2004) underlined that the local attachment to a specific geographical place, also referred to as place-identity, needs to be considered: Four aspects of this identity can be affected if changes are made to a landscape by the introduction of a high-risk and stigmatised industrial venture.

Perceived annoyance or disturbance is only in part a function of frequency, noisiness and timing of aircraft movement; it is also related to social conditions (socio-economic status, cultural and lifestyle differences) affecting the people's quality of life and expectations; fear of air accidents or disturbance from other airport activities may also involved in the underlying causes of annoyance; necessary differentiation between noise exposure and noise disturbance or tolerance (Thomas, Hume, & Hooper, s.a.).

9.2.2.4. The difficult integration of airports into the local territory: acceptability of airports

Despite the action taken in order to reduce noise nuisance for residents living nearby airports, local protests and oppositions can be observed in a number of countries and represent currently one of the major constraints for airport development (Faburel, 2003b; Bickenbach et al, 2005; Girvin, 2009). Airport conflicts have become widespread over the last years. The discrepancy between the positive effects of airport activity such as its contribution to employment and wealth on the one hand and its nuisances on the other hand seems to be growing. As illustrated by the few examples already mentioned, this conflict becomes apparent in particular when discussing the location of a new airport, the construction of a new terminal or a runway or the modification of flight paths. However, there is a high heterogeneity of situations as regards the countries' political culture, social relations and territorial characteristics (Faburel, 2003b). However, some points in common emerge.

According to Faburel (2003b) noise seems to play a double role in the growing opposition to airports. At first, the social and spatial effects of aircraft noise raise the question of the significance of acoustical measures. Consequently, the problem to be solved is how to measure noise effects. Moreover, noise effects create a social link within the local territories and a spatial link with the other scales of reference usually participating in the discussion where the discontinuity between airport and local territories had been perceived for a long time as due to the airport's extraterritoriality.

Therefore, the local territories constitute a new spatial scale of reference in the debates. By the values and legitimacies they carry, by the coalitions between elected representatives, by local authorities who structure their action, these territories more and more manage to hinder an airport project and sometimes even to redefine some of the political intentions of the management. Hence, the territory could be the key to the solution of the problem (Faburel, 2003b).

In order to reduce airport conflicts, it would be necessary to increase the airport's social acceptability for the purpose of assuring their durable integration into their local territories. Faburel (2003b) underlined that the number of initiatives in this direction has increased over the last years. One example is the Interreg IIC COFAR project (Common Options For Airport Regions)[567] bringing together amongst others the biggest European airports and their regions for the purpose of gathering best practices in airport management and in particular as regards their territorial integration (Berthon, 2004b). Concepts like "airport city", "*aéroville*" in French (Berthon, Bringand, & Prins, 2001), extension of the previous concept of "*aéropôle*" or "city airport" (Ray, 1989), stem from it. The airport city is characterised by being both fully integrated in the surrounding urban system and relatively autonomous (Busquets, 2000, p. 49).

Airport managers seem to back the idea of increasing the airport's social acceptability. Thus, ADP has contributed to efforts to achieve a financial equalisation of revenues from the airport activity and has shown the willingness to improve access of persons living nearby the airport to employment generated directly or indirectly by the airport (Cherradi, 2004). In this regard, job training plays an important role but access by public transport to the airport is just as important since working hours are often different from those of office employees (early in the morning, late in the evening, during the weekend) and a large part of jobs are less qualified and thus are relatively low-paid. Furthermore, some airport operators tend to act as mediator in this conflict. This is the impression that one can receive from the mediation process at Frankfurt airport. Faburel, coll. Mikiki (2003, pp. 80, 96, 98, 105) underlined the change of the position of ADP that seems to wish to access to the mediator status in order to ensure the continuity of their facility.

A recurrent subject of discussion is economic, social and spatial compensations granted to local authorities or to residents suffering from noise (Association Ville et Aéroport, 2003, pp. 107-108). Actually, municipalities taking advantage from the airport's presence are not necessarily those suffering the most from its nuisances. In general, the shorter the distance to the airport, the higher is the nuisance but the latter depends also from the municipality's geographical position. As regards Paris CDG and Orly airports, municipalities in the west of the airports are much more annoyed as aircraft land and take-off upwind and the wind comes mostly from the west. As regards the benefits from the airport activity (in particular trade tax and real estate tax), they go to a large part to those municipalities on whose territory the airport facilities were constructed and where settled down the companies whose activity is related to the airport; a smaller part being redistributed via equalization funds at the department level towards municipalities suffering from noise without benefitting from the airport activity. This contributes to degree of opposition from local representatives. On the one hand, Tremblay-en-France takes a large advantage from the presence of Paris CDG airport as regards employment and tax income. Even though being one of the municipalities being the closest to the airport, it suffers only little from the airport's activity as 97 % of its

[567] Results published by IAURIF and ADP (2001) referring to the regional embeddedness of airport cities.

population lives in a part that is rarely overflown by aircraft. On the other hand, the representatives of municipalities being situated farther from the airport but in the axis of the runways (like Gonesse) and thus much more exposed to noise nuisance, without benefitting from tax income from the airport's presence which is too far away, are at the top of the opposition to the airport (Subra, 2004, pp. 146-148).

Lack of empirical evaluation hindering the estimation of social costs

The debate on compensation for local authorities and residents suffering from noise pollution attracts notice to the lack of empirical evaluation of the effects of the airport's presence on nearby territories. Far-reaching analysis is necessary as some points seem to be ambiguous. (Faburel & Barraqué, 2002) Initially, most airports were constructed in less urbanised area and thus most residents complaining about noise arrived later. This is also the case of Paris CDG airport opened in 1974.[568] The arrival of new residents was facilitated by a certain laxity concerning the award of building permits to the detriment of the strict respect of building restrictions (like the so called PEB in France). This accusation comes mostly from airports, airlines and the ministry of transport. However, the determinants of residential mobility of the population as well as the reasons explaining the award of building permits despite noise nuisances have not yet been studied empirically in detail. Local representatives point out that until the decentralization laws of 1982 building permits were awarded by the State, not by local authorities. Some municipalities consider building planning schemes (like the PEB in France) to be too restrictive in order to assure a harmonious and sustained development of their territory and ask for a better equalization of funds from the airport activity and more financial aid in order to assure a development of their municipality that would be compatible with the air traffic. As the airport activity generates much employment, it stimulates also demand for accommodation. To a large part, the representatives of the municipalities suffering from noise nuisance, on the one hand, refuse to take into account noise nuisance when developing their territory, and on the other hand, denounce noise pollution (Subra, 2004, pp. 148-150). As regards the State, it neglected to adopt a mandatory legislation avoiding further urbanization of the concerned territory[569] (Subra, 2004, pp. 150-152).

Implementing the idea of paying an adequate compensation requires the precise valuation of noise effects. The problem is that there is not sufficient information on noise effects and therefore the estimation of their social costs is rather difficult. For this reason, airports in general do not consider noise effects and their social costs when determining noise taxes, even though over 60 airports in 16 countries apply such a tax (Morrell & Lu, 2000, p. 306).

[568] See Subra (2004, pp. 123-137) for more information on the history of the conflict around Paris CDG airport. Interestingly, the consideration of nuisances was one reason for choosing the location for Paris CDG airport. However, at that time, the willingness to restrict nuisances from the airport was not due to political reasons but rather to the technicians' point of view seeking to maximise the projects' advantages while minimizing its negative effects. At that time, even though people living nearby the already existing Orly airport may have been bothered by nuisances, this annoyance did not result in a conflict.

[569] This behaviour cannot be justified by a sudden increase in air traffic as previous estimations realised by ADP and by the DGAC (the air transport department of the ministry of transport) projected an even higher traffic growth (Subra, 2004, pp. 150-152).

Nevertheless, this tax contributes to the application of the polluter-pays principle rather than the user-pays principle (Alamdari & Brewer, 1994). According to economic literature, this lack may be due to the uncertainties and limits carried by social costs measures and methods of evaluation (Schipper, Rietveld, & Nijkamp, 2001) although much methodological progress has been done in this field. As regards aircraft noise, Faburel and Mikiki (2004, p. 3) noted that the social cost data are not yet perceived as support for decision making. According to both authors, this may also be explained by what they call "legitimate technique" (Faburel & Mikiki, 2004, pp. 7-8), the referential of representation and action of technicians working for civil aviation administration or even air companies. It includes the use of a scientific and technical language and the refusal of the existence of impacts on the populations that have not been studied scientifically, e.g. property value depreciation, health effects, sometimes pauperisation.

Measures already taken in order to reduce noise nuisance, such as international aircraft normalization, models and instruments used for the definition of takeoff and landing procedures and for setting trajectories more respectful to the overflown territories, perimeters of zones in which planning rules and soundproofing assistance criteria are applied, determination of actors authorised to participate in airport noise commissions, are mainly based on acoustics.

Nevertheless, Faburel and Mikiki (2004, p. 9) considered that "the horizon of the real internalization seems more open today". As regards Paris CDG airport, local governments, the communities, the ACNUSA (French authority for noise control) and **more recently even the airport operator ADP called for the implementation of the polluter-pays principle in the aircraft noise domain**. Behind, Faburel and Mikiki (2004, p. 9) observed the emergence of a new referential shared by local representatives, associations, but also by airport managers following a mediation logic and ACNUSA with its political mission of dialogue, which are the territories, their values and symbols (such as proximity, identity, partnership, project, empowerment). The objective is not necessarily to incite airlines and air transport users to change their behaviour "but especially to create the funds for implementing new measures that, due to this referential, would be more territorialised: destination of airport employments to citizens located nearby airports, local transport services, funding for property value depreciation compensation, or even for those deciding to remain..." (Faburel & Mikiki, 2004, p. 9). Compared to the technicians of the civil aviation administration and of airline companies, these stakeholders perceive numerous noise effects due to their personal noise experiences as well as to the experiences of social and political networks created around the question of noise. They also ask for more evaluation and more precisely the use of a new approach to the problem with the aid of other knowledge, other categories of analysis and other observation methods.

Local stakeholders attribute the existing lack of evaluation and uncertainties to a shortage of public ambition to reduce noise effects. It may also be connected to the absence of local stakeholders in the decision-making process concerning the airport's future, the interdisciplinary valuation of spatial and social differentiation caused by the airport's presence on the one hand and decision making on the other hand being closely connected (Faburel & coll. Mikiki, 2003).

Integrating local stakeholders in the decision-making process – the construction of a joint territory together with the airport

Therefore, the question of the integration of airports in their local territories in order to guarantee their acceptability raises the question of how associating local stake-holders to the decision-making process which is a request of associations and coalitions of local representatives. In fact, the establishment of a relation between airports and their territories is a recurrent element of the speeches of local stakeholders, including even more and more the airports themselves. It would mean to open the decision-making process to cooperative participation, and maybe even to a new model of airport governance, namely territorial governance (Faburel 2003b).

This development would also be in the interest of airports as the globalisation movement has led to a new duality: whereas supply, production and distribution are more and more globalised, an increasing importance is attached to the local scale, including the diversification and adaptation to local clientele and the increasing emphasis of local specificities in general.[570] Some airports still fulfil a function relating to local or regional distribution but others represent more complex interfaces between their continent and the world. Beyond the airport's size, the applied competencies are essential, reinforcing thus the importance of the relationship between the airport platform and its territory and requiring a new type of consultation as regards their productive relations (Baudouin, 2000). Finally this relates to a new vision of the airport that would not be considered any longer as an infrastructure having both positive and negative impacts (income and employment on the one hand and nuisances on the other hand) on the surrounding spaces but to stress the airport's geo-economic role for the integration of surrounding metropolitan territory into the globalised world and to conceive the airport as going beyond the pure transport function, emphasizing the formation of wealth thanks to commercial opportunities from the globalization. This clearly implies the cooperation of the airport platform with the diverse local components and thus necessitates strong relations between the aerodrome and its metropolitan territory. The local scale plays an essential role in the mobilisation of competencies in the fields of employment, e.g. job training, and externalisation, e.g. attracting the companies that are necessary to the development of the facility (Baudouin, 2000).

The construction of a common/joint territory relates to both a political and a physical dimension, including two types of stakeholders who had been neglected more or less until now: urban communities and professional groups cooperating with the authority for the development of a joint territory (Baudouin, 2000). However, consultation and cooperation are complex issues as there is a multitude of stakeholders, beyond urban communities and professional groups, having each one their own interests and strategies. Even though being important places of activity and economic development, most airports do not correspond to a

[570] The term "glocalisation" referring to globalisation and localisation is related to this duality.

specific territory or a specific management authority as they are often located at the boundaries of different political units such as regions, provinces, counties, municipalities complicating the elaboration of a coherent policy.[571] While the infrastructure projects are in general planned at regional and national level, land use planning falls in sphere of local competencies. Although being often build far from the city centre, most airports are caught up by urban zones which still increases the conflict potential. Therefore, **consultation and coordination committee, gathering together the airport and representatives of the State, of the air transport sector, of local authorities but also of the civil society, economy and associations, seem to be the only way for finding compromises on the basis of the largest possible shared vision of the airport's future.** This is the case in England with the Airport Consultative Committees, Brussels airport or at Frankfurt airport with the regional dialogue forum (*"Regionales Dialogforum"*) which was established in 1998 by the state of Hesse for discussing the development of Frankfurt airport[572] (Berthon, 2004a).

The construction of a joint territory is also a chance for public authorities as pointed out by Humphreys and Francis (2002, p. 256). They consider the planning system, in addition to regulation, as the only policy instrument to exert influence on airport development in the wider public interest, e.g. by restricting the extension of airport capacity or approving it under certain conditions, since airlines and even airports are largely owned by the private sector and not longer under direct control of public authorities.

Finally, Thomas, Hume and Hopper (s.a.) placed emphasis on the need for airports to communicate with their neighbours since it allows to demonstrate their commitment to reducing disturbance if opposition is to be minimised. More proactively, airports must actively engage in dialogue in order to give the possibility to local residents to contribute to airport development and thereby ensure that the way an airport grows can be made as acceptable to as many people as possible. This necessitates transparency of systems, public reporting of targets and performance and third party auditing which will both assist the development of the management system and engender "trust". There will always be a conflict of interest between airport operators and their neighbouring communities which can only be minimised through open and honest dialogue (Thomas, Hume and Hopper, s.a.). According to the authors there is a strong argument that in particular noise nuisance (except at extreme levels of exposure) is most appropriately managed at a local level through consultation and the active participation of communities that are adversely affected.

9.2.3. Nuisances of air transport at global level

Due to the combustion of fuel, aircraft release carbon dioxide (CO_2) emissions but also water vapour (H_2O) as well as lesser quantities of nitrogen monoxide (NO) and nitrogen dioxide

[571] See Berthon (2004a, p. 244) for some examples.

[572] See Berthon (2004a, pp. 246-250) for examples for consultation at some European airports: airports operated by BAA, Brussels, Frankfurt, and Vienna airports. For Frankfurt airport see also Faburel & coll. Mikiki (2003, pp. 24-26) and www.mediation-flughafen.de (accessed on 14 December 2009), for the discussion on airport development in England see Jones (2004) and for the Dutch way of consultation see Prins (2004), for Paris CDG and Orly airport see Awada (2004).

(NO_2) gases (often summed up as NO_x emissions), sulphur oxides (SO_x) and soot directly into the upper troposphere and lower stratosphere.[573] The emitted gases and particles have been shown to contribute to global warming[574] by changing the concentration of atmospheric greenhouse gases, including CO_2, ozone (O_3) and methane (CH_4). Moreover, aircraft emissions include the formation of condensation trails (contrails) which possibly contribute to increased production of cirrus clouds (Penner, Lister, Griggs, Dokken, & McFarland, 1999).

Whereas the total amounts of aviation fuel burned as well as the total emissions of CO_2, NO_x, and water vapour by aircraft are well known, the climate impacts of the gases and particles emitted and formed as a result of aviation are more difficult to quantify. It is possible to compare them to each other and to climate effects from other sectors by using the concept of radiative forcing (Penner, Lister, Griggs, Dokken, & McFarland, 1999). However, the scientific understanding for the climate impact of all other emissions than CO_2 and contrails is rather fair and even poor for cirrus clouds. Therefore, this subchapter will concentrate on CO_2 emissions in the following (Grimme, 2008). Moreover, while other gases (such as NO_x, SO_x, water vapour) and particles have shorter atmospheric residence times, CO_2 has a long atmospheric residence time (about 100 years) explaining urgency for action.

In contrast to local nuisances (such as noise and local air quality), climate change is a global challenge and requires therefore solutions on a world scale. Developed countries have to assume their responsibility for the majority of CO_2 emissions. Nevertheless developing and especially newly industrialised countries have to be associated in order to prevent that they reproduce the same behavioural patterns that were adopted by developed countries' populations while conceding the wish for growth to developing countries.[575] This is particularly important as recent studies on aviation (Macintosh & Wallace, 2009) underline

573 Aircraft engine emissions on ground as well as during take-off and landing are often considered separately when referring to local air quality. This includes also emissions from auxiliary power units, ground support equipment and ground access vehicles. According to Holmén and Niemeier (2003) an estimation of the US Government (1997) indicated that aircraft engines and ground access vehicles (including passenger pick-up and drop-off) represent respectively about 45 % of total air pollutant emissions from airport operation, with auxiliary ground units and ground support equipment accounting for the remaining 10 %. Carbon monoxide (CO) and hydrocarbon (HC) emission still are a problem around airports even though there has been done much progress on aircraft emissions, especially by doubling fuel efficiency over the last 25 years. As regards nitrogen oxide (NO_x) emissions close to airports, it seems that they have increased until recently due to higher pressures and temperatures of more efficient engines. (Somerville, 2003, p. 266) These emissions could be lowered by reducing thrust levels at take-off which can, however, conflict with noise control requirements (like the respect of adherence to departure noise limits). Local air quality is also negatively influenced by the creation of ground level ozone (O_3) resulting from the reaction of volatile organic compounds (VOCs) and NO_x in sunlight. ICAO fixed aircraft emission standards for NO_x, CO and HCs using a reference landing and take-off cycle. However, Holmén and Niemeier (2003) underline that there are currently no specific standards or required control measures in respect of emissions from ground support equipment or vehicles. Surface access also contributes to the deterioration of local air quality as at many airports it depends largely on private cars. Congestion is a frequent problem. Therefore, many airports have taken measures in order to increase the share of public transport in surface access. See Fenger (2009) on a review of the history of air pollution which has developed from a local to a global problem.

574 See Lenzen, Dey and Hamilton (2003) on details on climate change, including information on the greenhouse effect, sources for greenhouse gas emissions and international negotiations on the topic.

575 See Lenzen, Dey and Hamilton (2003) on the responsibility of industrialized countries for CO_2 emissions and their trials to distort climate research and discussions in their favour bringing Agarwal and Narain (1991) even to speak of “environmental colonialism”.

that, despite technical progress, it would be likely that CO_2 emissions will continue to grow without demand restraints and demand shifts, thus necessitating measures aiming at changing profoundly the economic agents (whether households or firms) behaviour.

9.2.3.1. The air transport's contribution to CO_2 emissions

Until now, air transport[576] represents only a small part of total CO_2 emissions but its share is increasing steadily due to traffic growth thus contravening reduction targets under the Kyoto protocol. Furthermore, the strong rise of the last years will continue over the next decades according to medium and long term traffic forecasts.[577] Of course the current economic slump, which seems to lead to a decrease in traffic volumes in the short term, may alter these forecasts. However, in the past, air transport was growing faster than indicated in previous outlooks. Another point is that, at least in the short and medium term, air transport will depend on kerosene[578] derived from oil generating increasing amounts of CO_2, even though significant improvements in the efficiency of engines and aerodynamic design have been already achieved over the last years. Sharp increases in emissions from any sector could put at risk attempts to achieve climate targets and thus the objective of avoiding climate change. (Macintosh & Wallace, 2009) For this reason, CO_2 aviation emissions are a real concern and aviation has to contribute to efforts in this field.[579]

Whereas the EU's total greenhouse gas emissions fell by 3 % from 1990 to 2002, emissions from international aviation increased by almost 70 %. Despite significant improvement in aircraft technology and operational efficiency, the effect of traffic growth could not be neutralised and growth in emissions is likely to continue in the decades to come.[580] This applies also to the world scale[581] where CO_2 emissions have increased considerably over the last years. From 1990 to 2004, total global civil aviation CO_2 emissions increased by 60 % from about 400 Mt to at least 650 Mt even though there are differences in the estimates[582]. As regards international aviation emissions, they rose by 33 % from 292 Mt to 390 Mt over the same period (IEA, 2007a)[583]. In comparison with the world total emissions[584] in 2004, total

[576] See Schipper and Fulton (2003) on carbon dioxide emissions from transportation in general.

[577] See different studies on air transport growth, e.g. International Civil Aviation Organisation (2007), Airbus (2007) and Boeing (2007).

[578] For giving an idea of the time frame: IATA's objective is a carbon-free air transport industry by 2050 (Grimme, 2008).

[579] Emission policies refer primarily to direct emissions while neglecting indirect emissions that stem from the production of goods and services which are used as inputs. They are also significant but of a lower volume.

[580] See http://ec.europa.eu/environment/climat/aviation_en.htm, accessed on 2 March 2009.

[581] Macintosh and Wallace (2009) indicate that fuel efficiency of international aviation increased by 40 % from 1990 to 2005. This improvement is due to three factors: beneficial changes in air traffic management, improvements in aircraft and engine design as well as significant increases in load factors. See Macintosh and Wallace (2009) for further remarks and a note on fuel efficiency which may be overestimated due to data errors resulting from the poor quality of aviation statistics, especially in the early 1990s.

[582] See IEA (2007b; 2007c), Kim et al (2005) and Grimme (2008).

[583] Due to reporting problems, IEA estimates are subject to a certain degree of uncertainty (Macintosh & Wallace, 2009).

[584] According to Marland, Andres and Boden (2007), world total CO_2 emissions from fuel combustion, cement manufacture and gas flaring amounted to 29 029 Mt in 2004.

global civil aviation represented about 2.2 %, with international aviation corresponding to 1.3 % (Macintosh & Wallace, 2009) .

For this reason, air transport could become a significant factor of CO_2 emissions over the next decades. This results also from estimations on a worldwide scale for CO_2 emissions although they are based on a relatively or even very strong economic growth and do not integrate the current economic slump. According to estimations of the Intergovernmental Panel on Climate Change in 1999, CO_2 could grow according to different scenarios by between 60 % and 1000 % between 1992 and 2050 (Penner, Lister, Griggs, Dokken, & McFarland, 1999, p. 6). More recent studies predict increases in the same region. Horton (2006) indicated at least a doubling of CO_2 emissions between 2002 and 2030 which would correspond to an additional 100 $/tonne CO_2 incentive to technology acceleration; without this additional incentive emissions would be even higher by +22 % in 2030 in comparison with the case of the most technological advance.[585] According to Berghof et al (2005), the rise in CO_2 emissions varies according to four scenarios[586] between 2000 and 2020 by 17 % to 70 % and between 2000 and 2050 by 35 % to 360 %. Only the transition to hydrogen technology would allow to reduce significantly CO_2 emissions (-85 % by 2050, in comparison with 2000).[587]

All measures that may be taken by airlines in order to reduce emissions, such as developments in aircraft technology[588], the use of alternative fuels[589], voluntary offsets[590] or the renewal of the fleet[591] will have a positive but relatively small or rather long-term impact on aviation emissions (Forsyth, 2008b). CO_2 predictions over the next decades, despite differences in estimates, reveal that a restriction of emissions would necessitate the emergence and rapid deployment of a new emission saving technology allowing to reduce the emission intensity of

585 See Horton (2006, pp. 8-10) on more details. Both cases assumed fuel efficiency improvements until 2010.

586 For more details on the four different basic scenarios which are called “Unlimited Skies”, “Regulatory Push & Pull”, “Fractured World” and “Down to Earth” see Berghof et al (2005, pp. 6-8).

587 For further estimations see Macintosh and Wallace (2009) addressing also studies of Olsthoorn (2001) and Owen and Lee (2006).

588 Technology is being relatively locked in with few possibilities to accelerate the reduction in emissions, except in the very long term. Improvements in aircraft technology are increasingly difficult to realise; trade-offs may arise between the decrease in CO_2 emissions and the increase in noise or NO_x emissions (Grimme, 2008). For this reason, gains in fuel efficiency from new aircraft (such as the A380) probably will not be sufficient to compensate for additional aviation demand. Only in the long term, engine developments are expected to lead to significant changes in emissions. In the very long term, it may even be possible to use new methods of propulsion, such as hydrogen fuel cells.

589 In the medium term, there is some scope for reducing emissions by adding alternative fuels (like biofuels). Airlines are experimenting this, but the question is if these alternative fuels will be available and at which cost (Forsyth, 2008b).

590 Voluntary offsets (e.g. participation in climate protection projects) will lead to higher costs and risk the competitiveness of the airline. Although this may work for some airlines, in most cases, airlines prefer proposing their customers to compensate their emissions by paying an extra for a carbon offset.

591 Fleet renewal depends on the supply of new more fuel efficient aircraft by manufacturers but also on the airlines’ willingness to pay costs for replacing aircraft more quickly. Airlines in countries with strict emission policies will replace their fleets faster, thereby supplying the market for used aircraft with high emission aircraft which will be economical for airlines in countries with weak or no emission policies. Aircraft have relatively long lifetimes (Macintosh & Wallace, 2009) for which reason the replacement of the current fleet will take time. The impact of gradual fleet renewal on emission reductions is estimated at only 1 % per year per passenger-km and emission policies are not expected to speed up the process by much (Forsyth, 2008b).

air travel or a decrease in aviation demand. The latter could result from an international shock such as a major international conflict or a pandemic, a prolonged economic slowdown or a substantial increase in the oil price. As using alternative technology, such as hydrogen[592], is not yet an option, there is a need for restricting aviation demand. Otherwise, strong reductions must be made in other sectors in order to compensate air transport growth whilst striving for the stabilization of total CO_2 emissions. In this case, air transport will represent a significant share in the individual country's CO_2 budget by 2050. As regards the UK, aviation would absorb 22 % to 67 % of its CO_2 budget (Lee, Lim, & Raper, 2005).

9.2.3.2. Integration of air transport in emissions trading on a worldwide scale

As illustrated by noise nuisance, environmental regulation in aviation has traditionally been focused on command-and-control measures, such as engine standards or restrictions on flight movements. In recent years, the attention has turned to incentive-based measures such as the introduction of emission charges or tradable emission permits.[593]

Like many governments, the air transport industry is currently opposed to emission taxes, but supports emissions trading under certain conditions: For example, emissions trading should be introduced on the basis of mutual consent between participating nations; schemes should be open and permits should be allowed to be traded with other sectors (IATA, 2008; 2009).

As indicated by recent statistics, ICAO did not manage to stabilise international aviation emissions[594], although it had been considered to be the most appropriate authority for dealing with this issue since international aviation legislation is based on the body of law associated with the Chicago Convention and related bilateral air service agreement. Finding and implementing a solution to international aviation emissions is more complicated than for domestic aviation emissions.[595] While domestic aviation emissions have to be included in national emission tools and are intended to be addressed at the national level within the

[592] Grimme (2008) points out that hydrogen would require new aircraft and ground infrastructure and therefore its economic viability would be highly questionable.

[593] See Carlsson and Hammar (2002) on the principal configuration of an emission charge and a tradable emission permit system for international aviation. For a more general review on climate change mitigation policies see Forsyth (2008b).

[594] It was maybe unrealistic to expect ICAO to reach a global consensus on how reducing CO_2 emissions since industrialized countries were lacking in clear leadership and some of them had not even ratified the Kyoto Protocol. However, ICAO has a share in improving the understanding of the contribution of aviation to climate change. It has also supported the concept of international open emissions trading in order to manage CO_2 emissions but considers emissions trading to be implemented on a voluntary basis or through their integration into the existing schemes of states (Commission of the European Communities, 2005).

[595] While domestic aviation emissions are defined as "[e]missions from civil domestic passenger and freight traffic that departs and arrives in the same country", international aviation emissions refer to "[e]missions from flights that depart in one country and arrive in a different country", including take-offs and landings for the relevant flight stages (Maurice, Hockstad, Höhne, Hupe, Lee, & Rypdal, 2006, p. 58).

UNFCC/Kyoto Protocol regime, there is no agreement on how dealing with international aviation emissions for accounting[596] and legal reasons but also policy design issues.

9.2.3.3. The European emissions trading scheme (ETS)

For lack of an agreement on a world scale[597], the EU – accounting for about half of the CO_2 emissions from international aviation reported by developed countries[598] – aims for a European solution, including EU member states, Norway, Iceland and Liechtenstein. It could not only serve as a model for other countries considering regional and national schemes for emission trading. Moreover, the latter could be linked to the European one in the long run.

On 13 January 2009, the Directive 2008/101/EC to include aviation in the EU Emissions Trading Schemes[599] was published in the Official Journal.[600] It shall concern all flights arriving at and departing from EU airports from 2012.[601] As aircraft operators have the most direct control over the type of aircraft in operation and the way in which they are flown, each operator will be allocated an initial set of allowances free of charge on the basis of its share in overall passenger and cargo traffic on the routes to be covered by the EU emissions trading scheme.[602] The number of permits will allow each aircraft operator to emit a specified quantity of CO_2 from his flight (1 ton of CO_2 per allowance). Additional allowances have to be purchased. This requires aircraft operators to prepare a monitoring plan and to monitor and report emissions in accordance with that plan.

[596] The accounting system of the United Nations Framework Convention on Climate Change (UNFCC), according to which emissions are only attributable to a country if they result directly from activities within its territory, justifies the distinction between domestic and international aviation emissions.

[597] Australia and New Zealand consider the integration of aviation into their respective emissions trading system, too. In a first step, international aviation will be excluded but their later inclusion is possible (Forsyth, 2008b). Switzerland introduced its own emissions trading scheme in 2008, which could be linked with the EU emissions trading scheme (see www.bafu.admin.ch/emissionshandel/05538/index.html?lang=en, accessed on 15 December 2009). However, it does not cover aviation emissions and Swiss air transport federation Aerosuisse is opposed to joining the EU emissions trading system.

[598] According to 2002 data of Annex I Parties to the UNFCC, cited by the Commission to the European Communities (2005).

[599] With the purpose of reducing greenhouse gas emissions in a cost-effective and economically efficient manner, a scheme for greenhouse gas emission allowance trading within the EU was already established by Directive 2003/87/EC of 13 October 2003 and came into force on 1 January 2005. However, it refers only to energy-intensive industrial installations. See Scheelhaase and Grimme (2007) on the link between the European ETS and the Kyoto Protocol. The authors underline that aviation would be a likely net buyer of emission permits and therefore its integration into the already existing emissions trading scheme would augment the liquidity in the allowance market. Transaction costs would be reduced since the trading scheme has already been designed.

[600] This directive is based on a communication, adopted on 27 September 2005 by the European Commission, outlining plans to reduce the impact of aviation on climate change (Commission of the European Communities, 2005). It followed a final report on the possibility of including aviation in the ETS (Wit, Boon, van Velzen, Cames, Deuber, & Lee, 2005).

[601] Including foreign carriers in the emissions trading scheme seems to be compatible with international law as according to the Chicago Convention all laws and provisions of a country must be applied on all aircraft regardless of their nationality (Scheelhaase & Grimme, 2007). On the legal feasibility of including aviation in emissions trading see also Wit et al (2005, pp. 169-183).

[602] An exemption is granted to commercial air transport operators operating, for three consecutive four-month periods, fewer than 243 flights per period.

The total quantity of allowances to be issued will be defined at EU level. For 2012, it shall be equivalent to 97 % of the historical aviation emissions[603], decreasing to 95 % from 2013.[604] In 2012 and 2013, respectively 15 % of allowances will be auctioned, the remaining being distributed free of charge. Beyond, the percentage of auctioned allowances may be increased as well as the total number of allowances may be reviewed. As the EU emissions trading systems provides for the open trading of emission permits, aircraft operators may sell theirs and buy additional ones on the already existing market for emission allowances. As there is only one market for emission permits in an open trading scheme, only one price for CO_2 exists. This may be more efficient for reaching an overall target in emission reduction at least cost but it has the disadvantage that aviation may achieve not much reduction[605]: As aviation represents only a portion of all activities covered by emission trading, the price for an emission permit (i.e. each tonne of CO_2) will depend on overall demand and supply and thus will rather reflect abatement costs for future CO_2 emissions of energy intensive industry than of aviation (Deuber, 2008), the latter tending to be significantly higher (Dings, Wit, Leurs, Davidson, & Fransen, 2002).

9.2.3.4. Consequences of the inclusion of aviation into the ETS on airline competition, prices and profitability

An argument often brought forward by opponents of emissions trading is its negative effect on airline profits arguing that passengers could not be charged for permit prices[606] and consequently the latter would not lead to a decrease in demand. This may apply to certain circumstances but the impact of the introduction of emissions trading on airline competition, fares and profits depends on several factors and in particular on the actual or opportunity costs of allowances. When allowances have to be paid, they are reflected in actual expenses for airlines resulting in an increase in costs per passenger or per unit of freight. If this expenditure was not passed on to passengers, airline profits would be affected. When permits are obtained free of charge, they are not accompanied by actual expenditure. However, opportunity costs arise as the airline operator renounces the opportunity to sell these allowances in order to cover own emissions.[607] These costs may be passed through leading to an increase in airline profits. As proposed by Forsyth (2008b), both cases will be considered separately, starting with permits to be paid.

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[603] The decision is not taken but the quantity of allowances for the aviation sector will probably be designed to stabilise emissions of 2005 levels.

[604] According to Directive 2008/101/EC, a certain number of permits shall be reserved for new market entrants as well as for aircraft operators wishing to increase sharply their capacity.

[605] Forsyth (2008b) underlined that a smaller reduction in aviation emissions is no problem as long as the emissions trading scheme is working well and other industries realise larger reductions. If one considers that aviation emissions would be more damaging than other emissions, an additional incentive for reductions in aviation emissions may result from introducing adjustment factors for aviation in the emissions trading system or from establishing supplementary schemes (like emission trading for other gases).

[606] This question refers also to freight. However, there is less empirical data available.

[607] Note that opportunity costs of an allowance correspond to its market price, irrespective of the allocation method (Boon, Davidson, Faber, & van Velzen, 2007).

The impact of purchased permits depends on the period under consideration, on the market structure at the route level and on capacity constraints.

As regards the market structure, there can be distinguished competitive, oligopolistic and monopolistic routes[608]:

- Only some routes are competitive. They are served by a moderately large number of airlines (e.g. some North Atlantic routes or groups of routes, some routes between major hubs in Europe and in Asia). In this case, airlines are price takers having little scope for oligopolistic strategies.
- A large number of routes are oligopolistic as they are served by two to four airlines. In this case, the route is dominated by some airlines having a certain market power and being interdependent. In many cases, market entry and exit are free. This tendency to oligopoly might be explained by fixed costs of operating a route or by the requirements of operating an adequate frequency.
- Many routes are monopolistic as they are served by only airline. These routes are usually thin low density routes, often marginal, not highly profitable. They may face competition from surface transport.

According to Forsyth (2008b), there will not be much reduction in competition on markets (measured by the number of airlines serving them) in the short term. Whether on competitive, oligopolistic or monopolistic markets[609], the profitability of airlines will decrease as the latter will not be able to increase prices as much as it would be necessary in order to cover the full rise in costs.

However, in the long term, some airlines may exit the markets leading thus to a decrease in capacity facilitating airlines to restore profitability. Especially on routes under oligopolistic markets, exits may be significant allowing airlines to make profits again.[610] In the case of monopoly routes, airlines may restore profitability, too, by abandoning some of them.[611] Only in competitive markets, the number of exits may not be sufficient for diminishing the competitive pressure. Nevertheless, in the long term, airlines in competitive markets may pass the full increase in costs on passengers; airlines will neither win nor lose from this measure.[612] There is an adjustment problem in the short term but as regards the possibility for airlines to

[608] Some routes are imperfect substitutes for each other (Forsyth, 2008b).

[609] See Forsyth (2008b) for more details on the firms' behaviour and price setting in competitive, oligopolistic and monopolistic markets.

[610] In oligopoly, firms may pursue different strategies (like Bertrand and Cournot strategies). See Forysth (2008b) for more information.

[611] It is assumed that long run average and long run marginal costs curves are straight and horizontal which implies absence of scale economies. The precise increase in air fares depends on the elasticity of demand and on the form of the marginal cost function. The monopoly will not be able to cover the full permit price leading thus to a loss. If the surcharge is too small and ticket prices do not cover average variable costs, the airline will abandon the route in the short term; if ticket prices do not cover average costs, market exist will happen in the long term (Forsyth, 2008b).

[612] It is assumed that long run average and long run marginal costs curves are straight and horizontal. See Forsyth (2008b) for more details. See also Wit, Boon, van Velzen, Cames, Deuber and Lee (2005).

restore profitability in the long run, Forsyth (2008b) contradicted a study realised on behalf of the air transport industry by Ernst & Young and York Aviation (2007)[613] according to which the purchase of emission permits would lead to a permanent loss in profits as costs could not be passed on to passengers.[614] Boon et al (2007, p. 57) considered this even as "incorrect from a theoretical point of view and improbable given the available empirical evidence".

Airlines may be unable to pass on any permit price on passengers in the case of slot constrained airports[615] (Boon, Davidson, Faber, & van Velzen, 2007; Forsyth, 2008b). Then, a reduction in emissions might not be expected from a decrease in demand but only from the use of less polluting aircraft. However, Forsyth (2008b) pointed out that the situation is different in the case of short-haul flights from a slot constrained airport where airlines are competing with airlines using non constrained airports in a metropolitan area or in the case of airports competing for hub traffic or on routes subjected to capacity constraints due to air service agreements.[616] In the first case, fares from the non constrained airport will rise while those from the slot constrained airport will remain constant in the first time. Then, an increase in demand for flights from the slot constrained airport, resulting from a reduction in the fare premium, will lead to an upward shift of the demand curve. As a consequence, fares will rise and the airline will lose less as a result of the imposition of a permit price than in the case where the demand curve does not shift. In the second case of airports competing for hub traffic the situation is similar. Whereas some airports are slot constrained, others are not or at least not significantly. In a first step, air fares of flights from/to the non capacity constrained airports are expected to rise. As a result, demand for flights to/from the capacity constrained airports will increase allowing airlines using these hubs to advance their fares. Nevertheless, in practice, imperfect substitutability may be accompanied by a lesser increase in price at the slot constrained airport not allowing airlines to cover fully permit costs. If there are no effective competitors for slot constrained airports, airlines will not pass on any cost increase (Forsyth, 2008b). The latter may also apply to the third case of capacity restrictions due to air service agreements. At least in the short term, airlines may be forced to absorb the increase in costs if fares are market determined.

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613 The study has been realised at the request of the air transport industry (AEA, EBAA, ECA, ELFAA, ERA, IACA, also with the financial support of Airbus, Boeing, European Helicopter Association and SAFRAN).

614 Ernst & Young and York Aviation (2007) underline that the airlines' possibility to pass on the increase in costs on passenger will depend on the operator's business model, the exposure to competition and the position in the market but will be in general quite low. Therefore, airlines will be obliged to absorb a large part of the increase in costs.

615 According to OXERA (2003, pp. 11-12), congested airports represent about 25 % of intra-EU demand for air transport. At capacity constrained airports (whether for technical or environmental reasons), the air fare is higher than the marginal costs of production and corresponds to the level which clears demand at given supply, therefore called clearing price (OXERA, 2003). The difference between the marginal costs of production and the clearing price is the scarcity rent (Boon, Davidson, Faber, & van Velzen, 2007). Forsyth (2008b) indicates that passengers have a choice as to which airport they use. For this reason, the slot premium paid for using the capacity constrained airport does not relate to an absolute lack of airport capacity relative to demand but is a result of limited capacity at a preferred airport.

616 A CE Delft study (Boon, Davidson, Faber, & van Velzen, 2007) underlined that theoretically at congested airports additional expenses for emission permits will not be passed through whereas empirical data points into the direction that passengers are fully charged for them.

In practice, as underlined by Forsyth (2008b), airlines will probably differentiate price surcharges on slot constrained routes with a higher price premium for long-haul flights than for short-haul flights. In Europe, legacy network carriers like British Airways or Lufthansa operate largely at slot constrained airports while low-cost carriers tend to use less constrained airports, both competing for short-haul intra-European flights. If the airline market is competitive, the low-cost carriers will pass the total increase in air fares on to their passengers. When airlines using slot constrained airports apply price surcharges on long- and short-haul flights, the slot prices will fall. As regards short-haul flights, the decrease in slot prices will even outbalance the increase due to the surcharge. The costs for short-haul flights operated by legacy network carriers from capacity constrained airports will fall; a reduction which will be passed on in a competitive market. Forsyth (2008b) concludes that legacy carriers will be worse off due to a decline in slot values. Whereas their prices for short-haul flights will decrease, fares of their low-cost competitors will rise.[617]

Permits free of charge

If permits are allocated free of charge to airlines, the impacts on competition, prices and profits could be almost the same as in the case of purchased permits if airlines are profit maximising. As emission rights will be valuable and can be bought and sold, they will be considered as production factor and its market price will be taken into account.

As fares will rise in competitive and oligopolistic markets in the long run but permits had been allocated for free, the airlines will enjoy profits to this extent. In the monopoly market, airlines will not be able to increase fares as much as it would correspond to the value of the permits. Taking into account the value of the emission right, the airline will take a price/quantity choice that it had not made before and consequently it will realise a lower profit than before.

However, it has to be ensured that the allocation mechanism does not affect the airlines' behaviour.[618] In oligopoly and under competition, the allocation method may create incentives for airlines to stay in the market. When emission permits are granted on a year by year basis, airlines would lose the rent from these allowances when leaving the market. This explains why more airlines than is efficient might be incited to remain in the market, strengthening competition and thus leading to lower fares.[619] This means that airlines would be obliged to

[617] See Forsyth (2008b) for more details on the effects of differentiated price surcharges.

[618] Basically, two methods for allocating free emission rights exist: In the case of grandfathering the allocation is based on historical emissions; in the case of benchmarking on performance indicators, the latter allowing e.g. to reward early investment in fuel efficient aircraft. Besides, one off benchmarking where perpetual emission rights are allocated once at the beginning of the first period for all following trading periods can be distinguished from updated or repeated benchmarking where the allocation for one year is based on the performance indicator of the preceding year. If in the latter case, as specific year is used as benchmark for allocating emission rights for e.g. the upcoming five years, the operators may be incited to lower their prices during this benchmark year in order to get more free allowances for the next period thus creating a perverse effect, also called "opportunity benefit" from producing additional output (Boon, Davidson, Faber, & van Velzen, 2007).

[619] This effect is also called lock in effect and may be used for preventing export industries moving offshore when an emission trading system is introduced (Forsyth, 2008b).

share the benefits from free allowances with their passenger. If actual outputs are the basis for the future allocation of free permits, a higher production will entitle the airline to more free permits. Taking into account the value of these additional permits affects the effective cost function. If a market is competitive, the airlines will fix prices for flight tickets below the sum of long-run marginal costs and permit price, thus sharing some of the benefits from free emission rights with passengers. If the market is oligopolistic, it would be more attractive for the marginal firm to remain in the market since marginal and average costs are lower. The increased competition leads to lower fares and profits.[620]

Maybe airlines are not profit maximising (or only to a certain extent). In this case, they will not attach a great value to the emission permits and thus will not take into consideration their opportunity costs. In this case, airlines might aim at just covering the average costs of their flights, without profiting from free permits but considering the expenses for permits that have to be purchased as the granted allowances may be insufficient. If the market is competitive and airports are not slot constrained, an airline that sets prices at average costs would produce as long as average costs would be covered[621] (a sales maximising strategy), even if this may imply to buy additional allowances leading to an increase in average costs. Therefore, the output will be smaller and the corresponding price higher than in the absence of emission permits. However, the output will be still inefficient as it will be greater and the corresponding price lower than in the case of profit maximisation and therefore it will not cover marginal social costs[622] (Forsyth, 2008b).

If the benefits from free emission permits are shared with the passengers, they will not lead to an efficient outcome and it would be preferable to sell emission rights or to apply a carbon tax both being automatically passed on to passengers. According to Forsyth (2008b) the airlines' handling of resources which are at their disposal for free or at least below market price may give an idea of the extent to which airlines pursue profit maximising or average cost pricing strategies. This concerns airport slots and fuel: Currently, many airlines have been granted slots through grandfathering and certain airlines buy fuel below market prices thanks to hedging contracts (even though airlines have to pay for). If airlines were profit maximising, one would expect that their decisions and prices would reflect market prices.

An exact answer would require a more detailed analysis, but from some observations Forsyth (2008b) noted that slot trading at Heathrow airport provides an indication of the possibility that airlines do not fully consider the opportunity costs of their slots when deciding to operate or not a flight and that maybe a number of slots at capacity constrained airports do not cover their slot costs. However, the profits earned on slot constrained routes may also be used to cross subsidise loss-generating routes. As regards fuel prices, just like in the case of permit prices or carbon taxes, many airlines may have difficulties to pass on increases to their passengers in the short term. Therefore, airlines without hedging may be unprofitable. On the

[620] See Forsyth (2008b) on the case where incumbents get free permits while new entrants have to pay for.

[621] This strategy aims at maximising sales. See Forsyth (2008b, p. 28 fig.5).

[622] The profit maximising output will be the one that can be covered by emission allowances as producing additional outcome would require purchasing additional permits leading to an increase in average costs while the clearing price would decrease.

other hand, airlines with low hedged prices should realise profits if they manage to raise fares so that passengers pay more than the amount they pay for fuel thanks to hedging even though fares do not take into account the market price of fuel.

In summary, if emission permits are for free, it is likely that their full value will not be passed on to passengers. If airlines maximize their profit, the allocation of free emission rights may incite more airlines than is efficient to stay in the market thus leading to a decrease in ticket prices. If airlines do not maximize profits but sales in order to increase their market share, they are likely to pass some of the value of their free permits to passengers by keeping fares lower. Free emission rights will bring airlines to consider the marginal costs of their emissions, and thereby incite them to reduce emissions (including e.g. technical and operational measures), but it will not bring passengers to consider the marginal costs of their travel. For this reason, the mechanism of emission rights will be less effective and efficient (Forsyth, 2008b). As a result free permits will produce either windfall profits[623] and a demand effect or no windfall profits and no demand effect.[624] However, in the case of updated benchmarking, the opportunity costs of emission rights are covered by the opportunity benefits from producing additional output in order to get more free allowances for the next period (Boon, Davidson, Faber, & van Velzen, 2007, p. 60).[625]

Some estimation of the cost of emission allowances

Several different studies tried to number the impact of emission permits on ticket prices. Nevertheless, the impact of the introduction of emission permits is heavily depending on the exact design of the emissions trading system. According to Scheelhaase and Grimme (2007)[626], the financial impact on airlines would be rather moderate as even under unfavourable conditions, the cost increase for Lufthansa would represent less than 1 % of their traffic revenues from flights subject to the ETS (a maximum of 101 million EUR additional costs for Lufthansa in 2012 even under the most unfavourable combination of parameters – a moderate amount in comparison with the increase in fuel prices +800 million EUR in 2005 over 2004). For Ryanair the cost increase would represent up to 3 % of traffic revenues.

[623] “Windfall profits… occur if a firm obtains an asset for free of which the opportunity costs can be passed through” (Boon, Davidson, Faber, & van Velzen, 2007, p. 60).

[624] Only in the case of auctioning windfall profits could be avoided while still inducing demand effect (Boon, Davidson, Faber, & van Velzen, 2007). However, the airline industry is strongly opposed to auctioning.

[625] Boon et al (2007, p. 60) rejected the argument produced by Ernst & Young and York Aviation (2007) according to which windfall profits would not occur in liberalised markets with a high price elasticity of demand as “incorrect”. Moreover, the question is if the demand for air transport may be considered as highly price sensitive as do Ernst & Young and York Aviation (2007). After all, air transport is a derived demand.

[626] Scheelhaase and Grimme (2007) analysed three different scenarios: while the first one is relatively favourable to airlines (with a quite generous initial allocation of permits, low allowance prices, low price elasticities of demand, low rate of emissions growth, only intra-EU flights), a third one is relatively unfavourable to airlines (with a narrow initial allocation and more expensive permit prices, higher price elasticities of demand and accelerated emission growth, all flights from/to EU airports). In both cases, allocation is based on historical emissions (grandfathering). The second scenario is an in-between one but the allocation of permits is based on a benchmark. Moreover, four types of airlines are distinguished: full service network carrier, low-cost airline, holiday airline and regional airline. For more details see the article.

9.2.3.5. *Consequences of emission trading for airports*

Climate change represents also a challenge for airports. Action taken in order to stop the increase or even to reduce CO_2 emissions of the aviation sector will influence the airports' positioning as the primarily concerned airlines will have to adapt to a new regulatory framework and will be obliged to change their behaviour. Nevertheless, as CO_2 emissions are a global problem and thus measures have to be taken on a world scale, or at least at EU level, and not at local[627] one such as in the case of noise pollution, airports may not risk major competitive disadvantages.

Insofar as they operate routes from and to EU airports, all carriers will be subjected to the introduction of emission rights. Nevertheless, non-EU carriers will be less affected as only a relatively small proportion of their flights will be concerned. Moreover, EU airlines, dominating transfers at EU hubs, may see their competitive position[628] affected due to hub location that may benefit non-EU carriers, which dominate transfers at non-EU airports.

The potential distortion of competition between airports due to their location results from the so-called border effect (Wit, Boon, van Velzen, Cames, Deuber, & Lee, 2005). It relates not only to transfer passengers who may change the hub for the benefit of a non-EU airport, but also to origin/destination passengers and freight that may prefer an airport of departure or arrival being just located outside the geographical scope of the emission trading system.[629]

Border effect: Hub location and stopover airports

Referring to flights between EU airports and airports outside the EU, passengers travelling between major city-pairs often have the choice between direct flights and routings via a hub whereas other passengers may need to transfer at a hub anyway for lack of direct flights. Irrespective of the airline, direct flights will be subjected to emission rights. In the case of routings via hubs, both flights will be concerned if the hub airport is located inside the EU but only one flight if the hub is located outside the EU. If the carrier passes permit costs on to

[627] Airport emissions charges may contribute to reducing local emissions. However, there is no close relation between airport emissions and total emissions during the flight.

[628] As regards the consequence of this difference in the impact of emission allowances, the opinions differ. Some studies, such as one realised by CE Delft (Wit, Boon, van Velzen, Cames, Deuber, & Lee, 2005), do not expect a significant distortion of competition even though non-EU carriers might deploy their newest and cleanest aircraft on these routes subjected to EU regulation, using older aircraft for other routes, whereas EU carriers, which will be concerned to a larger extent, would need to buy new aircraft for these routes or to use up the corresponding volume of emission rights thus giving a competitive edge to non-EU airlines. On the contrary, some studies point out the risk of cross-subsidisation of routes from/to the EU by non-EU carriers in order to gain market share from EU carriers. The risk of additional cross-subsidisation depends on the airlines' capacity to generate additional profits on other routes. However, these opportunities are limited as it would require an increase in fares on routes that are not concerned by emission rights leading probably to a decrease in demand and in particular to a shift of demand to other carriers. Even if these routes would be monopolistic markets, this risk seems to be quite low as the overall demand would decline (Lowe, Faber, Mason, Veldhuis, Leishout, & Nelissen, 2007).

[629] Aviation emissions result from the combustion of jet fuel (mainly kerosene) which depends not only on the flight distance but also on the type of aircraft and engines operated, the time spent at each stage of flight as well as, to a lesser extent, on the altitude flown (Maurice, Hockstad, Höhne, Hupe, Lee, & Rypdal, 2006).

passengers on the basis of fuel consumption and thus on flight distance, the fare increase will be lower for a direct flight than for an indirect flight via an EU hub. Moreover, routing via a non-EU hub may reduce the distance of the flight being subjected to emission rights compared to a direct flight. Also for transfer passengers, routing via a non-EU hub may be more advantageous than routing via an EU-hub.

The effects of emission rights on direct flights and indirect flights via non-EU hubs, in the case where their costs are passed on to passengers, were analysed by CE Delft (Lowe, Faber, Mason, Veldhuis, Leishout, & Nelissen, 2007). Due to higher air fares, there will be a general decrease in the number of passengers. On direct flights, EU and non-EU carriers will be affected equally by a decline in traffic volumes even though some passengers now using indirect flights may switch to direct flights. At EU hubs, in addition to a less than proportional reduction in the number of passengers on direct flights, transfers are likely to decrease even more than proportionally. Transfers at non-EU hubs will also be affected by a downturn but less than proportionally. At certain airports, the number of transfer passengers may even increase – provided that the gain from reducing flight distance on routes subjected to emission rights will more than compensate for additional travel time and inconvenience of a transfer. The example of flights from Amsterdam to six major airports in North America and six in the Asia/Pacific region were used to quantify these effects (Lowe, Faber, Mason, Veldhuis, Leishout, & Nelissen, 2007). Calculations were based on an allowance price of 30 EUR/tonne of CO_2 and the full shifting of the cost increase. Results indicate that North American carriers' transfer traffic decreases less than the EU carriers' one since routings via the hubs at the US East coast allow to reduce significantly flight distances concerned by emission rights so that for certain journeys longer travel times and inconvenience due to the transfer could be compensated. The situation is different on routes from/to the Asia/Pacific region as both EU and non-EU carriers are affected almost the same way by a decline in traffics. This may be explained by the location of non-EU hubs which are mostly so far from the EU that non-EU carriers could not gain the same advantage as North American carriers from the US East Coast hubs.

Theoretically, non-EU airports might become popular hub or at least stop-over airports. For the relocation of a hub is little scope. This would mean for the airline to renounce the sunk costs from the setting up of the existing hub and require additional significant location-specific investment. The airline would need to acquire a large volume of traffic rights and slots at the non-EU airport, in particular during the most requested times of the day (morning and evening). This might be difficult due to shortage in airport capacities. Moreover, airlines may be deterred by political resistance and potential disturbances in airline operations. Besides, not all airports can serve as hub; the potential of an airport depends also on the catchment area. Even additional stopovers at a non-EU airport, especially on long-haul flights, are relatively improbable as the cost increase due to emission rights is likely to be not significant. (Lowe, Faber, Mason, Veldhuis, Leishout, & Nelissen, 2007) Albers, Bühne and Peters (2009) argued that even if EU carriers will have to face a cost disadvantage on certain routes due to emission rights, this disadvantage alone will not be significant enough to instigate major route network reconfigurations.[630] Airlines might consider the reduction of distance on flights into and out of the EU by adding additional stops on long-haul flights. Nevertheless, additional stops involve additional charges for airlines (such as airport charges) and inconvenience for passengers due to longer journey times which reduces the attractiveness.[631]

Even if the cost increase would be much higher, this is not very likely as additional stop over flights would not only require traffic rights and slots but are often part of an extensive hub and spoke system with a relatively large number of origin/destination passengers who start or terminate their journey at the airport (Lowe, Faber, Mason, Veldhuis, Leishout, & Nelissen, 2007). Therefore, additional stops might be interesting only on only on selected high-density routes in which the additional stop generates additional revenues by local point-to-point traffic (Albers, Bühne, & Peters, 2009). For this reason, airlines are expected to be rather reticent about changing their stopover to non-EU airports.

Zurich airport could benefit from the introduction of emissions rights as it is not subjected to this measure in contrast to nearby located airports, such as Munich. Switzerland introduced its own emissions trading scheme which however is not yet linked to the EU and does not cover aviation. This may be advantageous for Swiss International Airlines and thus for Lufthansa which took over the former in 2005 and fully integrated in its financial reports from July 2007. Swiss/Lufthansa already operates a hub at Zurich airport. However, it is questionable if shifting bigger traffic volumes to Zurich airport would be feasible (as additional traffic rights and slots had to be acquired) and financially interesting, in particular as there may be an incentive for Switzerland to join the EU-ETS (Haites, 2008). Another airport that could benefit from the introduction of emission permits might be Istanbul airport as Turkish airlines already operates a hub and spoke network from there serving a large number of European destinations. Dubai International airport benefits from its central location with respect to major east-west traffics and the emergence of Emirates as probably the most energetic and aggressive competitor[632] for European and Asian airlines. As regards emission costs, a

[630] Assuming an emission allowances price of 20 EUR/ton of CO_2, Albers, Bühne and Peters (2009) examined cost increases per passengers for a single ticket on different flight routes of the segments North America-Europe (New York – Cologne: +9.27 EUR on a direct flight, +1.74 EUR via Zurich, and +16.08 EUR via Frankfurt, New York – Düsseldorf: +13.84 EUR on a direct flight, +3.18 EUR via Zurich, +12.33 EUR via Frankfurt), Asia-Pacific-Europe (Singapore – Frankfurt, +19.77 EUR directly, +1.48 EUR via Zurich, +4.69 EUR via Istanbul, and +13.04 EUR via Dubai) and North America-Asia-Pacific (New York – New Delhi: +26.79 EUR via Frankfurt, 0 EUR on a direct flight, via Zurich and via Istanbul). Figures take into account typical flight cycle patterns and detours, the aircraft's fuel consumption combined with the specific CO_2 emission factor, flight altitude but neither different aircraft configurations for one route nor airport charges (Albers, Bühne, & Peters, 2009). However, be careful when comparing the figures as they refer to one specific aircraft configuration per flight and therefore differences in fuel consumption but also in the capacity exist, e.g. the additional costs for the direct Singapore – Frankfurt flight relate to 300 passengers, while on the Singapore - Zurich - Frankfurt the average number of passengers is only 98 passengers!

[631] As regards the Singapore – Frankfurt flight, an additional stopover at Zurich airport would lead to a decrease in ETS-related costs of 5800 EUR (i.e. 18 EUR per passenger) but imply additional airport charges at Zurich of about 2800 EUR resulting in a net difference in costs of only 3700 EUR. (Note that the calculated costs for the direct flight refer to a B777-300 aircraft with 300 passengers aboard while the Singapore - Zurich - Frankfurt route is operated by B777-300 and B737-300 aircraft with 98 passengers aboard.)

[632] According to Delfmann et al (2005). Sull, Ghoshal and Monteiro (2005) identified some factors explaining Emirates' success, including its flexible family organisation, a fluid decision making process, codeshare

stopover at Dubai airport does not allow to generate a significant advantage in comparison with direct flights as it is too far from the EU (Albers, Bühne, & Peters, 2009).

Border effect: Point-to-point traffic

As the influence of emission rights is likely to be quite small, the border effect is expected to be "virtually inexistent" for origin/destination traffic since passengers probably would need to join a more distant airport by surface transport (Wit, Boon, van Velzen, Cames, Deuber, & Lee, 2005). If the distance to the non-EU airport would be less important and therefore switching over to the airport would be considered by potential passengers, there still might be other obstacles hindering them to use this airport, including its transport offer or inconvenience due to leaving the EU.

However, this may not apply to Zurich airport which has an attractive transport offer and is well integrated into the Star Alliance's network as Swiss International Airlines has been taken over by Lufthansa. Moreover, Switzerland has already close relations with the EU[633] and its catchment area extends over a large area including the south of Germany. Zurich airport could become an attractive alternative for extra-EU flights.

Some concluding remarks

Even though significant network reconfigurations may not be expected, CO_2 abatement policies involving an increase in fuel costs (such as emission allowances) are likely to lead to the same response from airlines as any other cause of higher fuel prices. Additional costs may incite airlines to review their networks in order to save fuel allowing them to reduce emissions. If permitted by air traffic control authorities, airlines may modify flight paths. Moreover, airlines may optimise their network, e.g. by offering more direct flights which reduce the distance travelled by passengers and by consolidating loads (Forsyth, 2008b, p. 13). Fuel savings may also be possible by a reduction in ground delays. In order to reduce congestion, airports may contribute to a more efficient use of airport capacity, e.g. through pricing or slot management (Forsyth, 2008b).

Finally, the discussion on sustainable development that is associated to climate change calls also into question the role in our society of air transport in general and of airports in particular. Notice may be attracted to a more general shift in consumer patterns with e.g. the focus on closer destinations and to the possibilities of substituting train journeys for short-haul flights. In this respect and with regard to the projected liberalisation of railway traffic within the EU, airports may play an important role. They already have acquired a specific knowledge of the control and management of passenger and baggage flows within the airport. This may be very valuable for extending the infrastructure facility in order to handle also railway traffic and especially for interconnecting both. However, this requires airport

agreements with all major airlines (nut no alliance), its commitment to Dubai International airport, which Emirates is going to turn into the heart of a global hub-and-spoke system.

[633] Switzerland joined the Schengen area in December 2008 allowing passport free travel.

managers to conceive airports as infrastructure nodes in a multimodal transport network beyond their role in the air transport network. This might also be an alternative for generating future growth. Actually, restrictions on airport development are sometimes considered as restrictions to emissions, despite the weak relation between airports and emissions rendering this means particularly inefficient. The leakage effect is likely to be substantial as passengers will travel by car to more distant airports.

9.3. Management of scarce capacity

The development of the airport activity may be restricted due to capacity constraints which may arise from technical restrictions to the airport activity, e.g. due to runway or terminal capacity, but also from political or environmental reasons, such as night curfews or an upper limit for the number of aircraft movements. The airport's capacity to deal with these difficulties may have a large impact on its future development.

To start with chapter 9.3.1 is intended to give a short review of the situation at European airports. The extension of capacity is relatively difficult as it encounters much resistance. Moreover, the time frame for completing such an expansion of airport facilities is long. For this reason, chapter 9.3.2 and focus on instruments which might allow an optimal use of existing capacity and their consequences on airlines.

9.3.1. Capacity constraints and congestion at EU airports

The term "capacity" refers to the ability of a component in the airport system to handle aircraft and is usually measured by the number of operations per hour. It represents the maximum number of operations that can be handled in a 1 hour period under specific operating condition, such as ceiling and visibility, air traffic control, aircraft mix and the nature of operations (departure or arrival). Usually, the runway capacity is the controlling element of the airport's system capacity (Reynolds-Feighan & Button, 1999).[634] The maximum number of operations determines the number of slots that are available to airlines, slots being the scheduled times of arrival or departure available or allocated to an aircraft movement on a specific date at an airport (NERA, 2004).

9.3.1.1. Excess demand for slots at a number of airports

A large number of airports are concerned by an unsatisfied demand of slots, some of them all day long, others mainly during peak hours. A study published by ACI Europe (2004) revealed the already in 2002 sometimes large differences between the total number of slots initially requested by airlines at the IATA Scheduling Conference and the total number of slots initially allocated. IATA Scheduling Conferences are held twice a year in June and in

[634] See Reynolds-Feighan and Button (1999, p. 116-117) on the determinants of runway capacity.

November for the allocation of slots at fully coordinated airports.[635] Schedule changes may be complicated since a change at one airport will have an impact on one or more other airports.

NERA (2004, p. 24ff) analysed the demand for slots at 32 EU category 1 airports. Among them could be identified seven airports where **excess demand is severe** since it concerns not only peak but also off peak hours: Frankfurt, London Heathrow and Gatwick as well as Madrid airports which are characterised by physical capacity constraints related to the runway capacity; at Dusseldorf, Orly and Milan Linate airports declared capacity is below physical capacity but Dusseldorf and Paris Orly[636] airport see their capacity restricted for environmental reasons whereas at Milan Linate capacity is limited due to air traffic distribution rules between Milan Linate and Milan Malpensa airport. In addition, 14 airports are confronted to an **excess demand for slots during peak hours**: Malaga, Amsterdam, Brussels, Paris CDG, Copenhagen, Dublin, Rome Fiumicino, Lisbon, Munich, Milan Malpensa, Palma de Mallorca, London Stansted, Berlin Tegel and Vienna. In contrast, the following airports have only **little or even no excess demand**: Stockholm Arlanda, Thessaloniki, Athens, Bergamo, Rome Ciampino, Faro, Gran Canaria, Berlin Schonefeld and Tempelhof and London Luton. Whereas at unconstrained airports, the demand for slots is true demand since airlines can be sure to get the slots they ask for, at constrained airports the number of slots requested may be higher than the slots required for strategic reasons.

At the same time, there exist of course a large number of secondary airports which have significant spare runway capacity. For them, the liberalisation of air transport brought the opportunity to develop business, in particular with the new market entrants, rather than remain underutilised.

9.3.1.2. Delays

Delays are another aspect related to airport capacity.[637] However, several reasons may explain delays, including internal airline problems or schedule discrepancies, passengers and baggage, cargo and mail, aircraft and ramp handling, technical and aircraft equipment, damage to aircraft, flight operations and crewing, weather and air traffic control. In 1997, among the airports with the most delays on departure figure Athens, Madrid, Palma de Mallorca, Nice, Dusseldorf and Geneva airports with more than 25 % of all flights delayed for all of them with an average delay exceeding 4.9 minutes. However, certain airports register a large number of flights departing with at least 60 minutes delay, such as Athens (2333 flights) and Madrid (1500 flights). In the whole ECAC area, more than 15 % of flights were delayed with an average of 2.9 minutes. With respect to arrivals, the airports with the most delays are Athens, Milan Linate, Barcelona, Madrid, London Heathrow and Paris CDG and Orly airports, all having more than 25 % of flights delayed. As regards, Milan Linate, Barcelona,

[635] See NERA (2004, p. 17ff) for more details on the current scheduling process.

[636] The extent of excess demand has been illustrated by the bankruptcy of Air Lib due to which 35 658 slots were reallocated: About 251 000 slots were requested by 43 airlines. However, it can be assumed that airlines asked more slots than required in order to increase their chances to be served (NERA, 2004, pp. 24, 27).

[637] Delays at European airports were analysed e.g. by Reynolds-Feighan and Button (1999)

Madrid and London Heathrow, a significant proportion of delays is due to air traffic flow management. Delays are a delicate issue to hub airports where traffic is organised in waves and transfer possibilities are based on the minimum connecting time. Low-cost airlines which demand particularly fast turnaround times are also very sensitive to delays.

9.3.2. Slot allocation mechanisms

The continuous growth in air transport during the last decade has increased pressure on the capacity available at airports for aircraft movements. Airport slots turned out to be one of the major factors influencing competition between airlines. Inefficiencies may also result from restrictive air service agreements. However, the single European aviation market and more liberal air service agreements concluded with a number of countries imply that now the slot availability has the greatest potential for causing inefficiencies and not the traffic right. [638]

9.3.2.1. Current slot allocation in the EU

For this reason, Council Regulation (EEC) 95/93 established for the first time a common rule for the allocation of slots at Community airports. In short, it defined the airports concerned by the regulation on slot allocation as well as the process of slot allocation. In the European Union, slots at airports are generally granted to airlines that have used them historically. Thus, the basic principle of slot allocation is the following: An airline is entitled to keep a slot for the next scheduling period (grandfather's rights) unless it did not use it at least 80 % of the time for which the slot had been allocated in that, a rule known as use-it-or-lose-it rule. In order to enable new airlines to gain entry to the liberalised market, the allocation of slots had to be based on the rule that a maximum of 50 % of newly created or unused slots (including also slots given up by an airline or which otherwise become free) had to be reserved for newcomers on the markets.[639]

On 21 April 2004, the new Regulation (EC) 793/2004 amending Regulation 95/93 was adopted. The new regulation focuses on a number of technical issues that needed to be addressed before structural changes can be made to the current system of allocation. The changes primarily help to make the slot system more flexible in terms of both allocation and use and they strengthen the coordinator's role and the monitoring of compliance.

The current slot allocation system leads to inefficiencies. It impedes competition and the trading of slots which would allow airlines that obtain the greatest value from a slot to use it. It is likely that the absence of a market in airport slots leads to increased congestion[640] at a number of airports and may provide false signals to expand them.

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[638] This chapter heavily relies on NERA (2004).

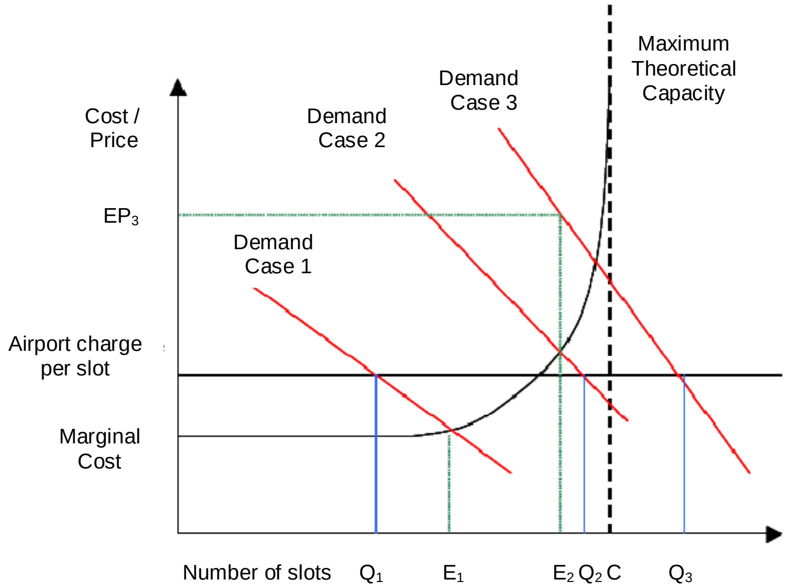
[639] See e.g. NERA (2004, p. 5ff) and Bourqui (2006, p. 237ff) on regulation 95/93. The latter also discusses the new regulation 793/2004 on slot allocation.

[640] This means not that congestion would be entirely eliminated by market mechanisms, rather excessive congestion would be reduced to an optimal level.

9.3.2.2. *Inefficiencies of the current slot allocation scheme*

The current slot allocation mechanism produces inefficiencies which are mainly due to the fact that charges to airlines (i.e. airport charges and taxes) do not reflect the marginal social cost of the service using the airport. The marginal social costs corresponds to the marginal operating cost of the airport owner and the costs that arise from congestion and delays to passengers and airlines. The latter tend to increase as the airport operates close to its physical capacity (NERA, 2004, p. 49ff). In practice charges are not fixed according to marginal social costs which results in three inefficiencies as illustrated by figure 67.

Figure 67: Excess demand when prices are below market-clearing levels



Source: NERA (2004, p. 50)

In the first case, the **price exceeds the marginal cost**. For this reason the number of used slots Q_1 is below the efficient number of slots E_1. This situation is inefficient because some flights might not accept to pay the airport charge for a slot but a price that would correspond to the marginal cost that they impose on the airport. This is often the case at airports with excess capacity: Airport charges tend to exceed the marginal cost since the additional cost for an extra aircraft landing is low.

In the second case, **airport charges are lower than the marginal cost but all demand for slots is satisfied**. Thus, the number of slots used Q_2 exceeds the efficient level E_2. This situation is less common at airports; it may arrive at airports without slot coordination but which are occasionally concerned with congestion.

The third case refers to the situation where **demand for slots Q_3 exceeds the declared capacity (E_2)**. This is the case at many major, slot-coordinated airports in Europe, at least during peak times. The optimal price is EP_3 as at this price demand for slots corresponds to the declared capacity.

In the current system, administrative procedures are used for managing excess demand: grandfather rights and rules related to the allocation of pool slots. Administrative procedures may be efficient but rather tend to be inefficient since they do not take into account the airlines willingness to pay for a slot, the latter reflecting the marginal utility of a slot and thus the benefit that an airlines can derive from an additional flight. Consequently, some slots may be allocated to airlines that would not be willing to pay the optimal price EP_3 whereas other airlines that would be willing to pay EP_3 or even more will not get slots.

In the current system where slots are allocated according to grandfather's rights and there is only limited scope to sell slots even though other airlines may value them more highly: Airlines at congested airports are incited to continue to use slots which had been granted to them if they can make a marginal profit on the service instead of returning them. NERA (2004) underlined that a lack in slot mobility leads at congested airports in difficulties to obtain series of slots which would be necessary for launching or expanding a new service. Pool slots tend only to be available at unattractive times or are not available as series. This barrier to competition affects not only new entrants and competitors to incumbent airlines but may also prevent incumbent airlines from improving their networks of series. For example, at Frankfurt airport, the banks operated by Lufthansa are broader and less pronounced relative to maximum capacity (80 movements per hour) than the banks operated by Austrian Airlines at Vienna airport[641] where excess demand concern only peak hours and is due to the hub activity of Austrian Airlines. Actually, none of the airports where there is little or no excess demand are used as hub of major network carriers which suggests that excess demand at peak times is due to hub airlines. As regards Lufthansa, a market mechanism for slot allocation could allow the airline to increase its peak slot holdings and thus improve service by reduced transfer times.

In consequence of the current framework for slot allocation, incumbent airlines are reluctant to renounce slot that they had been granted once and this even if they make a financial loss in some services, in the expectation that they can use the slot profitably again later. In the meantime, the operated services are inefficient and some flights may even be cancelled. Thus, scarce capacity is wasted.

Another inefficiency results from the current framework on slot allocation: Airlines that had been granted slots and that may want to return them to the pool have little incentive for giving them back on time thus limiting the possibility to reallocate them. For this reason, a number of slots remain unused due to late hand back.

Finally, the current slot allocation system also impedes competition: The lack of entry possibilities reduces the competitive threats faced by incumbent airlines and thus weakens the incentive to reduce costs; reduced competition at slot constrained airports also has an impact on air fares which tend to be higher on certain routes.[642]

[641] See NERA (2004, p. 37ff) for graphics indicating the operating pattern at Austrian Airlines at Vienna airport and Lufthansa at Frankfurt airport but also of British Airways at London Heathrow airport.

[642] The entry into a market with high air fares may lead to lower fares. At the same time, competition could decrease in other markets and thus lead to an increase in air fares since airport capacity is restricted (NERA, 2004, p. 52).

Despite the shortcomings from the current framework, NERA (2004, p. 53) recognised that certain factors may limit inefficiencies: In order to increase profitability and thus efficiency, individual carriers can adjust the services allocated to particular slot just as slots may be exchanged within airline alliances. Finally, secondary trading as it already occurs at London Heathrow and, to a limited extent, at certain airports but also slot lease agreements also allow to increase efficiency.

9.3.2.3. Alternative slot allocation mechanism

Only some basic ideas on alternative slot allocation shall be presented in this chapter since they are all based on abundant economic literature on mechanisms for achieving efficiency in the allocation of resources. Therefore one objective of the study published by NERA (2004) consisted in developing market oriented slot allocation mechanisms in consideration of the special features of the airline industry. In particular, competition issues had to be dealt with in an appropriate and it had to be recognised that airlines have made investments (in particular in hub and spoke networks) on the assumption that they have established property rights to airport slots.[643]

For such a market in airport slots to operate, property rights over slots and a framework within which the market could work need to be properly established. Primary and secondary trading mechanisms have the potential to address inefficiencies. Primary trading (such as auctions or higher posted prices) may be used to determine an initial allocation of slots among airlines which have to pay for slots. Then, secondary trading (such as bilateral negotiations between sellers and buyers), which is used once an initial allocation of slots has been determined, gives airlines the possibility to sell or lease slots to other airlines as well as to buy slots. This means that also slot holders who do not have to pay for their slots, face an opportunity cost in the form of revenues they could miss if they keep a slot that could be sold to another airlines. According to economic literature, different instruments can be used to create a market in airport slots. Theoretically, they all assure efficiency and would achieve the same result if they were applied perfectly. However, practical problems may explain why one instrument may work better than another. In addition, there are in general differences in the costs related to the implementation of the different mechanisms.

The NERA (2004) study considered the impacts of different market mechanisms and of their combinations, which were described and analysed in detail: secondary slot trading through bilateral negotiations between potential buyers and sellers; higher posted prices; higher posted prices and secondary slot trading; the auction of pool slots and secondary trading and the auction of 10 % of slots and secondary trading.

Implementation costs are considered to be very low for secondary trading, low for higher posted prices but very high for auctions of 10 % of slots and secondary trading whereas they are moderate for the two remaining mechanisms.

[643] On the basis of this study, the EU organised a consultation with the industry in late 2004 after which a second study has started in January 2006. The latter is focusing on a number of more clearly defined market mechanisms. This second study will probably provide the basis for changes in the regulation on slot allocation.

9.3.2.4. *The potential impact of market mechanisms for slot allocation*

The trading of slots would bring significant economic welfare benefits to consumers and, possibly, to those who are affected by airport congestion and expansion. The main impact of the introduction of market mechanisms for slot allocation will be a more efficient use of scarce capacity. According to NERA (2004)[644], this could lead to higher passenger volumes which would use existing airport facilities due to:

- a shift in the mix of services using congested airports, in particular an increase in the proportion of long-haul services, which generally use larger aircraft, carrying a higher number of passengers and often at higher load factors in comparison with short haul services.
- a general shift to services with higher load factors within each category of service,
- a shift to services to off-peak hours or to uncongested airports where possible for airlines
- an improvement in slot utilisation, as the increased fixed costs (including opportunity costs) of holding slots will encourage a more intensive used of slots by reducing the late slot returns and cancellations.

Nevertheless, it is unlikely that any specific market mechanism will lead to all of this increase. Service levels on certain routes will decrease whereas other routes may gain from an increase in service levels and also from stronger and more effective competition. The authors of the NERA study considered that the cases where service levels are increased will more than offset those where services are reduced, thus consumers will benefit from increased volume of flights and from higher service levels. This increase in services, together with stronger competition on some routes, is likely to put downward pressure on fares. The authors of the NERA study expect that the decrease on fares on average will not be offset by the effect of higher slot costs as they are mainly fixed costs and will not therefore have an impact on the long run profit maximising fare structure for airlines.

All the options (but in particular auctions of existing slots) would be likely to lead to an increased concentration of slot holdings by hub carriers at their main airports. More generally, the impact on the degree of competition is likely to be positive thanks to the removal of important entry barriers for low-cost airlines and competing long-haul services which will contribute to stronger competition on key routes. Nevertheless, negative effect on the environment could increase since the overall volume of flights, especially long-haul flights to and from EU airports will increase as well as the aircraft size. However, this effect may be offset by delaying the need for new airport capacity, changes in the traffic mix and an increase in load factors leading to lower environmental cost per passenger km. In addition, a negative impact on the accessibility of regional airports is also possible.

[644] See NERA (2004, pp. 82-211) for more details on the impact of different market mechanisms for slot allocation and their combinations on different types of air services/ airlines at two categories of airports, namely those that are confronted with excess demand for slots throughout the day and those that have to deal with excess demand during peak hours.

Table 4: Summary of main properties of market mechanisms

	Secondary trading	Higher posted prices	Higher posted prices & secondary trading	Auction of pool slots & secondary trading	Auction of 10 % of slots & secondary trading
Approximate estimate on passenger numbers					
Low case	2.2 %	3.8 %	4.1 %	2.4 %	0.4 %
Central case	**4.0 %**	**4.3 %**	**5.0 %**	**4.2 %**	**4.1 %**
High case	4.8 %	5.2 %	5.8 %	5.0 %	4.6 %
Implementation costs	very low	low	moderate	moderate	very high
Other factors					
- potential for instability in airline schedules	very low	low	low	low	high
- likelihood of increased concentration at hub airports	moderatley high	moderately high	moderately high	high	very high
- consistency with existing scheduling procedures	good	moderately good	moderately good	moderately good	poor
- risk of international disputes, challenges & retaliation	low	high	high	low	very high

Source: According to NERA (2004, p. 217).

Before focusing on the results of the NERA study with respect to the potential impact on different airline types operating at airports that are characterised by severe or only limited excess demand for slots, an additional impact could affect some or all categories of airlines: the utilisation of slots is likely to be improved. In particular, the number of late slot returns will decrease. If airlines have to pay for slots that are not returned by the required date, which had been set in order to facilitate their reallocation, they will be strongly incited to avoid late returns. Under secondary trading, airline will be incited to sell unwanted slots. Moreover, the cost of any underutilisation of slots will increase for airlines which could incite airlines to avoid retaining more slots than they really need: Either they ask fewer slots or sell any excess slots to other airlines.

Potential impact on airports with severe excess demand for slots throughout the day

As regards airports that are characterised by severe excess demand for slots the whole day, the authors of the study (NERA, 2004, p. 82ff) expect substantially higher prices during peak hours and slightly higher prices during off peak hours. These increases could be actual increases in price or increases opportunity costs.

Pressure from higher slot prices would probably the most on **regional carriers** which do not have agreements with hub airlines: Airport charges represent a quite large proportion of their costs since they operate mostly short haul flights; moreover, they operate rather small aircraft which benefit from the current weight based airport charges but would be penalised by the introduction of a price per slot. Even during off peak hours the increase in slot prices could be too high. Moreover, there is often only limited room for shifting flights to off peak time since some regional airlines carry a large proportion of business travellers. Due to a decrease in the profitability of a number of regional routes as a consequence of a rise in airline costs, regional airlines would probably withdraw from these airports. Some of the abandoned regional services could be taken over by certain low-cost carriers and hub airlines still would operate regional services in order to feed their hub or delegate these services to another carrier.

Charter airlines are likely to shift some or all of their operations to alternative airports if available. The increase in airline costs will probably are less important than to other carriers since they tend to operate large aircraft but they have a certain flexibility with the respect to airport choice. Competition among charter airlines could also incite them to shift operations to off peak hours instead of leaving congested airports as long as this is feasible. It would also possible to use congested airports during off peak hours and alternative airports during peak hours or larger aircraft. However, destination airports are not concerned as they are generally not congested or only during certain hours.

Short-haul services by full-service airlines other than the hub carrier are the third type of service to come under pressure. A number of these services already are unprofitable due to their cost base, competition from low-cost carriers and a lack in significant feed from long haul routes. It is possible that these services are shifted to alternative airports except for short haul flights that serve a hub at the other end since their withdrawal could have negative effects on the whole hub and spoke network. It would also possible that these carriers reduce frequency and rather use larger aircraft. Nevertheless, a decrease in frequency may have a negative effect on the attractiveness of the service for high-yield point-to-point business passengers.

As **low-cost carriers** are relatively heterogonous, their likely reaction will depend on the type of low-cost carrier. Those airlines, that seek to minimise costs, serve secondary airports and focus primarily on leisure passengers, avoid congested airports in general (e.g. Ryanair). The authors of the NERA study expect that these *cost-minimising low-cost airlines* would be very sensitive to any increase in costs at these airports. Ryanair might be able to absorb some increase in charges but would start reducing services if costs rose too much. In contrast, there are low-cost airlines which operate at a low-cost level but also focus on yields and thus largely serve main airports, including many congested airports since they also want to attract business passengers. For this reason, *yield-oriented low-cost airlines* operate certain services at relatively high frequencies (e.g. Easyjet). Their reaction is likely to be different: On a number of routes they compete directly with full-service airlines. Since the latter’s costs are much higher than for low-cost airlines, it could be that some routes start to incur a loss due to higher slot costs, forcing them to withdraw from them. If the low-cost airline would be able to operate these routes still profitably, it could pick up some of these slots set free by their competitor. Even if some of the routes operated by this type of low-cost airlines could become unprofitable, the authors of the NERA study expect that they will increase their slot holdings at congested airports (busy non-hub airports or hub airports that are destinations in their own right). However, they will probably not replace the short-haul services of hub carriers since their business model is not suitable for feeding hubs: By interlining agreements, baggage transfer and longer turnaround times, they could lose their cost advantages. At the same time, the increase in slot holdings that could achieve these low-cost airlines will depend largely on what other airlines will be willing to pay for slots. In particular for creating or expanding long-haul services, airlines might accept to pay higher prices than low-cost airlines would pay for these slots.

The network airline which operates its hub at the airport with severe excess demand will be obliged to consider the full operating cost of their slot holdings. Hub operation patterns generate by nature peaks in demand for slots and thus create excess demand at peak times. Increased slot costs might well strengthen the hub and spoke model since they are mainly used for feeding intercontinental flights and there is little scope for operating them on a point-to-point basis from small or medium European airports. A potential response for a hub airline that is faced with an increase in slot costs in its peaks would be to move some flights outside the banks, i.e. widen the banks. The scope for is limited as transfer time would increase but it is possible for flights for which the value of short connecting time is low. By the way, this behaviour could already be observed by some airlines (e.g. American Airlines and SAS) although due to financial pressure. There is also limited scope for reducing short-haul feeder services due the large number of transfer passengers. The withdrawal of short-haul services would negatively affect the whole network and in particular long haul services. Hub carriers are likely to continue to operate most of their short-haul services themselves although they might look for cost reductions. Hub carriers which face currently excess demand for slots at their main airports might pick up additional slots in their banks as other airlines reschedule or withdraw their services. Thus, the hub carrier may be able to increase the number of long-haul and short-haul services from the hub.

Most **other long-haul routes** will not be adversely affected by market mechanisms. However, they may lose some feeder traffic due to a possible cutback in short-haul services and may face a minor increase in operating costs (in part because they fly very large aircraft). A negative impact could concern some destinations (e.g. in Africa) which are already not viable in the current framework since demand is too small. While airlines might withdraw from some of these services, others will continue to be operated due to political constraints and some will be transferred to less congested airports. At the same time, there could be market entry on certain long-haul routes, in particular at airports with large catchment areas.

Potential impact on airports with excess demand during peak hours

At airports which are characterised by excess demand only during peak hours, although peak hours may vary by airport, costs may increase during peak hours and decrease during off-peak hours (if revenues from auctions or higher posted prices allow so. However, off-peak airport charges will not decrease if secondary trading is applied alone. But even in this case, airlines may shift services to off-peak slots in order to sell valuable peak slots.

Even if the total increase in costs will be limited in the case of airports with peak-time congestion only since off-peak charge might fall, **regional airlines** are likely to be confronted with a number of regional services becoming unprofitable, in particular due to the use of smaller aircraft. They have only limited scope to switch to off-peak hours since they carry high proportions of business passengers. Regional airlines could reschedule slightly some flights (+/- 30 minutes) in order to avoid some cost increase but will not be able to move away from the peaks.

Charter airlines may be confronted with the effects of peak pricing at origin as well as at some holiday destination airports. The authors of the NERA study consider that they will react rapidly to peak pricing at origin airports and move flights to off peak hours. The introduction of night time surcharges at airports already showed that certain airlines shifted their services outside the night periods. The situation is different if peak pricing would lead to higher prices only during the summer season just because of the large demand from charter airlines which operate more services during that period. In this case, charter airlines might rather shift all or some of their operations to alternative airports if available for a particular catchment area. Otherwise, they might also use larger planes, increase fares (to the extent this is possible) and operate fewer services. With respect to peak pricing at holiday destination airports, rather small increases in costs are expected. Competition is strong and most tour operators are not interested in a particular destination which may easily be replaced by another one if prices increase. Peak pricing at a holiday airport could result in a sharp fall in passenger volumes and tour operators would quickly divert their services to other destinations. However, the price of package tours already contains a peak pricing element with respect to accommodation. For this reason, peak pricing at the holiday airport could lead to a decrease in accommodation prices: While charter airlines would charge more, hotel would reduce prices so that the package cost would remain competitive. The net impact of peak pricing at the airport thus would be alleviated or even be neutral.

Short-haul services by full-service carriers other than the hub carrier have some flexibility to shift flights to off-peak hours except for flights that carry a large proportion of originating and terminating business passengers. Flexibility is also reduced for such services that serve a hub at the other end since traffic due to bank timings. At many airports short-haul services arrive and depart within about one hour of each other, i.e. very narrow bank windows. For this reason, it could be possible to reschedule slightly flights (+/- 30 minutes but not 90 minutes) in order to avoid higher charges or to shift them to a suitable alternative airport if available. Besides, airlines may reduce frequency or use larger aircraft, in particular if excess demand is relatively widespread instead of affecting a few hours each day.

Since **low-cost airlines** operate regular services throughout the day and the year. To the extent that peak pricing does not lead to an overall increase in their costs, they are rather unlikely to reschedule their services. They may even be able to pick up additional slots if peak pricing forces other carriers to withdraw from the airport, provided that slots are not taken by other services that may be accept to pay a higher price for them. If peak pricing leads to an overall increase in their operating cost, *cost-minimising low-cost airlines* (e.g. Ryanair) may be more sensitive to these increases: If services are irregular, they could be shifted to off peak hours while the number of flights remains unchanged. For regular services, limited cost increases would not necessarily imply cuts in services but may stop their expansion at the airport. However, if the rise in overall costs would be too strong, these carriers might be forced to withdraw services. *Yield-oriented low-cost airlines* (e.g. Easyjet) might benefit from peak pricing as in the case of airports with severe excess demand: Reductions in some existing services due to higher prices may be more than offset by services that these airlines may take over from full-service airlines if the latter have difficulties in operating these services profitably, especially at airports that are not hubs. The possibility to get previously unavailable peak slots will permit these yield-oriented low-cost airlines to introduce new routes thus leading to a higher demand for off-peak slots: In order to offer regular services which allow the airline to increase aircraft utilisation and to face competition from full-service carriers for business but also leisure travellers, they also need off-peak slots. For this reason, the authors of the NERA study expect a significant increase in the number and proportion of services operated by low-cost airlines at partially congested airports.

The banks established by the hub operator explain at most airports traffic peaks. Therefore, the consequences of peak pricing at partially congested airports on the hub airlines will be similar to those at airports with sever excess demand. The main difference is that there is some scope for lower off-peak charges at congestion is limited to certain times of the day, while at the airports with excess demand throughout the day even off-peak charges will increase although less than peak charges. For this reason, there is a stronger incentive at partially congested airports for hub operators to shift certain services to off-peak hours out of the banks (i.e. widen the banks). Nevertheless, the scope for this will depend on the competition between hubs and the extent to which competing hubs also implement peak pricing. In return, if the hub operator lacks slots at its hub and other operators withdraw from its banks as a result from peak pricing, it may get some additional slots within the bank window allowing him to strengthen its hub.

Many **other long-haul routes** will not be largely affected by peak pricing. The rise in costs will probably not lead to a problem of profitability. Due to the withdrawal of certain services, there may even be market entry for new long-haul routes at airports with large catchment areas. Only for some long-haul routes, the increase in cost could pose a problem. Probably there is only limited scope for shifting these services away from the banks or to alternative airport as they depend on feeder traffic. Whether such services will be removed or continue to be operated will depend on political constraint.

Conclusion: The airport's capacity to meet airlines' requirements and to deal with public policies allows him to pursue current and to safeguard future development

This chapter considered three issues that are essential to airports and which illustrate the complexity of the context into which airports perform their activity. This complexity is due to the large number and diversity of parties involved in air transport. In particular the two first issues reveal the emergence of the airport as a strategic player within the air transport system.

On the one hand, airports need to answer the airlines' requirements for the choice of an airport whether the airline wants to establish a hub or operate low-cost, charter or freight traffic. The consideration of these needs necessitates the knowledge of the air carrier which is particularly important with respect to low-cost airlines since this group is relatively heterogeneous. As exigencies differ, airports also have to differentiate their services. This is just the subject of the formal, specific contracts negotiated by airports and airlines in order to allow a better balance of risk and which were already addressed in the first chapter.

On the other hand, airports have to deal with an increasing public interest in their activity which is due to the positive impact of the airport activity generating income and employment but also to its nuisances, in particular at local level. This issue concerns a large number of airports. However, at larger airports, beyond a certain traffic volume, the activity as a whole seems not to be threatened; smaller airports benefit from relatively unconcern but once they register a certain traffic growth the subject becomes very important as illustrate examples like Hahn, Niederrhein/Weeze or Beauvais airports. In this respect, more and more airports become aware of the necessity to increase the airport's social acceptability for their durable integration into the local territory. This means to reinforce interdependencies and to contribute to the construction of a joint territory around the airport. Airports may make a substantial contribution to this process by communicating, by participating in consultations and in an open and honest dialogue which enable residents and local authorities to contribute to the airport development. Therefore, the airport needs to restore trust, e.g. by a high degree of transparency. The airport has a role which is particularly strategic since its own positioning and the possibility that it gives to other parties to get involved contribute largely to reducing the potential for conflict.

Finally the third issue which is the management of scarce capacity concerns already a number of airports that are characterised by excess demand for airport slots throughout the day or at least during peak hours. These restrictions may be technical or political/environmental and thus depend also the airport's capacity to deal with opposition from residents and neighbouring communities. Moreover, airports contribute to determining the capacity of their infrastructure and thus the number of slots since the physical layout of airport facilities, the rapid handling of aircraft, passengers and freight due to the improvement of processing levels contribute to ability of terminals, stands and other facilities to accept the traffic that the runway accommodates. Nevertheless, airports may not influence how capacity is used. Bass (2003) even considered that airports would not wish either to get into discussions between airlines, their customers, or even between governments. However, airports will benefit from an efficient use of airport capacity since an increase of passenger numbers would result in a growth in commercial revenues and thus in the airports' revenues. At the same time, airports have to take into account the effects on airlines of market mechanisms allowing a better allocation of airport slots since the impact depends on the degree to which the airport is characterised by excess demand for slots and the type of air service offered. Thus new opportunities may arise for certain airlines and thus also for airports if they manage to meet airlines' requirements.

Conclusion of part 3: The airport's room for manoeuvre depending on constraints and opportunities from its location and on its capacity to deal with other parties involved in air transport – emergence of a new strategic actor within a complex set of relations

The third part focused on the spatial and territorial context into which airports are embedded. After chapter 7 which provided a kind of introduction to the spatial and territorial context, the analysis of airport specialisation by means of an airport taxonomy and its association with the respective spatial and territorial context, whose results were presented and discussed in chapter 8, underlined the extent to which the airport's location determines the possibilities to develop a particular profile.

At the same time, the analysis also suggested the influence of other factors whose importance however depends on the airport's capacity to deal with certain issues which were analysed in detail. Among them figures the airport's capacity to answer the requirements of airlines' for the choice of an airport. Another issue arises from the growing public interest in the airport activity. The airports' behaviour in airport conflicts is particularly strategic since it may largely determine the outcome. In this respect, a number of airports seem to become aware of the contribution they can make for a better integration of the airport in its local territories, for increasing the social acceptability of the airport and the construction of a joint territory around thus allowing different stakeholders to participate in the decisions on the development of the airport. The airport's role is particularly important for creating trust and for ensuring an open and honest dialogue. Finally, airports have partly an influence on their capacity to handle a certain traffic volume. This capacity may be increased to a certain limit thanks to the airports ability to deal with passenger flows, aircraft and freight within its facilities. At the same time the latter may be restricted e.g. for environmental reason which underlines again the importance of dealing with environmental problems. In return, airports have less influence of the way capacity used once it had been determined. This issue underlines to which extent, despite privatisation tendencies and the introduction of commercial practices, public authorities continue to play a considerable role whereas the airport, which will benefit from an efficient allocation of slots, has to take into account the airlines' reactions to the introduction of a new regulatory framework and answer the changes in their requirements.

To the extent to which the airport's capacity to manage certain issues and to deal with the other parties involved in air transport allows him to pursue actual and to safeguard future development, the airport establishes itself as strategic player. The airport takes decisions concerning the development of its activity (e.g. market segments, investments in airport infrastructure) and the relations with airlines, other airports, residents, local authorities, the operators of other transport modes etc. These decisions are strategic as they determine the overall direction of the airport and "its ultimate viability in light of the predictable, the unpredictable, and the unknowable changes that may occur in its [...] environments" (Mintzberg & Quinn, 1991, p. 5).

GENERAL CONCLUSION

The main contribution of this thesis is an analysis of the air transport system identifying different agents, their rationales and their relationships with a focus on airports that have emerged as major actors. On the one hand, the general conditions, which may be more or less favourable, determine the possibilities of an airport to develop. On the other hand, the analysis shows that the only spatial and territorial context into which airports are embedded is not sufficient: Certain airports may take advantage of a good situation while other may not; certain airports manage to outweigh remoteness while others may not. The observation that some airports seem to perform better or worse with respect to constraints or opportunities resulting from their spatial and territorial context confirms that development of an airport is not automatic but depends on to the dynamics arising from the interactions between the different actors, on strategies that are not defined in advance.

A differentiation of airport strategies: influenced by the spatial and territorial context into which airports are embedded and their positioning with respect to other airports

This thesis placed the emphasis on the emergence of airport specialisations: In parallel to some generalist hub airports which concentrate a large part of traffic, secondary poles have emerged pursuing a functional and/or regional specialisation. The extent of this phenomenon became apparent from the analysis the European airport panorama, with a focus on France, Germany, Spain and Italy although other European countries were also considered. Actually, the differentiation of airport strategies according to their commitment to certain market segments has progressed considerably and is not a marginal phenomenon concerning only some aerodromes. The strategies pursued by airports are largely determined by the spatial and territorial context into which they are embedded. Existing research underlines the link between an airport's general traffic volume and the airport's catchment area with its economic structure, its density and the socio-economic structure of the population living there, the offer of ground transport and the location of the airport within this zone in addition to factors related to the airport's supply-side policy. In addition, this work gave an insight into the link between airport strategy and the spatial and territorial context into which the airport is embedded, a link that is missing, or at least not explicit, in recent research.

The main results shall be shortly summarised:

- The territorial context into which the different airports are embedded influences to a certain extent the type of profile developed by an airport. Specialisations such as on the role as a generalist hub airport or freight airport are to a larger degree subject to this territorial context. This also applies to charter airports and airports pursuing a regional specialisation, both characterised by a peripheral location.
- The four *generalist hub airports* are all located in the very dense and economically powerful heart of Europe. Nevertheless, a difference may be observed: While London Heathrow and Paris CDG airport are located next to very large cities of a very large economic and touristic importance, Frankfurt and Amsterdam airports are embedded in very dense urban areas that are composed of only large (Amsterdam) and medium-sized cities (Frankfurt), which however are of a large economic relevance, but also of

further small or medium-sized cities of a certain economic importance thus generating large air transport demand.

– Just like connecting traffic, *freigh*t is concentrated on a small number of airports. Due to the strong link between passenger and cargo traffic, the four generalist hub airports London Heathrow, Frankfurt, Paris CDG and Amsterdam figure also among the busiest airports as regards freight transport. Moreover, a small number of airports have specialised in cargo and some of them have established themselves as *hub for an express freight company*. The latter are all located in a geographically restricted zone next to the urban areas of Paris or Frankfurt. This may be explained by the economic importance of this zone and very tight delivery times for which reason express freight hubs may not be localised to far from the economic centres. Not in line with this observation seems to be the choice of Leipzig/Halle airport as new hub by DHL after leaving Brussels. However, it just underlines the large size of catchment areas for freight traffic where great volumes of cargo are carried by road to partly distant airports in order to concentrate cargo flights on a small number of platforms. As regards the remaining freight airports, they may also handle express freight but rather focus on general cargo where delivery times are less critical. Their number is also limited and they are also located next to economically important and dense urban areas but seem to be exposed to fewer territorial constraints.
– *Low-cost traffic* is a subject to a large number of airports. For this reason, differences may be observed with respect to the territorial context into which these airports are embedded. Smaller airports like Beauvais, Frankfurt-Hahn, Bergamo or Girona owe all their growth to low-cost airlines; this growth is by the way out of all proportion in comparison to the territorial context into which they are embedded. Most of these airports are located outside of urban areas although still close enough so they manage to outweigh their remoteness by proposing an additional, attractive flight offer in a zone which however is already served by larger airports, but not necessarily within this market segment. In parallel, some medium-sized and larger airports (such as Stuttgart or Nice) started also handling low-cost traffic as well as regional airports which increase their attractiveness thanks to this type of air service while the former flag carriers often reduced the number of destinations offered from these airports as they prefer to concentrate on feeding their respective hub airports. Low-cost traffic is also important to some airports that are located next to popular touristic destinations although being situated in zones that are in general lightly populated and of a smaller economic relevance. For some of these airports, low-cost traffic allowed to create new demand whereas for others it corresponds to a certain extent to former charter traffic as a number of charter airlines have decided to convert to scheduled, low-cost flights since the liberalisation of air transport within the EU. Despite the capacity of low-cost airlines to generate new demand thanks to favourable prices, some airports do not manage to outweigh remoteness.
– Due to the growth of low-cost airlines, only some *charter airports* remain at the periphery of Europe (in particular on the Greek islands) suggesting that these airports

are penalised by their location despite touristic attractiveness. In this case, the territorial context seems to prevent airports from developing other specialisations.

– *Regional specialisation* appears to be linked to a peripheral location whether the latter refers to Europe's geography or to former political boundaries. The concentration of traffic towards Northern or Eastern Europe on some airports may be explained by a relatively small demand for air transport despite different reasons: Whereas Northern Europe is characterised by a very large, sparsely populated surface with a considerable part of the population being concentrated in a small number of larger and economically important cities, Eastern Europe still falls behind Western Europe as regards its economic development. As regards traffic towards Latin America, a relatively small demand for air transport may favour its concentration on some airports among which Madrid airport is the most important which is probably due to historic reasons (Iberia's focus on Latin America) but also to flight distance, which is already very large from Madrid airport despite its location at the periphery of Europe.

Limits of the analysis of the spatial and territorial context into which airports are embedded

The analysis was mainly based on data from the Eurostat transport and Urban Audit statistics as well as from the Official Airline Guide. They cover the European Union, including Switzerland and Norway, and thus ensure methodological coherence. At the same time, the analysis of the territorial context has a limited degree of accuracy and figures indicate only orders of magnitude for two reasons mainly: The data from urban statistics refer to the period 2003-2006 and were restricted to 365 cities; the delimitation of catchment areas is a rather rough estimate due to the wish to include a large number of European airports into the analysis. For this reasons, figures indicate only orders of magnitude.

In return, the analysis of 100 airports reveals the extent of the emergence of airport specialisations thus giving reasons for studying the territorial context into which these airports are embedded. The scope of this phenomenon would not have become apparent when the analysis had been restricted to a certain geographical area (like a region or a country) or a small number of airports for the benefit of using "better" urban data. This also applies to the analysis of the territorial context into which the airports are embedded: Certain structures and tendencies would not have become apparent when the number of airports had been restricted for the benefit of the precise determination of catchment areas.

The airport emerging as a new strategic actor

In the course of this work, it became apparent that current and in particular future development depends not only on airline behaviour but also, and to a large extent, on the airports' capacity to respond to airline needs and to deal with various subjects related to their activity, including environmental problems, scarce capacity and the access by ground transport. It is through the airport's interest for and awareness of these aspects that airports emerge as full partners in the air transport system. In this respect, the development of non-aeronautical activities and the restructuring process, that a number of airports have undergone, have largely contributed to the broadening of the airport's room for manoeuvre. The different facets of the airport business show the latter's intention of being recognised as a full partner in the air transport system as they largely exceed the technical and management skills of an infrastructure provider in order to include the promotion of the air transport within the catchment area, the promotion of the catchment area to air transport and the promotion of the own facility to air carriers as well as to economic and political partners, the coordination between the different parties performing their activities at the airport (such as air carriers, ground handling companies, freight forwarders, public administrations, e.g. customs service, health service, airport and frontier police, but also business and services rendering the airport more comfortable, e.g. shops and restaurants) as well as the participation in consultations of and the dialogue with residents and neighbouring communities.

For this reason, airport strategies are not limited to the development of a particular specialisation but depend also on the airport's capacity to take into account and to cope with these different aspects which are crucial for safeguarding future development.

Importance of the multi-scale character of the link between airport and territory and the multimodal character of transport

The emergence of the airport as a new strategic actor in the air transport system places emphasis on the relation between airport and territory: The airport acts on but is also embedded into several territories. This multi-scale character of the link between airport and territory is reflected in the division of catchment areas according to different market segments but also in the relationship with the airport's surrounding areas. It is of a particular relevance for the better integration of the airport into local territories in order to ensure the social acceptability of the airport activity since there is a strong interdependency between the airport that gets necessary resources, such as labour, services and equipment from neighbouring territories and the latter benefitting from induced territorial dynamics but also suffering from nuisances. It is also reflected in the diverseness of landside access with the airport's integration in multimodal transport chains which include not only the flight but also urban public, road, railway, and high-speed railway transport referring to local, regional, national, international and even intercontinental levels thus covering territories of different scales.

Importance of the link between private and public aspects of the airport activity

Finally, the link between private and public aspects of the airport activity has to be underlined. It has come to the fore with the privatisation tendencies that could be observed in the airport industry with the introduction of the private sector justified by the pursuit of improved efficiency leading to higher service quality, passenger and airline market orientation and airport performance and the, at least partial, withdrawal of state funding. The necessity to generate substantial revenues providing for profitability to shareholders and financial resources for future investments may incite airport managers to focus on short-term profit seeking that may create tensions between the airport operator and other parties (e.g. airport users, service providers, airport employees and residents) which result from conflicts of interests. In this respect, residents and local authorities have come to the fore launching the discussion on nuisances, sustainable development and the distribution of benefits from air transport with a particular focus on the need for economic and environmental regulation. Besides, public authorities continue to finance infrastructure in most cases, so that the private operator deals actually only with a small part of the system.

Outlook

Based on the differentiation of airport strategies according to the airports' commitment to certain market segments, the analysis of the spatial and territorial context into which the airports are embedded showed its influence on the development of airports but confirmed also that the latter is not automatic but subject to the dynamics arising from the interactions between the different actors. In this respect, the emergence of the airport as a new strategic player in the air transport system places the emphasis on the complex relation between airport and territory which is reflected in a number of issues connected with the airport activity. Finally, through the different aspects that were discussed in this work, airports raise the most complex and interesting questions, just as it is the case of other infrastructures and transport systems...

APPENDICES

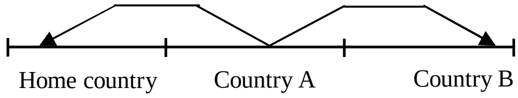
Appendix 1: The freedoms of the air

First freedom: the right to overfly a country en route to another (transit freedom)

The right of an airline of the home country to fly to country B over the territory of country A without landing.

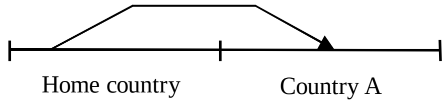
Second freedom: the right to make a technical stop

The right of an airline of the home country to land in country A for non-traffic purposes such as refuelling or maintenance while en route to country B.



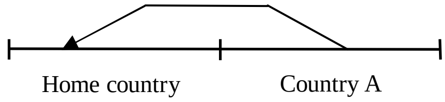
Third freedom: the right to carry traffic from the home country to another country A for purpose of commercial services

The right of an airline of the home country to carry passengers/freight/mail from its territory to country A.



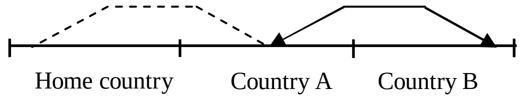
Fourth freedom: the right to carry traffic to the home country from another country A for purpose of commercial services

The right of an airline of the home country to carry passengers/freight/mail from country A to its territory.



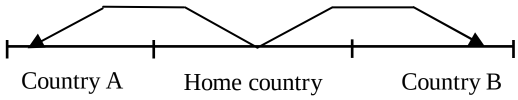
Fifth freedom: the right to carry traffic between two countries by an airline of a third country on route with origin/destination in its home country

The right of an airline of the home country to carry passengers/freight/mail between countries A and B providing the flight originates or terminates in its own country.



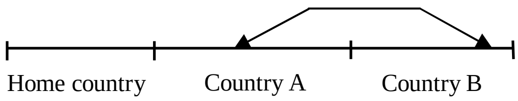
Sixth freedom: the right to carry traffic between two countries by an airline of a third country on two routes connecting in its home country

The right of an airline of the home country to carry passengers/freight/mail between two countries A and B via its own country (combination of the third and fourth freedoms).



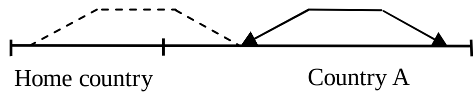
Seventh freedom: the right to base aircraft in a foreign country

The right of an airline of the home country to operate flights between two countries A and B without the flight originating or terminating in its own country:
It means that an airline may base aircraft in a foreign country for use on international services, establishing a de facto foreign hub.



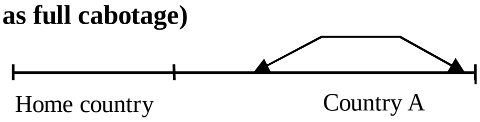
Eighth freedom: consecutive cabotage rights

The right for a foreign airline to carry traffic between two or more domestic points in a foreign country on a flight that originates or terminates in the carrier's home country.



Ninth freedom: stand-alone cabotage rights (also referred to as full cabotage)

The freedom to carry traffic between two or more domestic points in a foreign country: It allows a foreign airline to operate dedicated domestic flights.



Source: OACI

Appendix 2: Data availability in Urban Audit statistics

	Population	Foreigners	GDP	NACE	Unemploy-ment	Head-quarters	Meetings	Beds available
Copenhagen	X	X	X	X	X	-	X	X
Kernel Copenhagen	-	-	X	-	X	-	-	-
Helsinki	X	-	X	X	-	X	X	X
Kernel Helsinki	X	X	X		X	-	-	-
Stockholm	X	X	X	-	-	X	X	X
Kernel Stockholm	X	X	(X)[1]	-	-	-	-	-
Inner London	X	-	-	-	X	-	-	-
London	X	-	X	X	X	X	X	X
Paris	X	X	X	X	X	X	X	X
Paris with "small ring"	X	X	-	-	X	-	-	-
Athens	X	X	-	-	X	X	X	X
Kernel Athens	X	X	-	-	X	-	-	-
Lisbon	X	X	X	X	X	X	X	X
Kernel Lisbon	X	-	X	-	X	-	-	-

NB:

X … data available

\- ... data not available

... data used

()[1] … data for Kernel Stockholm is obviously erroneous

Appendix 3: Reference year for Urban Audit 2003-2006

CITY_CODE	CITY_NAME	STSICD	WORKING_POP	TOTAL_POP	EU_NATIONALS	NON_EU_NATIONALS	GDP_HEAD	UNEMPLOY	NACE_A_to_P	HEADQUARTERS	BEDS_AVAIL	BEDS_AVAIL_POP	BEDS_AVAIL_POP_HIGH_S	BEDS_AVAIL_POP_LOW_S
at001c	Vienna	AT022	2004	2004	2004	2004	2004	2004	:	2004	2004	2004	2004	2004
at002c	Graz	AT006	2004	2004	2004	2004	:	2004	:	2004	2004	2004	2004	2004
at003c	Linz	AT014	2004	2004	2004	2004	:	2004	:	2004	2004	2004	2004	2004
at004c	Salzburg	AT016	2004	2004	2004	2004	:	2004	:	2004	2004	2004	2004	2004
at005c	Innsbruck	AT007	2004	2004	2004	2004	:	2004	:	2004	2004	2004	2004	2004
be001c	Brussels	BE014	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004
be002c	Antwerpen	BE004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004
be003c	Gent	BE022	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004
be004c	Charleroi	BE015	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004
be005c	Liège	BE034	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004
be006c	Brugge	BE013	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004
be007c	Namur	BE046	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004
bg001c	Sofia	BG020	2004	2004	:	:	:	:	2004	:	:	:	:	:
bg002c	Plovdiv	BG014	2004	2004	:	:	:	:	2004	:	:	:	:	:
bg003c	Varna	BG023	2004	2004	:	:	:	:	2004	:	:	:	:	:
bg004c	Burgas	BG003	2004	2004	:	:	:	:	2004	:	:	:	:	:
bg005c	Pleven	BG013	2004	2004	:	:	:	:	2004	:	:	:	:	:
bg006c	Ruse	BG016	2004	2004	:	:	:	:	2004	:	:	:	:	:
bg007c	Vidin	BG024	2004	2004	:	:	:	:	2004	:	:	:	:	:
ch001c	Zurich	CH016	:	2004	2004	2004	:	2004	2005	:	2005	:	:	:
ch002c	Geneva	CH006	:	2004	2004	2004	:	2004	2005	:	2005	:	:	:
ch004c	Bern	CH002	:	2004	2004	2004	:	2004	2005	:	2005	:	:	:
ch005c	Lausanne	CH009	:	2004	2004	2004	:	2004	2005	:	2005	:	:	:
cy001c	Lefkosia/Nicosia	CY006	2004	2004	2004	2004	:	2004	2004	:	:	:	:	:
cz001c	Prague	CZ047	:	2004	:	:	:	:	:	2004	:	:	:	:
cz002c	Brno	CZ003	:	2004	:	:	:	:	:	2004	:	:	:	:
cz003c	Ostrava	CZ042	:	2004	:	:	:	:	:	2004	:	:	:	:
cz004c	Plzen	CZ046	:	2004	:	:	:	:	:	2004	:	:	:	:
cz005c	Usti nad Labem	CZ060	:	2004	:	:	:	:	:	2004	:	:	:	:
cz006c	Olomouc	CZ039	:	2004	:	:	:	:	:	:	:	:	:	:
cz007c	Liberec	CZ029	:	2004	:	:	:	:	:	:	:	:	:	:
cz008c	Ceske Budejovice	CZ005	:	2004	:	:	:	:	:	:	:	:	:	:
cz009c	Hradec Kralove	CZ015	:	2004	:	:	:	:	:	:	:	:	:	:
cz010c	Pardubice	CZ044	:	2004	:	:	:	:	:	:	:	:	:	:
cz011c	Zlin	CZ066	:	2004	:	:	:	:	:	:	:	:	:	:
cz012c	Kladno	CZ022	:	2004	:	:	:	:	:	:	:	:	:	:
cz013c	Karlovy Vary	CZ020	:	2004	:	:	:	:	:	:	:	:	:	:
cz014c	Jihlava	CZ018	:	2004	:	:	:	:	:	:	:	:	:	:
de001c	Berlin	DE057	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de002c	Hamburg	DE221	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de003c	Munich	DE370	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de004c	Cologne	DE288	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de005c	Frankfurt/Main	DE163	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de006c	Essen	DE151	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de007c	Stuttgart	DE526	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de008c	Leipzig	DE314	2004	2006	2004	2004	2004	2004	2006	2004	:	:	:	:
de009c	Dresden	DE121	2004	2006	2004	2004	2004	2004	2006	2004	:	:	:	:
de010c	Dortmund	DE119	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de011c	Düsseldorf	DE126	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de012c	Bremen	DE077	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de013c	Hannover	DE226	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de014c	Nürnberg	DE400	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de015c	Bochum	DE067	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de016c	Wuppertal	DE600	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de017c	Bielefeld	DE059	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:

CITY_CODE	CITY_NAME	STSICD	WORKING_POP	TOTAL_POP	EU_NATIONALS	NON_EU_NATIONALS	GDP_HEAD	UNEMPLOY	NACE_A_to_P	HEADQUARTERS	BEDS_AVAIL	BEDS_AVAIL_POP	BEDS_AVAIL_POP_HIGH_S	BEDS_AVAIL_POP_LOW_S
de018c	Halle/Saale	DE219	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de019c	Magdeburg	DE339	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de020c	Wiesbaden	DE583	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de021c	Göttingen	DE204	2004	2004	2004	2004	:	2004	2006	2004	:	:	:	:
de022c	Mühleim a.d.Ruhr	DE369	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de023c	Moers	DE361	2004	2004	2004	2004	:	2004	2006	2004	:	:	:	:
de025c	Darmstadt	DE103	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de026c	Trier	DE532	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de027c	Freiburg im Breisgau	DE167	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de028c	Regensburg	DE444	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de029c	Frankfurt/Oder	DE164	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de030c	Weimar	DE565	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de031c	Schwerin	DE490	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de032c	Erfurt	DE144	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de033c	Augsburg	DE025	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de034c	Bonn	DE068	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de035c	Karlsruhe	DE274	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de036c	Mönchengladbach	DE362	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de037c	Mainz	DE341	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de039c	Kiel	DE283	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de040c	Saarbrucken	DE468	2004	2004	2004	2004	:	2004	2006	2004	:	:	:	:
de041c	Potsdam	DE431	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
de042c	Koblenz	DE287	2004	2004	2004	2004	2004	2004	2006	2004	:	:	:	:
dk001c	Copenhagen	DK013	2004	2004	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
dk001k	Kernel Copenhagen		:	:	:	:	2004	2004	:	:	:	:	:	:
dk002c	Aarhus	DK026	2004	2004	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
dk003c	Odense	DK017	2004	2004	2004	2004	2004	2004	2004	:	2004	2004	:	2004
dk004c	Aalborg	DK001	2004	2004	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
ee001c	Tallinn	EE002	2004	2004	:	:	2004	2004	2004	2004	2004	2004	2004	2004
ee002c	Tartu	EE003	2004	2004	:	:	2004	2004	2004	2004	2004	2004	2004	2004
es001c	Madrid	ES119	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es002c	Barcelona	ES033	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es003c	Valencia	ES206	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es004c	Sevilla	ES188	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es005c	Zaragoza	ES225	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es006c	Malaga	ES121	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es007c	Murcia	ES139	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es008c	Las Palmas	ES108	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es009c	Valladolid	ES208	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es010c	Palma di Mallorca	ES148	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es011c	Santiago de Compostela	ES184	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es012c	Vitoria/Gasteiz	ES220	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es013c	Oviedo	ES146	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es014c	Pamplona	ES149	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es015c	Santander	ES183	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es016c	Toledo	ES197	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es017c	Badajoz	ES030	2004	2006	2004	2004	2004	2004	2004	:	:	:	:	:
es018c	Logrono	ES114	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es019c	Bilbao	ES037	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es020c	Cordoba	ES059	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es021c	Alicante	ES016	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es022c	Vigo	ES211	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es023c	Gijon	ES086	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
es024c	Hospitalet de Llobregat(L')	ES335	2004	2006	2004	2004	2004	2004	2004	:	:	:	:	:

CITY_CODE	CITY_NAME	STSICD	WORKING_POP	TOTAL_POP	EU_NATIONALS	NON_EU_NATIONALS	GDP_HEAD	UNEMPLOY	NACE_A_to_P	HEADQUARTERS	BEDS_AVAIL	BEDS_AVAIL_POP	BEDS_AVAIL_POP_HIGH_S	BEDS_AVAIL_POP_LOW_S
es025c	Sta. Cruz de Tenerife	ES181	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
fi001c	Helsinki	FI003	:	:	:	:	2004	2004	2004	2004	2004	:	:	:
fi001k	Kernel Helsinki		:	:	:	:	2004	2004	:	:	:	:	:	:
fi002c	Tampere	FI034	:	:	:	:	2004	2004	2004	2004	2004	:	:	:
fi003c	Turku	FI036	:	:	:	:	2004	2004	2004	2004	2004	:	:	:
fi004c	Oulu	FI023	:	:	:	:	2004	2004	2004	2004	2004	:	:	:
fr001c	Paris	FR159	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr001k	Paris with "small ring"		:	:	:	:	:	:	:	:	:	:	:	:
fr003c	Lyon	FR124	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr004c	Toulouse	FR202	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr006c	Strasbourg	FR197	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr007c	Bordeaux	FR037	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr008c	Nantes	FR149	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr009c	Lille	FR118	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr010c	Montpellier	FR145	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr011c	Saint-Etienne	FR181	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr012c	Le Havre	FR112	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr013c	Rennes	FR171	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr014c	Amiens	FR009	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr015c	Rouen	FR176	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr016c	Nancy	FR148	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr017c	Metz	FR134	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr018c	Reims	FR170	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr019c	Orléans	FR156	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr020c	Dijon	FR074	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr021c	Poitiers	FR165	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr022c	Clermont-Ferrand	FR064	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr023c	Caen	FR045	:	2006	2006	2006	:	:	2006	:	2004	:	:	:
fr024c	Limoges	FR119	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr025c	Besançon	FR033	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr026c	Grenoble	FR096	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr027c	Ajaccio	FR005	:	2006	2006	2006	:	:	2006	:	2004	:	:	:
fr032c	Toulon	FR201	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr035c	Tours	FR203	:	2006	2006	2006	:	:	2006	:	2004	:	:	:
fr202c	Aix-en-Provence	FR003	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr203c	Marseille	FR128	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr205c	Nice	FR152	:	2006	2006	2006	:	:	2006	2006	2004	:	:	:
fr207c	Lens - Liévin	FR115	:	2006	2006	2006	:	:	2006	:	2004	:	:	:
gr001c	Athens	GR005	2004	2004	2004	2004	:	2004	:	2004	2004	2004	2004	2004
gr001k	Kernel Athens		2004	2004	2004	2004	:	2004	:	:	:	:	:	:
gr002c	Thessaloniki	GR031	2004	2004	2004	2004	:	2004	:	:	2004	2004	2004	2004
gr003c	Patra	GR025	2004	2004	2004	2004	:	2004	:	:	2004	2004	2004	2004
gr004c	Irakleio	GR010	2004	2004	2004	2004	:	2004	:	:	2004	2004	2004	2004
gr005c	Larisa	GR023	2004	2004	2004	2004	:	2004	:	2004	2004	2004	2004	2004
gr006c	Volos	GR035	2004	2004	2004	2004	:	2004	:	:	2004	2004	2004	2004
gr007c	Ioannina	GR009	2004	2004	2004	2004	:	2004	:	:	2004	2004	2004	2004
gr008c	Kavala	GR014	2004	2004	2004	2004	:	2004	:	:	2004	2004	2004	2004
gr009c	Kalamata	GR066	2004	2004	2004	2004	:	2004	:	:	2004	2004	2004	2004
hr001c	Zagreb	HR054	:	:	:	:	:	2004	2004	:	:	:	:	:
hr002c	Rijeka	HR035	:	2004	:	:	:	2004	2004	:	:	:	:	:
hr003c	Slavonski Brod	HR043	:	:	:	:	:	2004	2004	:	:	:	:	:
hr004c	Osijek	HR028	:	:	:	:	:	2004	2004	:	:	:	:	:
hr005c	Split	HR045	:	:	:	:	:	2004	2004	:	:	:	:	:
hu001c	Budapest	HU006	2005	2005	2005	2005	2004	:	2005	2004	2004	:	:	:

CITY_CODE	CITY_NAME	STSICD	WORKING_ POP	TOTAL_POP	EU_ NATIONALS	NON_EU_ NATIONALS	GDP_HEAD	UNEMPLOY	NACE_A_to_P	HEADQUARTERS	BEDS_AVAIL	BEDS_AVAIL_ POP	BEDS_AVAIL_ POP_HIGH_S	BEDS_AVAIL_ POP_LOW_S
hu002c	Miskolc	HU038	2005	2005	2005	2005	2004	:	2005	2004	2004	:	:	:
hu003c	Nyiregyhaza	HU043	2005	2005	2005	2005	2004	:	2005	2004	2004	:	:	:
hu004c	Pecs	HU049	2005	2005	2005	2005	2004	:	2005	2004	2004	:	:	:
hu005c	Debrecen	HU009	2005	2005	2005	2005	2004	:	2005	2004	2004	:	:	:
hu006c	Szeged	HU054	2005	2005	2005	2005	2004	:	2005	2004	2004	:	:	:
hu007c	Gyor	HU018	2005	2005	2005	2005	2004	:	2005	2004	2004	:	:	:
hu008c	Kecskemet	HU029	2005	2005	2005	2005	2004	:	2005	2004	2004	:	:	:
hu009c	Szekesfehervar	HU055	2005	2005	2005	2005	2004	:	2005	2004	2004	:	:	:
ie001c	Dublin	IE006	2004	2004	2004	2004	:	2004	2004	:	2004	2004	:	:
ie002c	Cork	IE002	2004	2004	2004	2004	:	2004	2004	:	2004	2004	:	:
ie003c	Limerick	IE007	2004	2004	2004	2004	:	2004	2004	:	2004	2004	:	:
ie004c	Galway	IE005	2004	2004	2004	2004	:	2004	2004	:	2004	2004	:	:
ie005c	Waterford	IE008	2004	2004	2004	2004	:	2004	2004	:	2004	2004	:	:
it001c	Rome	IT344	2004	2006	2005	2005	:	:	2004	2004	2004	2004	:	:
it002c	Milan	IT240	2004	2006	2005	2005	:	:	2004	2004	2004	2004	:	:
it003c	Naples	IT267	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it004c	Turin	IT410	2004	2006	2005	2005	:	:	2004	2004	2004	2004	:	:
it005c	Palermo	IT295	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it006c	Genoa	IT174	2004	2006	2005	2005	:	:	2004	2004	2004	2004	:	:
it007c	Florence	IT154	2004	2006	2005	2005	:	2004	2004	2004	2004	2004	:	:
it008c	Bari	IT042	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it009c	Bologna	IT054	2004	2006	2005	2005	:	:	2004	2004	2004	2004	:	:
it010c	Catania	IT093	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it011c	Venice	IT430	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it012c	Verona	IT434	2004	2006	2005	2005	:	2004	2004	2004	2004	2004	:	:
it013c	Cremona	IT133	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it014c	Trento	IT417	2004	2006	2005	2005	:	2005	2004	:	2004	2004	:	:
it015c	Trieste	IT421	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it016c	Perugia	IT302	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it017c	Ancona	IT019	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it018c	l'Aquila	IT199	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it019c	Pescara	IT304	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it020c	Campobasso	IT069	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it021c	Caserta	IT084	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it022c	Taranto	IT402	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it023c	Potenza	IT325	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it024c	Catanzaro	IT094	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it025c	Reggio di Calabria	IT335	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it026c	Sassari	IT376	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it027c	Cagliari	IT063	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it028c	Padova	IT293	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it029c	Brescia	IT058	2004	2006	2005	2005	:	:	2004	2004	2004	2004	:	:
it030c	Modena	IT246	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it031c	Foggia	IT155	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
it032c	Salerno	IT353	2004	2006	2005	2005	:	:	2004	:	2004	2004	:	:
lt001c	Vilnius	LT006	2004	2005	:	:	:	2004	2004	:	2004	2004	2004	2004
lt002c	Kaunas	LT002	2004	2005	:	:	:	2004	2004	:	2004	2004	2004	2004
lt003c	Panevezys	LT004	2004	2005	:	:	:	2004	2004	:	2004	2004	2004	2004
lu001c	Luxembourg	LU002	2004	2006	2004	2004	:	2004	2004	2004	2004	2004	2004	2004
lv001c	Riga	LV004	2004	2004	:	:	2004	2004	2004	:	2004	2004	:	:
lv002c	Liepaja	LV003	2004	2004	:	:	2004	:	2004	:	2004	2004	2004	:
mt001c	Valletta	MT001	2006	2006	:	:	:	:	2006	2006	:	:	:	:
nl001c	The Hague	NL001	2004	2004	2004	2004	:	:	2004	:	2004	2004	2004	2004
nl002c	Amsterdam	NL007	2004	2004	2004	2004	2004	2004	2004	:	2004	2004	:	:

CITY_CODE	CITY_NAME	STSICD	WORKING_POP	TOTAL_POP	EU_NATIONALS	NON_EU_NATIONALS	GDP_HEAD	UNEMPLOY	NACE_A_to_P	HEADQUARTERS	BEDS_AVAIL	BEDS_AVAIL_POP	BEDS_AVAIL_POP_HIGH_S	BEDS_AVAIL_POP_LOW_S
nl003c	Rotterdam	NL056	2004	2004	2004	2004	:	2004	2004	:	:	:	:	:
nl004c	Utrecht	NL066	2004	2004	2004	2004	:	:	2004	:	:	:	:	:
nl005c	Eindhoven	NL022	2004	2004	2004	2004	:	:	2004	:	2004	2004	2004	2004
nl006c	Tilburg	NL065	2004	2004	2004	2004	:	:	2004	:	2004	2004	2004	2004
nl007c	Groningen	NL030	2004	2004	2004	2004	:	:	2004	:	2004	2004	2004	:
nl008c	Enschede	NL024	2004	2004	2004	2004	:	:	2004	:	2004	2004	:	:
nl009c	Arnhem	NL009	2004	2004	2004	2004	:	:	2004	:	2004	2004	:	:
nl010c	Heerlen	NL033	2004	2004	2004	2004	:	:	2004	:	2004	2004	2004	2004
nl011c	Almere	NL086	2004	2004	2004	2004	2004	:	2004	:	2004	2004	2004	2004
nl012c	Breda	NL013	2004	2004	2004	2004	:	:	2004	:	2004	2004	2004	2004
nl013c	Nijmegen	NL049	2004	2004	2004	2004	:	:	2004	:	2004	2004	2004	2004
nl014c	Apeldoorn	NL008	2004	2004	2004	2004	:	:	2004	:	2004	2004	2004	2004
nl015c	Leeuwarden	NL042	2004	2004	2004	2004	:	:	2004	:	2004	2004	:	:
nl513c	Deventer	NL018	:	:	:	:	:	:	:	:	:	:	:	:
nl514c	Alkmaar	NL003	:	:	:	:	:	:	:	:	:	:	:	:
nl515c	Venlo	NL071	:	:	:	:	:	:	:	:	:	:	:	:
nl516c	Helmond	NL034	:	:	:	:	:	:	:	:	:	:	:	:
nl517c	Hengelo (O.)	NL035	:	:	:	:	:	:	:	:	:	:	:	:
nl518c	Schiedam	NL057	:	:	:	:	:	:	:	:	:	:	:	:
nl519c	Almelo	NL004	:	:	:	:	:	:	:	:	:	:	:	:
nl520c	Lelystad	NL085	:	:	:	:	:	:	:	:	:	:	:	:
no001c	Oslo	NO017	2006	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
no002c	Bergen	NO003	2006	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
no003c	Trondheim	NO029	2006	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
no004c	Stavanger	NO025	2006	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
no005c	Kristiansand	NO012	2006	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
no006c	Tromso	NO028	2004	2006	2004	2004	2004	2004	2004	:	2004	2004	2004	2004
pl001c	Warsaw	PL183	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl002c	Lodz	PL086	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl003c	Krakow	PL074	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl004c	Wroclaw	PL189	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl005c	Poznan	PL130	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl006c	Gdansk	PL034	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl007c	Szczecin	PL167	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl008c	Bydgoszcz	PL017	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl009c	Lublin	PL093	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl010c	Katowice	PL061	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl011c	Bialystok	PL008	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl012c	Kielce	PL064	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl013c	Torun	PL176	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl014c	Olsztyn	PL113	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl015c	Rzeszow	PL142	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl016c	Opole	PL115	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl017c	Gorzow Wielkopolski	PL042	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl018c	Zielona Gora	PL201	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl019c	Jelenia Gora	PL058	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl020c	Nowy Sacz	PL107	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl021c	Suwalki	PL161	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl022c	Konin	PL069	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl023c	Zory	PL202	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl024c	Czestochowa	PL027	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl025c	Radom	PL138	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl026c	Plock	PL128	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl027c	Kalisz	PL059	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004
pl028c	Koszalin	PL073	2004	2004	:	:	2004	:	2004	2004	2004	2004	2004	2004

CITY_CODE	CITY_NAME	STSICD	WORKING_ POP	TOTAL_POP	EU_ NATIONALS	NON_EU_ NATIONALS	GDP_HEAD	UNEMPLOY	NACE_A_to_P	HEADQUARTERS	BEDS_AVAIL	BEDS_AVAIL_ POP	BEDS_AVAIL_ POP_HIGH_S	BEDS_AVAIL_ POP_LOW_S
pt001c	Lisbon	PT018	2004	2006	:	:	2004	:	:	2004	2004	2004	2004	2004
pt001k	Kernel Lisbon		2004	2006	:	:	2004	:	:	:	:	:	:	:
pt002c	Oporto	PT022	2004	2006	:	:	2004	:	:	2004	2004	2004	2004	2004
pt003c	Braga	PT007	2004	2006	:	:	2004	:	:	2004	2004	2004	2004	2004
pt004c	Funchal	PT015	2004	2006	:	:	2004	:	:	2004	2004	2004	2004	2004
pt005c	Coimbra	PT009	2004	2006	:	:	2004	:	:	2004	2004	2004	2004	2004
pt006c	Setubal	PT025	2004	2006	:	:	2004	:	:	2004	2004	2004	2004	2004
pt007c	Ponta Delgada	PT021	2004	2006	:	:	2004	:	:	2004	2004	2004	2004	2004
pt008c	Aveiro	PT006	2004	2006	:	:	2004	:	:	2004	2004	2004	2004	2004
pt009c	Faro	PT014	2004	2006	:	:	2004	:	:	2004	2004	2004	2004	2004
ro001c	Bucuresti	RO020	2004	2004	:	:	:	:	:	:	2004	2004	:	:
ro002c	Cluj-Napoca	RO033	2004	2004	:	:	:	:	:	:	2004	2004	:	:
ro003c	Timisoara	RO096	2004	2004	:	:	:	:	:	:	2004	2004	:	:
ro004c	Craiova	RO038	2004	2004	:	:	:	:	:	:	2004	2004	:	:
ro005c	Braila	RO018	2004	2004	:	:	:	:	:	:	2004	2004	:	:
ro006c	Oradea	RO070	2004	2004	:	:	:	:	:	:	2004	2004	:	:
ro007c	Bacau	RO006	2004	2004	:	:	:	:	:	:	2004	2004	:	:
ro008c	Arad	RO005	2004	2004	:	:	:	:	:	:	2004	2004	:	:
ro009c	Sibiu	RO090	2004	2004	:	:	:	:	:	:	2004	2004	:	:
ro010c	Targu Mures	RO100	2004	2004	:	:	:	:	:	:	2004	2004	:	:
ro011c	Piatra Neamt	RO075	2004	2004	:	:	:	:	:	:	2004	2004	:	:
ro012c	Calarasi	RO023	2004	2004	:	:	:	:	:	:	2004	2004	:	:
ro013c	Giurgiu	RO053	2004	2004	:	:	:	:	:	:	2004	2004	:	:
ro014c	Alba Iulia	RO003	2004	2004	:	:	:	:	:	:	2004	2004	:	:
se001c	Stockholm	SE036	2004	2006	2004	2004	2004	:	2004	2004	2004	2004	2004	2004
se001k	Kernel Stockholm		2004	2006	2004	2004	:	:	:	:	:	:	:	:
se002c	Goeteborg	SE008	2004	2006	2004	2004	2004	:	2004	2004	2004	2004	2004	2004
se003c	Malmoe	SE026	:	2006	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004
se004c	Joenkoeping	SE012	2004	2006	2004	2004	2004	:	2004	2004	2004	2004	2004	2004
se005c	Umea	SE042	:	2006	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004
se006c	Uppsala	SE044	2004	2006	2004	2004	2004	:	2004	2004	2004	2004	2004	2004
se007c	Linkoeping	SE023	2004	2006	2004	2004	2004	:	2004	2004	2004	2004	2004	2004
se008c	Oerebro	SE030	2004	2006	2004	2004	2004	:	2004	2004	2004	2004	2004	2004
si001c	Ljubljana	SI009	2004	2004	:	:	:	2004	2004	2004	2004	2004	:	:
si002c	Maribor	SI010	2004	2004	:	:	:	2004	2004	2004	2004	2004	:	:
sk001c	Bratislava	SK004	2004	2004	:	:	2004	2004	2004	2004	2004	2004	2004	2004
sk002c	Kosice	SK012	2004	2004	:	:	2004	2004	2004	2004	2004	2004	2004	2004
sk003c	Banska Bystrica	SK002	2004	2004	:	:	2004	2004	2004	2004	2004	2004	2004	2004
sk004c	Nitra	SK018	2004	2004	:	:	2004	2004	2004	2004	2004	2004	2004	2004
sk005c	PreSov	SK025	2004	2004	:	:	2004	2004	2004	:	2004	2004	2004	2004
sk006c	Zilina	SK038	2004	2004	:	:	2004	2004	2004	:	2004	2004	2004	2004
sk007c	Trnava	SK035	2004	2004	:	:	2004	2004	2004	:	2004	2004	2004	2004
sk008c	Trencin	SK034	2004	2004	:	:	2004	2004	2004	:	2004	2004	2004	2004
tr001c	Ankara	TR006	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr002c	Adana	TR068	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr003c	Antalya	TR008	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr004c	Balikesir	TR011	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr005c	Bursa	TR017	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr006c	Denizli	TR022	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr007c	Diyarbakir	TR023	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr008c	Edirne	TR024	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr009c	Erzurum	TR027	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr010c	Gaziantep	TR029	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr011c	Hatay	TR072	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr012c	Istanbul	TR033	2004	2004	:	:	:	2004	:	:	:	:	:	:

CITY_CODE	CITY_NAME	STSICD	WORKING_POP	TOTAL_POP	EU_NATIONALS	NON_EU_NATIONALS	GDP_HEAD	UNEMPLOY	NACE_A_to_P	HEADQUARTERS	BEDS_AVAIL	BEDS_AVAIL_POP	BEDS_AVAIL_POP_HIGH_S	BEDS_AVAIL_POP_LOW_S
tr013c	Izmir	TR034	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr014c	Kars	TR038	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr015c	Kastamonu	TR039	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr016c	Kayseri	TR040	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr017c	Kocaeli (Izmit)	TR035	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr018c	Konya	TR043	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr019c	Malatya	TR045	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr020c	Manisa	TR046	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr021c	Nevsehir	TR052	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr022c	Samsun	TR056	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr023c	Siirt	TR057	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr024c	Trabzon	TR062	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr025c	Van	TR065	2004	2004	:	:	:	2004	:	:	:	:	:	:
tr026c	Zonguldak	TR067	2004	2004	:	:	:	2004	:	:	:	:	:	:
uk001c	London	UK132	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk001k	Inner London		2004	2004	:	:	:	2004	:	:	:	:	:	:
uk002c	Birmingham	UK591	2004	2004	:	:	:	2004	2004	:	2006	:	:	:
uk003c	Leeds	UK593	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk004c	Glasgow	UK122	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk005c	Bradford	UK599	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk006c	Liverpool	UK178	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk007c	Edinburgh	UK110	2004	2004	:	:	:	2004	2004	:	2005	:	:	:
uk008c	Manchester	UK594	2004	2004	:	:	:	2004	2004	:	2004	2004	:	:
uk009c	Cardiff	UK066	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk010c	Sheffield	UK238	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk011c	Bristol	UK052	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk012c	Belfast	UK031	2004	2004	:	:	:	2004	:	:	2004	2004	2004	2004
uk013c	Newcastle upon Tyne	UK598	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk014c	Leicester	UK173	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk015c	Derry	UK318	2004	2004	:	:	:	:	:	:	2004	2004	2004	2004
uk016c	Aberdeen	UK002	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk017c	Cambridge	UK062	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk018c	Exeter	UK112	2004	2004	:	:	:	2004	2004	:	2005	:	:	:
uk019c	Lincoln	UK177	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk020c	Gravesham	UK597	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk021c	Stevenage	UK252	2004	2004	:	:	:	2004	2004	:	2004	2004	2004	2004
uk022c	Wrexham	UK299	2004	2004	:	:	:	2004	2004	:	2004	2004	:	:
uk023c	Portsmouth	UK221	2004	2004	:	:	:	2004	2004	:	2006	:	:	:
uk024c	Worcester	UK296	2004	2004	:	:	:	2004	2004	:	2004	2004	:	:
uk025c	Coventry	UK087	2004	2004	:	:	:	2004	2004	:	2004	2004	2004	2004
uk026c	Kingston-upon-Hull	UK168	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk027c	Stoke-on-trent	UK595	2004	2004	:	:	:	2004	2004	:	2004	2004	2004	2004
uk028c	Wolverhampton	UK592	2004	2004	:	:	:	2004	2004	:	2006	:	:	:
uk029c	Nottingham	UK208	2004	2004	:	:	:	2004	2004	:	:	:	:	:
uk030c	Wirral	UK596	2004	2004	:	:	:	2004	2004	:	:	:	:	:

NB:

:	… figure not available
CITY_CODE	… city code used for town or city in Urban audit statistics
CITY_NAME	… name of the town or city
STSICD	… "Settlement Site Code" used in the GISCO reference data base
WORKING_POP	… population of working age (15-64 years old)
TOTAL_POP	… total population
EU_NATIONALS	… nationals of another EU Member State as a proportion of the total population (in %)
NON_EU_NATIONALS	… non-EU nationals as a proportion of the total population (in %)
GDP_HEAD	… gross domestic product per head (in euros)
UNEMPLOY	… unemployment rate (in %)
NACE_A_to_P	… employment (jobs) according to different economic activities
HEADQUARTERS	… number of companies quoted on the national stock exchange with headquarters within the town/city
BEDS_AVAIL	… number of beds available
BEDS_AVAIL_POP	… number of beds available per 1000 residents
BEDS_AVAIL_POP_LOW_S	… number of beds available per 1000 residents during the low season
BEDS_AVAIL_POP_HIGH_S	… number of beds available per 1000 residents during the high season

Appendix 4: Accessibility by rail and road (Urban Audit 2003-2006)

CITY_CODE	CITY_NAME	STSICD	ACCESS_RAIL	ACCESS_ROAD
at001c	Vienna	AT022	103	111
at002c	Graz	AT006	86	104
at003c	Linz	AT014	114	121
at004c	Salzburg	AT016	:	:
at005c	Innsbruck	AT007	:	:
be001c	Brussels	BE014	217	186
be002c	Antwerpen	BE004	201	186
be003c	Gent	BE022	193	179
be004c	Charleroi	BE015	193	173
be005c	Liège	BE034	207	188
be006c	Brugge	BE013	164	166
be007c	Namur	BE046	:	:
bg001c	Sofia	BG020	38	47
bg002c	Plovdiv	BG014	32	38
bg003c	Varna	BG023	35	41
bg004c	Burgas	BG003	38	46
bg005c	Pleven	BG013	37	44
bg006c	Ruse	BG016	42	50
bg007c	Vidin	BG024	38	46
ch001c	Zurich	CH016	:	:
ch002c	Geneva	CH006	:	:
ch004c	Bern	CH002	:	:
ch005c	Lausanne	CH009	:	:
cy001c	Lefkosia/Nicosia	CY006	4	5
cz001c	Prague	CZ047	98	117
cz002c	Brno	CZ003	88	101
cz003c	Ostrava	CZ042	91	92
cz004c	Plzen	CZ046	100	119
cz005c	Usti nad Labem	CZ060	106	119
cz006c	Olomouc	CZ039	:	:
cz007c	Liberec	CZ029	:	:
cz008c	Ceske Budejovice	CZ005	:	:
cz009c	Hradec Kralove	CZ015	:	:
cz010c	Pardubice	CZ044	:	:
cz011c	Zlin	CZ066	:	:
cz012c	Kladno	CZ022	:	:
cz013c	Karlovy Vary	CZ020	:	:
cz014c	Jihlava	CZ018	:	:
de001c	Berlin	DE057	150	138
de002c	Hamburg	DE221	156	148
de003c	Munich	DE370	161	159
de004c	Cologne	DE288	236	207
de005c	Frankfurt/Main	DE163	230	199
de006c	Essen	DE151	220	207
de007c	Stuttgart	DE526	:	:
de008c	Leipzig	DE314	161	152
de009c	Dresden	DE121	134	141
de010c	Dortmund	DE119	213	207
de011c	Düsseldorf	DE126	233	207
de012c	Bremen	DE077	173	159
de013c	Hannover	DE226	193	166
de014c	Nürnberg	DE400	168	177
de015c	Bochum	DE067	211	209
de016c	Wuppertal	DE600	217	206
de017c	Bielefeld	DE059	191	178
de018c	Halle/Saale	DE219	164	156
de019c	Magdeburg	DE339	152	148
de020c	Wiesbaden	DE583	212	190
de021c	Göttingen	DE204	192	174
de022c	Mühleim a.d.Ruhr	DE369	225	208

CITY_CODE	CITY_NAME	STSICD	ACCESS_RAIL	ACCESS_ROAD
de023c	Moers	DE361	183	194
de025c	Darmstadt	DE103	212	194
de026c	Trier	DE532	166	184
de027c	Freiburg im Breisgau	DE167	181	160
de028c	Regensburg	DE444	146	162
de029c	Frankfurt/Oder	DE164	114	122
de030c	Weimar	DE565	159	164
de031c	Schwerin	DE490	122	124
de032c	Erfurt	DE144	169	163
de033c	Augsburg	DE025	163	159
de034c	Bonn	DE068	214	192
de035c	Karlsruhe	DE274	210	188
de036c	Mönchengladbach	DE362	223	197
de037c	Mainz	DE341	223	193
de039c	Kiel	DE283	:	:
de040c	Saarbrucken	DE468	:	:
de041c	Potsdam	DE431	:	:
de042c	Koblenz	DE287	:	:
dk001c	Copenhagen	DK013	60	55
dk001k	Kernel Copenhagen		:	:
dk002c	Aarhus	DK026	56	63
dk003c	Odense	DK017	65	66
dk004c	Aalborg	DK001	39	44
ee001c	Tallinn	EE002	21	24
ee002c	Tartu	EE003	32	36
es001c	Madrid	ES119	52	54
es002c	Barcelona	ES033	57	65
es003c	Valencia	ES206	38	42
es004c	Sevilla	ES188	34	31
es005c	Zaragoza	ES225	43	49
es006c	Malaga	ES121	25	26
es007c	Murcia	ES139	28	30
es008c	Las Palmas	ES108	:	:
es009c	Valladolid	ES208	40	44
es010c	Palma di Mallorca	ES148	17	19
es011c	Santiago de Compostela	ES184	22	28
es012c	Vitoria/Gasteiz	ES220	47	50
es013c	Oviedo	ES146	23	29
es014c	Pamplona	ES149	51	50
es015c	Santander	ES183	26	34
es016c	Toledo	ES197	39	43
es017c	Badajoz	ES030	23	36
es018c	Logrono	ES114	40	47
es019c	Bilbao	ES037	:	:
es020c	Cordoba	ES059	:	:
es021c	Alicante	ES016	:	:
es022c	Vigo	ES211	:	:
es023c	Gijon	ES086	:	:
es024c	Hospitalet de Llobregat(L')	ES335	:	:
es025c	Sta. Cruz de Tenerife	ES181	:	:
fi001c	Helsinki	FI003	22	25
fi001k	Kernel Helsinki		:	:
fi002c	Tampere	FI034	15	16
fi003c	Turku	FI036	13	14
fi004c	Oulu	FI023	6	6
fr001c	Paris	FR159	225	182
fr001k	Paris with "small ring"		:	:
fr003c	Lyon	FR124	162	135
fr004c	Toulouse	FR202	75	77
fr006c	Strasbourg	FR197	192	184
fr007c	Bordeaux	FR037	95	72
fr008c	Nantes	FR149	106	83
fr009c	Lille	FR118	206	176
fr010c	Montpellier	FR145	101	91

CITY_CODE	CITY_NAME	STSICD	ACCESS_RAIL	ACCESS_ROAD
fr011c	Saint-Etienne	FR181	128	116
fr012c	Le Havre	FR112	112	123
fr013c	Rennes	FR171	100	85
fr014c	Amiens	FR009	168	169
fr015c	Rouen	FR176	112	123
fr016c	Nancy	FR148	163	171
fr017c	Metz	FR134	169	191
fr018c	Reims	FR170	139	180
fr019c	Orléans	FR156	131	130
fr020c	Dijon	FR074	160	156
fr021c	Poitiers	FR165	127	91
fr022c	Clermont-Ferrand	FR064	87	103
fr023c	Caen	FR045	84	113
fr024c	Limoges	FR119	79	81
fr025c	Besançon	FR033	152	148
fr026c	Grenoble	FR096	142	121
fr027c	Ajaccio	FR005	22	24
fr032c	Toulon	FR201	:	:
fr035c	Tours	FR203	:	:
fr202c	Aix-en-Provence	FR003	:	:
fr203c	Marseille	FR128	113	89
fr205c	Nice	FR152	88	89
fr207c	Lens - Liévin	FR115	:	:
gr001c	Athens	GR005	23	28
gr001k	Kernel Athens		:	:
gr002c	Thessaloniki	GR031	28	35
gr003c	Patra	GR025	16	20
gr004c	Irakleio	GR010	4	5
gr005c	Larisa	GR023	23	28
gr006c	Volos	GR035	22	26
gr007c	Ioannina	GR009	27	31
gr008c	Kavala	GR014	21	26
gr009c	Kalamata	GR066	11	14
hr001c	Zagreb	HR054	:	:
hr002c	Rijeka	HR035	:	:
hr003c	Slavonski Brod	HR043	:	:
hr004c	Osijek	HR028	:	:
hr005c	Split	HR045	:	:
hu001c	Budapest	HU006	81	88
hu002c	Miskolc	HU038	66	73
hu003c	Nyiregyhaza	HU043	57	66
hu004c	Pecs	HU049	54	57
hu005c	Debrecen	HU009	:	:
hu006c	Szeged	HU054	:	:
hu007c	Gyor	HU018	:	:
hu008c	Kecskemet	HU029	:	:
hu009c	Szekesfehervar	HU055	:	:
ie001c	Dublin	IE006	35	36
ie002c	Cork	IE002	16	15
ie003c	Limerick	IE007	18	17
ie004c	Galway	IE005	17	15
ie005c	Waterford	IE008	:	:
it001c	Rome	IT344	85	87
it002c	Milan	IT240	:	147
it003c	Naples	IT267	78	74
it004c	Turin	IT410	142	126
it005c	Palermo	IT295	19	24
it006c	Genoa	IT174	109	121
it007c	Florence	IT154	93	115
it008c	Bari	IT042	52	62
it009c	Bologna	IT054	119	133
it010c	Catania	IT093	25	30
it011c	Venice	IT430	103	113
it012c	Verona	IT434	129	140

CITY_CODE	CITY_NAME	STSICD	ACCESS_RAIL	ACCESS_ROAD
it013c	Cremona	IT133	117	138
it014c	Trento	IT417	116	130
it015c	Trieste	IT421	91	89
it016c	Perugia	IT302	65	91
it017c	Ancona	IT019	84	85
it018c	l'Aquila	IT199	55	77
it019c	Pescara	IT304	70	77
it020c	Campobasso	IT069	58	66
it021c	Caserta	IT084	73	76
it022c	Taranto	IT402	47	53
it023c	Potenza	IT325	55	59
it024c	Catanzaro	IT094	34	37
it025c	Reggio di Calabria	IT335	31	36
it026c	Sassari	IT376	12	14
it027c	Cagliari	IT063	9	10
it028c	Padova	IT293	20	75
it029c	Brescia	IT058	:	:
it030c	Modena	IT246	:	:
it031c	Foggia	IT155	:	:
it032c	Salerno	IT353	:	:
lt001c	Vilnius	LT006	32	33
lt002c	Kaunas	LT002	30	33
lt003c	Panevezys	LT004	24	29
lu001c	Luxembourg	LU002	166	192
lv001c	Riga	LV004	22	26
lv002c	Liepaja	LV003	17	19
mt001c	Valletta	MT001	9	10
nl001c	The Hague	NL001	185	155
nl002c	Amsterdam	NL007	180	152
nl003c	Rotterdam	NL056	191	164
nl004c	Utrecht	NL066	197	175
nl005c	Eindhoven	NL022	202	189
nl006c	Tilburg	NL065	197	182
nl007c	Groningen	NL030	135	132
nl008c	Enschede	NL024	174	167
nl009c	Arnhem	NL009	200	184
nl010c	Heerlen	NL033	202	186
nl011c	Almere	NL086	:	:
nl012c	Breda	NL013	:	:
nl013c	Nijmegen	NL049	:	:
nl014c	Apeldoorn	NL008	:	:
nl015c	Leeuwarden	NL042	:	:
nl513c	Deventer	NL018	:	:
nl514c	Alkmaar	NL003	:	:
nl515c	Venlo	NL071	:	:
nl516c	Helmond	NL034	:	:
nl517c	Hengelo (O.)	NL035	:	:
nl518c	Schiedam	NL057	:	:
nl519c	Almelo	NL004	:	:
nl520c	Lelystad	NL085	:	:
no001c	Oslo	NO017	:	:
no002c	Bergen	NO003	:	:
no003c	Trondheim	NO029	:	:
no004c	Stavanger	NO025	:	:
no005c	Kristiansand	NO012	:	:
no006c	Tromso	NO028		
pl001c	Warsaw	PL183	82	72
pl002c	Lodz	PL086	78	80
pl003c	Krakow	PL074	89	89
pl004c	Wroclaw	PL189	94	96
pl005c	Poznan	PL130	91	75
pl006c	Gdansk	PL034	62	45
pl007c	Szczecin	PL167	93	83
pl008c	Bydgoszcz	PL017	81	66

CITY_CODE	CITY_NAME	STSICD	ACCESS_RAIL	ACCESS_ROAD
pl009c	Lublin	PL093	68	68
pl010c	Katowice	PL061	97	96
pl011c	Bialystok	PL008	57	46
pl012c	Kielce	PL064	72	80
pl013c	Torun	PL176	65	64
pl014c	Olsztyn	PL113	50	46
pl015c	Rzeszow	PL142	74	79
pl016c	Opole	PL115	93	94
pl017c	Gorzow Wielkopolski	PL042	81	80
pl018c	Zielona Gora	PL201	91	84
pl019c	Jelenia Gora	PL058	82	90
pl020c	Nowy Sacz	PL107	71	80
pl021c	Suwalki	PL161	57	46
pl022c	Konin	PL069	84	78
pl023c	Zory	PL202	88	91
pl024c	Czestochowa	PL027	:	:
pl025c	Radom	PL138	:	:
pl026c	Plock	PL128	:	:
pl027c	Kalisz	PL059	:	:
pl028c	Koszalin	PL073	:	:
pt001c	Lisbon	PT018	22	36
pt001k	Kernel Lisbon		:	:
pt002c	Oporto	PT022	27	39
pt003c	Braga	PT007	27	38
pt004c	Funchal	PT015	:	:
pt005c	Coimbra	PT009	24	36
pt006c	Setubal	PT025	21	34
pt007c	Ponta Delgada	PT021	:	:
pt008c	Aveiro	PT006	25	35
pt009c	Faro	PT014	:	:
ro001c	Bucuresti	RO020	48	55
ro002c	Cluj-Napoca	RO033	43	49
ro003c	Timisoara	RO096	52	58
ro004c	Craiova	RO038	43	48
ro005c	Braila	RO018	36	41
ro006c	Oradea	RO070	51	56
ro007c	Bacau	RO006	38	44
ro008c	Arad	RO005	52	58
ro009c	Sibiu	RO090	42	48
ro010c	Targu Mures	RO100	40	46
ro011c	Piatra Neamt	RO075	37	43
ro012c	Calarasi	RO023	37	44
ro013c	Giurgiu	RO053	43	50
ro014c	Alba Iulia	RO003	43	48
se001c	Stockholm	SE036	24	20
se001k	Kernel Stockholm		:	:
se002c	Goeteborg	SE008	30	29
se003c	Malmoe	SE026	58	49
se004c	Joenkoeping	SE012	32	23
se005c	Umea	SE042	5	4
se006c	Uppsala	SE044	:	:
se007c	Linkoeping	SE023	:	:
se008c	Oerebro	SE030	:	:
si001c	Ljubljana	SI009	76	92
si002c	Maribor	SI010	77	88
sk001c	Bratislava	SK004	93	101
sk002c	Kosice	SK012	66	73
sk003c	Banska Bystrica	SK002	69	81
sk004c	Nitra	SK018	76	89
sk005c	PreSov	SK025	:	:
sk006c	Zilina	SK038	:	:
sk007c	Trnava	SK035	:	:
sk008c	Trencin	SK034	:	:
tr001c	Ankara	TR006	:	:

CITY_CODE	CITY_NAME	STSICD	ACCESS_RAIL	ACCESS_ROAD
tr002c	Adana	TR068	:	:
tr003c	Antalya	TR008	:	:
tr004c	Balikesir	TR011	:	:
tr005c	Bursa	TR017	:	:
tr006c	Denizli	TR022	:	:
tr007c	Diyarbakir	TR023	:	:
tr008c	Edirne	TR024	:	:
tr009c	Erzurum	TR027	:	:
tr010c	Gaziantep	TR029	:	:
tr011c	Hatay	TR072	:	:
tr012c	Istanbul	TR033	:	:
tr013c	Izmir	TR034	:	:
tr014c	Kars	TR038	:	:
tr015c	Kastamonu	TR039	:	:
tr016c	Kayseri	TR040	:	:
tr017c	Kocaeli (Izmit)	TR035	:	:
tr018c	Konya	TR043	:	:
tr019c	Malatya	TR045	:	:
tr020c	Manisa	TR046	:	:
tr021c	Nevsehir	TR052	:	:
tr022c	Samsun	TR056	:	:
tr023c	Siirt	TR057	:	:
tr024c	Trabzon	TR062	:	:
tr025c	Van	TR065	:	:
tr026c	Zonguldak	TR067	:	:
uk001c	London	UK132	153	153
uk001k	Inner London		:	:
uk002c	Birmingham	UK591	127	129
uk003c	Leeds	UK593	104	105
uk004c	Glasgow	UK122	63	54
uk005c	Bradford	UK599	101	106
uk006c	Liverpool	UK178	108	103
uk007c	Edinburgh	UK110	60	48
uk008c	Manchester	UK594	117	113
uk009c	Cardiff	UK066	102	89
uk010c	Sheffield	UK238	116	117
uk011c	Bristol	UK052	113	104
uk012c	Belfast	UK031	32	34
uk013c	Newcastle upon Tyne	UK598	79	65
uk014c	Leicester	UK173	123	124
uk015c	Derry	UK318	19	22
uk016c	Aberdeen	UK002	31	23
uk017c	Cambridge	UK062	121	128
uk018c	Exeter	UK112	83	69
uk019c	Lincoln	UK177	96	102
uk020c	Gravesham	UK597	168	142
uk021c	Stevenage	UK252	156	149
uk022c	Wrexham	UK299	102	101
uk023c	Portsmouth	UK221	117	110
uk024c	Worcester	UK296	112	119
uk025c	Coventry	UK087	:	:
uk026c	Kingston-upon-Hull	UK168	:	:
uk027c	Stoke-on-trent	UK595	:	:
uk028c	Wolverhampton	UK592	:	:
uk029c	Nottingham	UK208	:	:
uk030c	Wirral	UK596	:	:

NB:

:	… figure not available
	… figure referring to 1999-2002 (i.e. figure for 2003-2006 not available)
CITY_CODE	… city code used for town or city in Urban audit statistics
CITY_NAME	… name of the town or city
STSICD	… "Settlement Site Code" used in the GISCO reference data base
ACCESS_RAIL	… accessibility by rail (index, EU-27=100)
ACCESS_ROAD	… accessibility by road (index, EU-27=100)

Appendix 5: Population of working age and proportion of residents who are nationals of another EU Member State or non-EU nationals (Urban Audit 2003-2006)

CITY_CODE	CITY_NAME	STSICD	WORKING_ POP	STSICD	EU_ NATIONALS	NON_EU_ NATIONALS
at001c	Vienna	AT022	1 119 627	AT022	3,61	13,71
at002c	Graz	AT006	165 479	AT006	2,46	9,61
at003c	Linz	AT014	126 967	AT014	1,83	10,84
at004c	Salzburg	AT016	102 437	AT016	4,18	15,55
at005c	Innsbruck	AT007	79 070	AT007	4,74	8,96
be001c	Brussels	BE014	661 179	BE014	15,26	11,09
be002c	Antwerpen	BE004	289 837	BE004	4,42	6,85
be003c	Gent	BE022	151 424	BE022	2,13	4,69
be004c	Charleroi	BE015	130 056	BE015	10,40	3,60
be005c	Liège	BE034	233 655	BE034	11,72	4,13
be006c	Brugge	BE013	76 161	BE013	1,54	0,85
be007c	Namur	BE046	70 139	BE046	3,18	2,06
bg001c	Sofia	BG020	775 990	BG020	0,10	0,67
bg002c	Plovdiv	BG014	244 979	BG014	0,18	0,50
bg003c	Varna	BG023	229 525	BG023	0,06	0,56
bg004c	Burgas	BG003	140 508	BG003	0,02	0,43
bg005c	Pleven	BG013	88 812	BG013	0,05	0,55
bg006c	Ruse	BG016	116 072	BG016	0,01	0,27
bg007c	Vidin	BG024	41 999	BG024	0,00	0,25
ch001c	Zurich	CH016	253 975	CH016	14,96	14,33
ch002c	Geneva	CH006	124 871	CH006	28,16	15,68
ch004c	Bern	CH002	88 693	CH002	11,48	10,34
ch005c	Lausanne	CH009	85 858	CH009	21,70	14,08
cy001c	Lefkosia/Nicosia	CY006	149 900	CY006	4,61	5,53
cz001c	Prague	CZ047	822 528	CZ047	0,92	2,08
cz002c	Brno	CZ003	263 289	CZ003	0,61	0,82
cz003c	Ostrava	CZ042	224 753	CZ042	0,53	0,67
cz004c	Plzen	CZ046	117 629	CZ046	0,26	0,85
cz005c	Usti nad Labem	CZ060	67 536	CZ060	0,42	1,23
cz006c	Olomouc	CZ039	72 556	CZ039	:	:
cz007c	Liberec	CZ029	70 142	CZ029	:	:
cz008c	Ceske Budejovice	CZ005	68 142	CZ005	:	:
cz009c	Hradec Kralove	CZ015	68 194	CZ015	:	:
cz010c	Pardubice	CZ044	63 672	CZ044	:	:
cz011c	Zlin	CZ066	56 603	CZ066	:	:
cz012c	Kladno	CZ022	49 946	CZ022	:	:
cz013c	Karlovy Vary	CZ020	37 114	CZ020	:	:
cz014c	Jihlava	CZ018	35 910	CZ018	:	:
de001c	Berlin	DE057	2 413 451	DE057	3,43	9,99
de002c	Hamburg	DE221	1 196 576	DE221	3,53	10,56
de003c	Munich	DE370	878 721	DE370	8,74	15,08
de004c	Cologne	DE288	667 828	DE288	5,03	12,34
de005c	Frankfurt/Main	DE163	455 286	DE163	6,66	14,89
de006c	Essen	DE151	383 599	DE151	2,91	8,79
de007c	Stuttgart	DE526	409 863	DE526	8,96	14,80
de008c	Leipzig	DE314	345 949	DE314	1,77	4,41
de009c	Dresden	DE121	337 385	DE121	1,50	3,49
de010c	Dortmund	DE119	388 705	DE119	3,74	12,20
de011c	Düsseldorf	DE126	390 341	DE126	6,72	11,12
de012c	Bremen	DE077	366 334	DE077	2,66	10,55
de013c	Hannover	DE226	351 732	DE226	3,80	11,36
de014c	Nürnberg	DE400	334 207	DE400	5,59	12,36
de015c	Bochum	DE067	261 373	DE067	2,76	8,73
de016c	Wuppertal	DE600	237 404	DE600	5,48	10,16
de017c	Bielefeld	DE059	214 661	DE059	2,93	9,54
de018c	Halle/Saale	DE219	166 146	DE219	0,59	3,40
de019c	Magdeburg	DE339	156 438	DE339	0,53	3,04
de020c	Wiesbaden	DE583	185 331	DE583	7,33	13,10
de021c	Göttingen	DE204	87 745	DE204	2,70	7,94
de022c	Mühleim a.d.Ruhr	DE369	109 052	DE369	2,29	7,46

CITY_CODE	CITY_NAME	STSICD	WORKING_ POP	STSICD	EU_ NATIONALS	NON_EU_ NATIONALS
de023c	Moers	DE361	71 130	DE361	2,50	7,60
de025c	Darmstadt	DE103	96 585	DE103	4,71	10,42
de026c	Trier	DE532	68 087	DE532	3,89	4,79
de027c	Freiburg im Breisgau	DE167	153 486	DE167	4,81	9,02
de028c	Regensburg	DE444	89 084	DE444	2,79	8,38
de029c	Frankfurt/Oder	DE164	46 805	DE164	2,30	2,91
de030c	Weimar	DE565	45 345	DE565	0,78	2,33
de031c	Schwerin	DE490	67 788	DE490	0,31	4,12
de032c	Erfurt	DE144	143 757	DE144	0,64	2,47
de033c	Augsburg	DE025	173 170	DE025	4,19	13,75
de034c	Bonn	DE068	212 167	DE068	4,49	12,31
de035c	Karlsruhe	DE274	194 370	DE274	6,62	8,59
de036c	Mönchengladbach	DE362	172 376	DE362	3,28	7,44
de037c	Mainz	DE341	129 423	DE341	6,07	12,79
de039c	Kiel	DE283	163 282	DE283	1,93	7,37
de040c	Saarbrucken	DE468	122 203	DE468	5,94	8,54
de041c	Potsdam	DE431	103 657	DE431	1,17	4,26
de042c	Koblenz	DE287	70 013	DE287	1,96	7,85
dk001c	Copenhagen	DK013	367 700	DK013	3,03	8,26
dk001k	Kernel Copenhagen		:		:	:
dk002c	Aarhus	DK026	206 222	DK026	1,36	4,64
dk003c	Odense	DK017	125 968	DK017	1,10	4,87
dk004c	Aalborg	DK001	111 796	DK001	1,00	3,62
ee001c	Tallinn	EE002	275 535	EE002	0,14	27,81
ee002c	Tartu	EE003	67 616	EE003	0,27	8,27
es001c	Madrid	ES119	2 132 316	ES119	0,87	11,66
es002c	Barcelona	ES033	1 061 467	ES033	1,74	10,19
es003c	Valencia	ES206	545 933	ES206	0,81	7,79
es004c	Sevilla	ES188	491 373	ES188	0,34	2,01
es005c	Zaragoza	ES225	441 621	ES225	0,39	6,24
es006c	Malaga	ES121	385 137	ES121	0,67	3,29
es007c	Murcia	ES139	275 716	ES139	0,41	7,92
es008c	Las Palmas	ES108	270 103	ES108	0,98	5,29
es009c	Valladolid	ES208	229 790	ES208	0,22	2,69
es010c	Palma di Mallorca	ES148	263 864	ES148	2,70	9,81
es011c	Santiago de Compostela	ES184	65 923	ES184	0,47	2,01
es012c	Vitoria/Gasteiz	ES220	161 558	ES220	0,61	4,06
es013c	Oviedo	ES146	147 400	ES146	0,38	3,32
es014c	Pamplona	ES149	132 195	ES149	0,74	7,53
es015c	Santander	ES183	126 839	ES183	0,32	3,89
es016c	Toledo	ES197	51 324	ES197	0,32	4,26
es017c	Badajoz	ES030	97 528	ES030	0,77	1,46
es018c	Logrono	ES114	99 486	ES114	0,50	8,69
es019c	Bilbao	ES037	238 381	ES037	0,34	3,37
es020c	Cordoba	ES059	220 626	ES059	0,16	1,19
es021c	Alicante	ES016	216 063	ES016	1,49	7,83
es022c	Vigo	ES211	208 008	ES211	0,73	2,50
es023c	Gijon	ES086	190 070	ES086	0,45	2,14
es024c	Hospitalet de Llobregat(L')	ES335	176 466	ES335	0,39	12,96
es025c	Sta. Cruz de Tenerife	ES181	157 132	ES181	0,87	3,75
fi001c	Helsinki		401 211		:	3,60
fi001k	Kernel Helsinki	FI003	680 162	FI003	1,57	3,19
fi002c	Tampere	FI034	137 927	FI034	0,66	2,04
fi003c	Turku	FI036	120 123	FI036	1,02	3,27
fi004c	Oulu	FI023	87 576	FI023	0,42	1,15
fr001c	Paris		1 510 880	FR159	4,31	10,20
fr001k	Paris with "small ring"	FR159	4 250 500		4,11	10,11
fr003c	Lyon	FR124	788 893	FR124	2,43	6,24
fr004c	Toulouse	FR202	412 137	FR202	2,01	4,00
fr006c	Strasbourg	FR197	313 274	FR197	2,99	6,97
fr007c	Bordeaux	FR037	454 270	FR037	2,15	2,97
fr008c	Nantes	FR149	379 174	FR149	0,63	1,86
fr009c	Lille	FR118	727 875	FR118	1,88	3,95
fr010c	Montpellier	FR145	286 492	FR145	1,70	5,13

CITY_CODE	CITY_NAME	STSICD	WORKING_ POP
fr011c	Saint-Etienne	FR181	248 265
fr012c	Le Havre	FR112	167 228
fr013c	Rennes	FR171	260 124
fr014c	Amiens	FR009	118 874
fr015c	Rouen	FR176	262 573
fr016c	Nancy	FR148	181 286
fr017c	Metz	FR134	147 193
fr018c	Reims	FR170	150 216
fr019c	Orléans	FR156	182 206
fr020c	Dijon	FR074	166 560
fr021c	Poitiers	FR165	89 397
fr022c	Clermont-Ferrand	FR064	183 430
fr023c	Caen	FR045	150 521
fr024c	Limoges	FR119	126 143
fr025c	Besançon	FR033	118 709
fr026c	Grenoble	FR096	260 456
fr027c	Ajaccio	FR005	41 717
fr032c	Toulon	FR201	244 277
fr035c	Tours	FR203	180 553
fr202c	Aix-en-Provence	FR003	234 935
fr203c	Marseille	FR128	632 823
fr205c	Nice	FR152	306 171
fr207c	Lens - Liévin	FR115	158 353
gr001c	Athens		575 799
gr001k	Kernel Athens	GR005	2 065 268
gr002c	Thessaloniki	GR031	275 481
gr003c	Patra	GR025	127 334
gr004c	Irakleio	GR010	108 203
gr005c	Larisa	GR023	99 002
gr006c	Volos	GR035	59 915
gr007c	Ioannina	GR009	57 713
gr008c	Kavala	GR014	43 369
gr009c	Kalamata	GR066	45 779
hr001c	Zagreb	HR054	536 981
hr002c	Rijeka	HR035	100 703
hr003c	Slavonski Brod	HR043	43 520
hr004c	Osijek	HR028	79 092
hr005c	Split	HR045	129 653
hu001c	Budapest	HU006	1 180 035
hu002c	Miskolc	HU038	126 739
hu003c	Nyiregyhaza	HU043	87 854
hu004c	Pecs	HU049	114 218
hu005c	Debrecen	HU009	147 991
hu006c	Szeged	HU054	115 800
hu007c	Gyor	HU018	93 120
hu008c	Kecskemet	HU029	76 493
hu009c	Szekesfehervar	HU055	76 567
ie001c	Dublin	IE006	334 136
ie002c	Cork	IE002	79 360
ie003c	Limerick	IE007	34 525
ie004c	Galway	IE005	45 952
ie005c	Waterford	IE008	28 989
it001c	Rome	IT344	1 705 699
it002c	Milan	IT240	843 991
it003c	Naples	IT267	666 429
it004c	Turin	IT410	585 615
it005c	Palermo	IT295	455 487
it006c	Genoa	IT174	377 473
it007c	Florence	IT154	232 126
it008c	Bari	IT042	223 575
it009c	Bologna	IT054	236 589
it010c	Catania	IT093	200 905
it011c	Venice	IT430	173 784
it012c	Verona	IT434	169 039

STSICD	EU_ NATIONALS	NON_EU_ NATIONALS
FR181	2,03	5,85
FR112	0,66	2,80
FR171	0,58	1,97
FR009	0,84	2,98
FR176	1,08	3,24
FR148	1,49	3,72
FR134	2,12	4,48
FR170	1,69	3,24
FR156	2,54	4,60
FR074	1,85	3,92
FR165	0,77	2,18
FR064	3,48	3,05
FR045	0,73	2,05
FR119	1,10	3,05
FR033	1,48	3,62
FR096	3,45	4,94
FR005	2,95	5,39
FR201	:	:
FR203	1,80	2,49
FR003	:	:
FR128	0,97	5,26
FR152	:	:
FR115	0,51	2,79
GR005	2,89	22,97
	1,42	10,65
GR031	1,40	10,08
GR025	0,34	5,27
GR010	0,47	3,59
GR023	0,13	4,25
GR035	0,32	3,82
GR009	0,22	6,43
GR014	0,39	4,69
GR066	0,32	4,69
HR054	0,09	0,73
HR035	0,18	1,02
HR043	0,05	0,87
HR028	0,04	0,56
HR045	0,07	0,57
HU006	0,24	1,32
HU038	0,18	0,25
HU043	0,18	0,62
HU049	0,13	0,74
HU009	0,08	0,61
HU054	0,15	0,90
HU018	0,27	0,36
HU029	0,06	0,19
HU055	0,22	0,42
IE006	4,22	8,88
IE002	4,73	2,62
IE007	4,97	2,57
IE005	7,76	5,24
IE008	4,39	3,12
IT344	0,93	4,75
IT240	0,79	10,23
IT267	0,19	1,29
IT410	0,41	7,27
IT295	0,13	1,97
IT174	0,28	4,45
IT154	0,72	7,48
IT042	0,38	1,60
IT054	0,54	6,24
IT093	0,18	1,67
IT430	0,44	4,36
IT434	0,47	7,69

CITY_CODE	CITY_NAME	STSICD	WORKING_ POP	STSICD	EU_ NATIONALS	NON_EU_ NATIONALS
it013c	Cremona	IT133	45 773	IT133	0,31	6,48
it014c	Trento	IT417	73 871	IT417	0,47	5,39
it015c	Trieste	IT421	129 192	IT421	0,53	4,73
it016c	Perugia	IT302	103 217	IT302	0,96	7,63
it017c	Ancona	IT019	65 789	IT019	0,46	5,52
it018c	l'Aquila	IT199	48 924	IT199	0,47	2,97
it019c	Pescara	IT304	80 025	IT304	0,24	1,76
it020c	Campobasso	IT069	34 880	IT069	0,11	0,75
it021c	Caserta	IT084	53 978	IT084	0,42	1,85
it022c	Taranto	IT402	135 858	IT402	0,11	0,28
it023c	Potenza	IT325	47 517	IT325	0,07	0,57
it024c	Catanzaro	IT094	65 138	IT094	0,21	0,90
it025c	Reggio di Calabria	IT335	122 969	IT335	0,36	2,52
it026c	Sassari	IT376	88 476	IT376	0,22	0,71
it027c	Cagliari	IT063	112 137	IT063	0,14	1,39
it028c	Padova	IT293	137 630	IT293	0,40	7,33
it029c	Brescia	IT058	124 798	IT058	0,37	12,22
it030c	Modena	IT246	117 764	IT246	0,56	8,38
it031c	Foggia	IT155	104 308	IT155	0,11	1,24
it032c	Salerno	IT353	89 021	IT353	0,27	1,50
lt001c	Vilnius	LT006	398 960	LT006	0,05	1,10
lt002c	Kaunas	LT002	257 928	LT002	0,01	0,49
lt003c	Panevezys	LT004	81 539	LT004	0,01	0,47
lu001c	Luxembourg	LU002	53 429	LU002	45,87	7,79
lv001c	Riga	LV004	513 725	LV004	0,06	6,22
lv002c	Liepaja	LV003	59 113	LV003	0,01	6,91
mt001c	Valletta	MT001	143 987	MT001	1,27	0,64
nl001c	The Hague	NL001	321 833	NL001	2,74	7,62
nl002c	Amsterdam	NL007	535 118	NL007	3,61	8,47
nl003c	Rotterdam	NL056	409 332	NL056	2,02	7,97
nl004c	Utrecht	NL066	197 021	NL066	1,84	5,94
nl005c	Eindhoven	NL022	142 947	NL022	1,91	4,92
nl006c	Tilburg	NL065	138 908	NL065	1,02	3,73
nl007c	Groningen	NL030	134 523	NL030	1,06	2,65
nl008c	Enschede	NL024	105 980	NL024	1,67	4,26
nl009c	Arnhem	NL009	99 979	NL009	1,11	4,97
nl010c	Heerlen	NL033	63 037	NL033	2,26	2,82
nl011c	Almere	NL086	117 943	NL086	1,27	3,79
nl012c	Breda	NL013	112 072	NL013	1,14	2,78
nl013c	Nijmegen	NL049	112 570	NL049	1,81	3,63
nl014c	Apeldoorn	NL008	103 866	NL008	0,45	2,02
nl015c	Leeuwarden	NL042	63 590	NL042	0,58	3,17
nl513c	Deventer	NL018	60 964	NL018	:	:
nl514c	Alkmaar	NL003	65 049	NL003	:	:
nl515c	Venlo	NL071	63 927	NL071	:	:
nl516c	Helmond	NL034	58 671	NL034	:	:
nl517c	Hengelo (O.)	NL035	56 392	NL035	:	:
nl518c	Schiedam	NL057	52 798	NL057	:	:
nl519c	Almelo	NL004	49 961	NL004	:	:
nl520c	Lelystad	NL085	49 751	NL085	:	:
no001c	Oslo	NO017	363 614	NO017	4,04	5,97
no002c	Bergen	NO003	156 176	NO003	1,79	2,79
no003c	Trondheim	NO029	104 236	NO029	1,61	2,49
no004c	Stavanger	NO025	75 356	NO025	3,17	3,13
no005c	Kristiansand	NO012	49 146	NO012	1,72	3,12
no006c	Tromso	NO028	42 736	NO028	2,68	2,39
pl001c	Warsaw	PL183	1 205 306	PL183	:	:
pl002c	Lodz	PL086	554 795	PL086	:	:
pl003c	Krakow	PL074	548 863	PL074	:	:
pl004c	Wroclaw	PL189	461 747	PL189	:	:
pl005c	Poznan	PL130	416 726	PL130	0,03	0,07
pl006c	Gdansk	PL034	330 557	PL034	:	:
pl007c	Szczecin	PL167	297 886	PL167	0,04	0,10
pl008c	Bydgoszcz	PL017	264 279	PL017	:	:

CITY_CODE	CITY_NAME	STSICD	WORKING_ POP
pl009c	Lublin	PL093	262 033
pl010c	Katowice	PL061	231 063
pl011c	Bialystok	PL008	213 532
pl012c	Kielce	PL064	154 206
pl013c	Torun	PL176	153 554
pl014c	Olsztyn	PL113	128 764
pl015c	Rzeszow	PL142	116 796
pl016c	Opole	PL115	95 701
pl017c	Gorzow Wielkopolski	PL042	92 774
pl018c	Zielona Gora	PL201	87 188
pl019c	Jelenia Gora	PL058	62 741
pl020c	Nowy Sacz	PL107	60 000
pl021c	Suwalki	PL161	49 405
pl022c	Konin	PL069	59 572
pl023c	Zory	PL202	49 206
pl024c	Czestochowa	PL027	178 427
pl025c	Radom	PL138	162 459
pl026c	Plock	PL128	94 398
pl027c	Kalisz	PL059	77 767
pl028c	Koszalin	PL073	79 054
pt001c	Lisbon		333 761
pt001k	Kernel Lisbon	PT018	1 225 303
pt002c	Oporto	PT022	159 516
pt003c	Braga	PT007	119 882
pt004c	Funchal	PT015	70 714
pt005c	Coimbra	PT009	97 706
pt006c	Setubal	PT025	82 876
pt007c	Ponta Delgada	PT021	44 470
pt008c	Aveiro	PT006	50 644
pt009c	Faro	PT014	40 430
ro001c	Bucuresti	RO020	1 427 245
ro002c	Cluj-Napoca	RO033	239 901
ro003c	Timisoara	RO096	230 771
ro004c	Craiova	RO038	229 447
ro005c	Braila	RO018	163 608
ro006c	Oradea	RO070	155 769
ro007c	Bacau	RO006	138 872
ro008c	Arad	RO005	125 025
ro009c	Sibiu	RO090	116 464
ro010c	Targu Mures	RO100	110 347
ro011c	Piatra Neamt	RO075	84 287
ro012c	Calarasi	RO023	55 918
ro013c	Giurgiu	RO053	52 079
ro014c	Alba Iulia	RO003	51 270
se001c	Stockholm		526 150
se001k	Kernel Stockholm	SE036	950 242
se002c	Goeteborg	SE008	328 038
se003c	Malmoe	SE026	177 094
se004c	Joenkoeping	SE012	76 617
se005c	Umea	SE042	75 596
se006c	Uppsala	SE044	124 955
se007c	Linkoeping	SE023	90 897
se008c	Oerebro	SE030	83 672
si001c	Ljubljana	SI009	188 809
si002c	Maribor	SI010	79 554
sk001c	Bratislava	SK004	318 800
sk002c	Kosice	SK012	173 075
sk003c	Banska Bystrica	SK002	62 019
sk004c	Nitra	SK018	63 766
sk005c	PreSov	SK025	66 811
sk006c	Zilina	SK038	63 051
sk007c	Trnava	SK035	52 626
sk008c	Trencin	SK034	41 672
tr001c	Ankara	TR006	2 365 417

STSICD	EU_ NATIONALS	NON_EU_ NATIONALS
PL093	:	:
PL061	:	:
PL008	:	:
PL064	:	:
PL176	:	:
PL113	:	:
PL142	:	:
PL115	:	:
PL042	:	:
PL201	0,05	0,12
PL058	0,05	0,11
PL107	0,02	0,10
PL161	0,00	0,04
PL069	0,01	0,03
PL202	0,03	0,05
PL027	0,02	0,15
PL138	0,01	0,05
PL128	:	:
PL059	0,01	0,09
PL073	:	:
PT018	0,76	2,66
	:	:
PT022	0,52	1,13
PT007	0,36	1,16
PT015	0,49	1,14
PT009	0,29	1,17
PT025	0,29	3,18
PT021	0,14	0,61
PT006	0,33	1,67
PT014	1,32	2,57
RO020	0,08	0,49
RO033	0,08	0,27
RO096	0,14	0,34
RO038	0,06	0,09
RO018	0,01	0,05
RO070	0,06	0,20
RO006	0,03	0,12
RO005	0,10	0,11
RO090	0,04	0,11
RO100	0,03	0,10
RO075	0,03	0,10
RO023	0,01	0,03
RO053	0,01	0,02
RO003	0,07	0,11
SE036	3,92	5,35
	4,08	5,08
SE008	3,01	5,54
SE026	3,92	5,93
SE012	1,14	2,45
SE042	2,02	2,10
SE044	2,19	3,85
SE023	1,12	3,00
SE030	1,22	3,76
SI009	0,11	3,63
SI010	0,06	1,69
SK004	0,99	0,32
SK012	0,46	0,33
SK002	0,36	3,48
SK018	0,27	1,93
SK025	0,18	1,91
SK038	0,25	1,49
SK035	0,20	1,64
SK034	0,51	2,21
TR006	0,04	0,19

CITY_CODE	CITY_NAME	STSICD	WORKING_ POP	STSICD	EU_ NATIONALS	NON_EU_ NATIONALS
tr002c	Adana	TR068	758 878	TR068	0,01	0,03
tr003c	Antalya	TR008	476 288	TR008	2,05	0,70
tr004c	Balikesir	TR011	154 931	TR011	0,03	0,03
tr005c	Bursa	TR017	907 071	TR017	0,17	1,25
tr006c	Denizli	TR022	200 035	TR022	0,03	0,03
tr007c	Diyarbakir	TR023	326 616	TR023	0,00	0,01
tr008c	Edirne	TR024	87 232	TR024	0,05	0,26
tr009c	Erzurum	TR027	243 622	TR027	0,00	0,03
tr010c	Gaziantep	TR029	552 547	TR029	0,01	0,07
tr011c	Hatay	TR072	92 366	TR072	0,02	0,05
tr012c	Istanbul	TR033	6 828 168	TR033	0,08	0,43
tr013c	Izmir	TR034	1 658 758	TR034	0,06	0,24
tr014c	Kars	TR038	45 142	TR038	:	0,18
tr015c	Kastamonu	TR039	42 586	TR039	0,00	0,21
tr016c	Kayseri	TR040	365 788	TR040	0,01	0,09
tr017c	Kocaeli (Izmit)	TR035	129 984	TR035	0,08	0,13
tr018c	Konya	TR043	523 259	TR043	0,01	0,09
tr019c	Malatya	TR045	266 210	TR045	0,00	0,01
tr020c	Manisa	TR046	155 739	TR046	0,01	0,06
tr021c	Nevsehir	TR052	46 948	TR052	0,07	0,71
tr022c	Samsun	TR056	240 432	TR056	0,01	0,08
tr023c	Siirt	TR057	54 838	TR057	0,00	0,00
tr024c	Trabzon	TR062	151 025	TR062	0,02	0,56
tr025c	Van	TR065	169 192	TR065	0,00	0,66
tr026c	Zonguldak	TR067	64 954	TR067	0,00	0,02
uk001c	London	UK132	5 184 600	UK132	:	:
uk001k	Inner London		2 136 800		:	:
uk002c	Birmingham	UK591	643 200	UK591	:	:
uk003c	Leeds	UK593	482 900	UK593	:	:
uk004c	Glasgow	UK122	397 800	UK122	:	:
uk005c	Bradford	UK599	309 500	UK599	:	:
uk006c	Liverpool	UK178	302 700	UK178	:	:
uk007c	Edinburgh	UK110	318 700	UK110	:	:
uk008c	Manchester	UK594	305 500	UK594	:	:
uk009c	Cardiff	UK066	216 000	UK066	:	:
uk010c	Sheffield	UK238	343 700	UK238	:	:
uk011c	Bristol	UK052	272 500	UK052	:	:
uk012c	Belfast	UK031	176 233	UK031	:	:
uk013c	Newcastle upon Tyne	UK598	183 200	UK598	:	:
uk014c	Leicester	UK173	191 900	UK173	:	:
uk015c	Derry	UK318	70 837	UK318	:	:
uk016c	Aberdeen	UK002	140 900	UK002	:	:
uk017c	Cambridge	UK062	89 000	UK062	:	:
uk018c	Exeter	UK112	79 700	UK112	:	:
uk019c	Lincoln	UK177	58 600	UK177	:	:
uk020c	Gravesham	UK597	61 600	UK597	:	:
uk021c	Stevenage	UK252	51 800	UK252	:	:
uk022c	Wrexham	UK299	85 800	UK299	:	:
uk023c	Portsmouth	UK221	128 900	UK221	:	:
uk024c	Worcester	UK296	62 700	UK296	:	:
uk025c	Coventry	UK087	201 400	UK087	:	:
uk026c	Kingston-upon-Hull	UK168	165 300	UK168	:	:
uk027c	Stoke-on-trent	UK595	156 700	UK595	:	:
uk028c	Wolverhampton	UK592	154 300	UK592	:	:
uk029c	Nottingham	UK208	191 800	UK208	:	:
uk030c	Wirral	UK596	197 900	UK596	:	:

NB:

:	… figure not available
	… figure referring to 1999-2002 (i.e. figure for 2003-2006 not available)
	… figure referrring to 1994-1998
	… figure only on total population available; estimation of the population of working age via the average percentage of population of working age in total population in other cities of the same country
CITY_CODE	… city code used for town or city in Urban audit statistics
CITY_NAME	… name of the town or city
STSICD	… "Settlement Site Code" used in the GISCO reference data base
WORKING_POP	… population of working age (15-64 years old)
EU_NATIONALS	… nationals of another EU Member State as a proportion of the total population (in %)
NON_EU_NATIONALS	… non-EU nationals as a proportion of the total population (in %)

Appendix 6: GDP per head, headquarters and unemployment rate (Urban Audit 2003-2006)

CITY_CODE	CITY_NAME	STSICD	GDP_HEAD	HEADQUARTERS	STSICD	UNEMPLOY
at001c	Vienna	AT022	19 607	22	AT022	8,9
at002c	Graz	AT006	:	1	AT006	7,8
at003c	Linz	AT014	:	2	AT014	7,0
at004c	Salzburg	AT016	:	0	AT016	:
at005c	Innsbruck	AT007	:	0	AT007	:
be001c	Brussels	BE014	52 975	48	BE014	:
be002c	Antwerpen	BE004	32 718	12	BE004	:
be003c	Gent	BE022	29 728	4	BE022	:
be004c	Charleroi	BE015	19 958	1	BE015	:
be005c	Liège	BE034	20 948	3	BE034	:
be006c	Brugge	BE013	25 547	0	BE013	:
be007c	Namur	BE046	20 883	0	BE046	:
bg001c	Sofia	BG020	3 573	78	BG020	4,3
bg002c	Plovdiv	BG014	1 601	23	BG014	10,2
bg003c	Varna	BG023	2 063	9	BG023	:
bg004c	Burgas	BG003	1 868	9	BG003	8,3
bg005c	Pleven	BG013	1 579	7	BG013	11,7
bg006c	Ruse	BG016	1 673	8	BG016	14,2
bg007c	Vidin	BG024	1 434	4	BG024	24,1
ch001c	Zurich	CH016	:	:	CH016	:
ch002c	Geneva	CH006	:	:	CH006	:
ch004c	Bern	CH002	:	:	CH002	:
ch005c	Lausanne	CH009	:	:	CH009	:
cy001c	Lefkosia/Nicosia	CY006	15 614	:	CY006	4,7
cz001c	Prague	CZ047	14 860	16	CZ047	3,9
cz002c	Brno	CZ003	9 951	2	CZ003	7,2
cz003c	Ostrava	CZ042	8 692	3	CZ042	16,6
cz004c	Plzen	CZ046	9 989	2	CZ046	6,7
cz005c	Usti nad Labem	CZ060	8 372	3	CZ060	12,7
cz006c	Olomouc	CZ039	:	:	CZ039	:
cz007c	Liberec	CZ029	:	:	CZ029	:
cz008c	Ceske Budejovice	CZ005	:	:	CZ005	:
cz009c	Hradec Kralove	CZ015	:	:	CZ015	:
cz010c	Pardubice	CZ044	:	:	CZ044	:
cz011c	Zlin	CZ066	:	:	CZ066	:
cz012c	Kladno	CZ022	:	:	CZ022	:
cz013c	Karlovy Vary	CZ020	:	:	CZ020	:
cz014c	Jihlava	CZ018	:	:	CZ018	:
de001c	Berlin	DE057	23 458	5	DE057	19,1
de002c	Hamburg	DE221	45 246	23	DE221	10,7
de003c	Munich	DE370	53 073	8	DE370	7,2
de004c	Cologne	DE288	40 469	12	DE288	11,7
de005c	Frankfurt/Main	DE163	73 932	36	DE163	9,0
de006c	Essen	DE151	33 295	7	DE151	12,0
de007c	Stuttgart	DE526	56 866	13	DE526	8,1
de008c	Leipzig	DE314	23 411	3	DE314	20,5
de009c	Dresden	DE121	31 169	36	DE121	15,6
de010c	Dortmund	DE119	28 084	4	DE119	15,0
de011c	Düsseldorf	DE126	63 777	21	DE126	9,7
de012c	Bremen	DE077	37 808	2	DE077	13,9
de013c	Hannover	DE226	41 695	7	DE226	13,5
de014c	Nürnberg	DE400	42 404	6	DE400	12,8
de015c	Bochum	DE067	28 979	2	DE067	12,2
de016c	Wuppertal	DE600	26 053	0	DE600	11,6
de017c	Bielefeld	DE059	29 038	1	DE059	13,1
de018c	Halle/Saale	DE219	22 352	0	DE219	22,6
de019c	Magdeburg	DE339	25 605	0	DE339	21,7
de020c	Wiesbaden	DE583	43 359	13	DE583	9,6
de021c	Göttingen	DE204	23 580	2	DE204	13,4
de022c	Mühleim a.d.Ruhr	DE369	27 121	2	DE369	8,9

CITY_CODE	CITY_NAME	STSICD	GDP_HEAD	HEADQUARTERS
de023c	Moers	DE361	16 655	0
de025c	Darmstadt	DE103	51 164	8
de026c	Trier	DE532	35 561	0
de027c	Freiburg im Breisgau	DE167	32 397	3
de028c	Regensburg	DE444	62 889	1
de029c	Frankfurt/Oder	DE164	27 367	0
de030c	Weimar	DE565	19 942	0
de031c	Schwerin	DE490	28 683	0
de032c	Erfurt	DE144	28 463	3
de033c	Augsburg	DE025	40 590	2
de034c	Bonn	DE068	36 177	5
de035c	Karlsruhe	DE274	46 604	4
de036c	Mönchengladbach	DE362	24 611	0
de037c	Mainz	DE341	43 034	4
de039c	Kiel	DE283	35 745	4
de040c	Saarbrucken	DE468	:	2
de041c	Potsdam	DE431	29 031	0
de042c	Koblenz	DE287	51 702	0
dk001c	Copenhagen	DK013	59 514	:
dk001k	Kernel Copenhagen		50 308	:
dk002c	Aarhus	DK026	38 145	6
dk003c	Odense	DK017	34 293	:
dk004c	Aalborg	DK001	36 217	9
ee001c	Tallinn	EE002	12 068	7
ee002c	Tartu	EE003	7 191	0
es001c	Madrid	ES119	31 028	:
es002c	Barcelona	ES033	27 955	:
es003c	Valencia	ES206	21 522	:
es004c	Sevilla	ES188	21 197	:
es005c	Zaragoza	ES225	20 836	:
es006c	Malaga	ES121	15 374	:
es007c	Murcia	ES139	19 799	:
es008c	Las Palmas	ES108	21 773	:
es009c	Valladolid	ES208	23 782	:
es010c	Palma di Mallorca	ES148	24 845	:
es011c	Santiago de Compostela	ES184	13 240	:
es012c	Vitoria/Gasteiz	ES220	27 695	:
es013c	Oviedo	ES146	21 233	:
es014c	Pamplona	ES149	29 869	:
es015c	Santander	ES183	22 761	:
es016c	Toledo	ES197	17 817	:
es017c	Badajoz	ES030	17 357	:
es018c	Logrono	ES114	23 260	:
es019c	Bilbao	ES037	28 962	:
es020c	Cordoba	ES059	14 065	:
es021c	Alicante	ES016	24 514	:
es022c	Vigo	ES211	20 215	:
es023c	Gijon	ES086	16 407	:
es024c	Hospitalet de Llobregat(L')	ES335	12 947	:
es025c	Sta. Cruz de Tenerife	ES181	22 284	:
fi001c	Helsinki	FI003	40 972	59
fi001k	Kernel Helsinki		46 937	:
fi002c	Tampere	FI034	27 465	4
fi003c	Turku	FI036	23 861	3
fi004c	Oulu	FI023	31 935	2
fr001c	Paris	FR159	69 875	331
fr001k	Paris with "small ring"		:	:
fr003c	Lyon	FR124	30 726	39
fr004c	Toulouse	FR202	27 299	11
fr006c	Strasbourg	FR197	24 781	8
fr007c	Bordeaux	FR037	25 217	7
fr008c	Nantes	FR149	24 520	7
fr009c	Lille	FR118	20 271	14
fr010c	Montpellier	FR145	20 346	7

STSICD	UNEMPLOY
DE361	8,9
DE103	8,5
DE532	8,8
DE167	8,5
DE444	9,2
DE164	22,3
DE565	18,1
DE490	18,1
DE144	18,0
DE025	11,6
DE068	7,4
DE274	9,2
DE362	11,7
DE341	8,1
DE283	14,1
DE468	13,8
DE431	12,5
DE287	7,8
DK013	5,2
	4,7
DK026	5,7
DK017	6,0
DK001	7,9
EE002	10,0
EE003	4,4
ES119	6,6
ES033	12,0
ES206	14,2
ES188	14,3
ES225	11,8
ES121	13,8
ES139	8,8
ES108	15,9
ES208	14,6
ES148	9,6
ES184	13,8
ES220	9,9
ES146	12,6
ES149	7,8
ES183	12,5
ES197	10,3
ES030	11,2
ES114	11,0
ES037	12,4
ES059	:
ES016	12,5
ES211	:
ES086	:
ES335	13,1
ES181	14,0
	:
FI003	8,5
FI034	13,3
FI036	13,1
FI023	12,9
FR159	11,7
	11,6
FR124	11,5
FR202	15,4
FR197	9,6
FR037	14,3
FR149	13,2
FR118	14,4
FR145	18,0

CITY_CODE	CITY_NAME	STSICD	GDP_HEAD	HEADQUARTERS
fr011c	Saint-Etienne	FR181	19 700	7
fr012c	Le Havre	FR112	23 661	1
fr013c	Rennes	FR171	23 719	8
fr014c	Amiens	FR009	20 737	1
fr015c	Rouen	FR176	23 661	2
fr016c	Nancy	FR148	21 176	3
fr017c	Metz	FR134	19 897	1
fr018c	Reims	FR170	25 921	4
fr019c	Orléans	FR156	25 683	3
fr020c	Dijon	FR074	26 101	1
fr021c	Poitiers	FR165	20 671	2
fr022c	Clermont-Ferrand	FR064	22 804	3
fr023c	Caen	FR045	20 757	1
fr024c	Limoges	FR119	22 053	2
fr025c	Besançon	FR033	24 349	1
fr026c	Grenoble	FR096	23 970	9
fr027c	Ajaccio	FR005	21 989	:
fr032c	Toulon	FR201	20 409	3
fr035c	Tours	FR203	26 754	:
fr202c	Aix-en-Provence	FR003	26 532	9
fr203c	Marseille	FR128	24 482	14
fr205c	Nice	FR152	24 350	3
fr207c	Lens - Liévin	FR115	13 569	:
gr001c	Athens	GR005	:	2
gr001k	Kernel Athens		:	:
gr002c	Thessaloniki	GR031	:	14
gr003c	Patra	GR025	:	2
gr004c	Irakleio	GR010	:	4
gr005c	Larisa	GR023	:	1
gr006c	Volos	GR035	:	0
gr007c	Ioannina	GR009	:	1
gr008c	Kavala	GR014	:	1
gr009c	Kalamata	GR066	:	1
hr001c	Zagreb	HR054	:	:
hr002c	Rijeka	HR035	:	:
hr003c	Slavonski Brod	HR043	:	:
hr004c	Osijek	HR028	:	:
hr005c	Split	HR045	:	:
hu001c	Budapest	HU006	16 622	29
hu002c	Miskolc	HU038	5 451	1
hu003c	Nyiregyhaza	HU043	4 494	0
hu004c	Pecs	HU049	6 022	1
hu005c	Debrecen	HU009	6 116	1
hu006c	Szeged	HU054	6 391	1
hu007c	Gyor	HU018	9 284	3
hu008c	Kecskemet	HU029	5 703	0
hu009c	Szekesfehervar	HU055	7 875	1
ie001c	Dublin	IE006	36 019	:
ie002c	Cork	IE002	31 496	:
ie003c	Limerick	IE007	25 036	:
ie004c	Galway	IE005	19 476	:
ie005c	Waterford	IE008	:	:
it001c	Rome	IT344	21 225	35
it002c	Milan	IT240	27 988	64
it003c	Naples	IT267	11 338	52
it004c	Turin	IT410	22 217	19
it005c	Palermo	IT295	11 627	35
it006c	Genoa	IT174	19 067	9
it007c	Florence	IT154	22 919	7
it008c	Bari	IT042	12 620	12
it009c	Bologna	IT054	25 019	5
it010c	Catania	IT093	11 346	6
it011c	Venice	IT430	21 050	39
it012c	Verona	IT434	20 644	4

STSICD	UNEMPLOY
FR181	13,5
FR112	17,1
FR171	9,0
FR009	16,9
FR176	14,6
FR148	11,1
FR134	11,9
FR170	13,5
FR156	8,7
FR074	10,7
FR165	10,9
FR064	10,6
FR045	14,0
FR119	10,0
FR033	11,1
FR096	13,2
FR005	14,2
FR201	:
FR203	:
FR003	:
FR128	20,3
FR152	13,9
FR115	19,7
GR005	8,6
	9,0
GR031	10,6
GR025	10,8
GR010	8,6
GR023	12,6
GR035	11,0
GR009	13,7
GR014	16,7
GR066	10,7
HR054	10,2
HR035	12,1
HR043	20,0
HR028	16,1
HR045	19,5
HU006	:
HU038	:
HU043	:
HU049	:
HU009	:
HU054	:
HU018	:
HU029	:
HU055	:
IE006	6,7
IE002	6,2
IE007	9,6
IE005	7,5
IE008	6,2
IT344	11,2
IT240	5,6
IT267	31,8
IT410	8,5
IT295	29,6
IT174	8,7
IT154	5,9
IT042	19,2
IT054	4,5
IT093	29,4
IT430	5,2
IT434	4,9

CITY_CODE	CITY_NAME	STSICD	GDP_HEAD	HEADQUARTERS	STSICD	UNEMPLOY
pl009c	Lublin	PL093	4 124	4	PL093	:
pl010c	Katowice	PL061	6 468	12	PL061	:
pl011c	Bialystok	PL008	4 185	0	PL008	:
pl012c	Kielce	PL064	4 139	4	PL064	:
pl013c	Torun	PL176	4 478	2	PL176	:
pl014c	Olsztyn	PL113	4 688	1	PL113	:
pl015c	Rzeszow	PL142	4 154	1	PL142	:
pl016c	Opole	PL115	4 601	1	PL115	:
pl017c	Gorzow Wielkopolski	PL042	4 761	0	PL042	:
pl018c	Zielona Gora	PL201	4 792	1	PL201	:
pl019c	Jelenia Gora	PL058	4 322	1	PL058	:
pl020c	Nowy Sacz	PL107	3 105	0	PL107	:
pl021c	Suwalki	PL161	4 185	0	PL161	:
pl022c	Konin	PL069	4 317	0	PL069	:
pl023c	Zory	PL202	5 496	0	PL202	:
pl024c	Czestochowa	PL027	4 845	1	PL027	23,8
pl025c	Radom	PL138	3 879	0	PL138	30,8
pl026c	Plock	PL128	5 930	2	PL128	23,3
pl027c	Kalisz	PL059	4 304	1	PL059	22,6
pl028c	Koszalin	PL073	4 504	0	PL073	23,5
pt001c	Lisbon	PT018	22 824	21	PT018	6,5
pt001k	Kernel Lisbon		19 345	:		6,7
pt002c	Oporto	PT022	13 679	6	PT022	9,3
pt003c	Braga	PT007	10 629	0	PT007	6,2
pt004c	Funchal	PT015	17 057	1	PT015	4,0
pt005c	Coimbra	PT009	14 143	0	PT009	5,2
pt006c	Setubal	PT025	10 102	2	PT025	8,9
pt007c	Ponta Delgada	PT021	11 998	0	PT021	5,5
pt008c	Aveiro	PT006	12 678	0	PT006	4,8
pt009c	Faro	PT014	14 328	0	PT014	4,9
ro001c	Bucuresti	RO020	4 237	:	RO020	7,1
ro002c	Cluj-Napoca	RO033	1 849	:	RO033	:
ro003c	Timisoara	RO096	2 121	:	RO096	7,6
ro004c	Craiova	RO038	1 682	:	RO038	13,7
ro005c	Braila	RO018	1 725	:	RO018	16,7
ro006c	Oradea	RO070	1 849	:	RO070	6,0
ro007c	Bacau	RO006	1 436	:	RO006	12,8
ro008c	Arad	RO005	2 121	:	RO005	5,4
ro009c	Sibiu	RO090	2 100	:	RO090	7,3
ro010c	Targu Mures	RO100	2 100	:	RO100	7,6
ro011c	Piatra Neamt	RO075	1 436	:	RO075	17,1
ro012c	Calarasi	RO023	1 590	:	RO023	23,7
ro013c	Giurgiu	RO053	1 590	:	RO053	17,2
ro014c	Alba Iulia	RO003	2 100	:	RO003	11,0
se001c	Stockholm	SE036	59 244	134	SE036	:
se001k	Kernel Stockholm		:	:		:
se002c	Goeteborg	SE008	41 890	26	SE008	7,6
se003c	Malmoe	SE026	36 975	14	SE026	
se004c	Joenkoeing	SE012	32 232	6	SE012	:
se005c	Umeaa	SE042	30 823	4	SE042	
se006c	Uppsala	SE044	28 036	10	SE044	3,8
se007c	Linkoeing	SE023	31 471	5	SE023	:
se008c	Oerebro	SE030	31 018	2	SE030	8,7
si001c	Ljubljana	SI009	:	:	SI009	5,3
si002c	Maribor	SI010	:	:	SI010	9,6
sk001c	Bratislava	SK004	14 325	73	SK004	8,7
sk002c	Kosice	SK012	5 598	17	SK012	15,4
sk003c	Banska Bystrica	SK002	5 237	2	SK002	12,3
sk004c	Nitra	SK018	5 454	7	SK018	15,9
sk005c	PreSov	SK025	3 813	:	SK025	17,9
sk006c	Zilina	SK038	5 119	:	SK038	13,5
sk007c	Trnava	SK035	6 448	:	SK035	9,2
sk008c	Trencin	SK034	5 758	:	SK034	6,2
tr001c	Ankara	TR006	3 049	:	TR006	14,7

CITY_CODE	CITY_NAME	STSICD	GDP_HEAD	HEADQUARTERS
pl009c	Lublin	PL093	4 124	4
pl010c	Katowice	PL061	6 468	12
pl011c	Bialystok	PL008	4 185	0
pl012c	Kielce	PL064	4 139	4
pl013c	Torun	PL176	4 478	2
pl014c	Olsztyn	PL113	4 688	1
pl015c	Rzeszow	PL142	4 154	1
pl016c	Opole	PL115	4 601	1
pl017c	Gorzow Wielkopolski	PL042	4 761	0
pl018c	Zielona Gora	PL201	4 792	1
pl019c	Jelenia Gora	PL058	4 322	1
pl020c	Nowy Sacz	PL107	3 105	0
pl021c	Suwalki	PL161	4 185	0
pl022c	Konin	PL069	4 317	0
pl023c	Zory	PL202	5 496	0
pl024c	Czestochowa	PL027	4 845	1
pl025c	Radom	PL138	3 879	0
pl026c	Plock	PL128	5 930	2
pl027c	Kalisz	PL059	4 304	1
pl028c	Koszalin	PL073	4 504	0
pt001c	Lisbon	PT018	22 824	21
pt001k	Kernel Lisbon		19 345	:
pt002c	Oporto	PT022	13 679	6
pt003c	Braga	PT007	10 629	0
pt004c	Funchal	PT015	17 057	1
pt005c	Coimbra	PT009	14 143	0
pt006c	Setubal	PT025	10 102	2
pt007c	Ponta Delgada	PT021	11 998	0
pt008c	Aveiro	PT006	12 678	0
pt009c	Faro	PT014	14 328	0
ro001c	Bucuresti	RO020	4 237	:
ro002c	Cluj-Napoca	RO033	1 849	:
ro003c	Timisoara	RO096	2 121	:
ro004c	Craiova	RO038	1 682	:
ro005c	Braila	RO018	1 725	:
ro006c	Oradea	RO070	1 849	:
ro007c	Bacau	RO006	1 436	:
ro008c	Arad	RO005	2 121	:
ro009c	Sibiu	RO090	2 100	:
ro010c	Targu Mures	RO100	2 100	:
ro011c	Piatra Neamt	RO075	1 436	:
ro012c	Calarasi	RO023	1 590	:
ro013c	Giurgiu	RO053	1 590	:
ro014c	Alba Iulia	RO003	2 100	:
se001c	Stockholm	SE036	59 244	134
se001k	Kernel Stockholm		:	:
se002c	Goeteborg	SE008	41 890	26
se003c	Malmoe	SE026	36 975	14
se004c	Joenkoeping	SE012	32 232	6
se005c	Umea	SE042	30 823	4
se006c	Uppsala	SE044	28 036	10
se007c	Linkoeping	SE023	31 471	5
se008c	Oerebro	SE030	31 018	2
si001c	Ljubljana	SI009	:	:
si002c	Maribor	SI010	:	:
sk001c	Bratislava	SK004	14 325	73
sk002c	Kosice	SK012	5 598	17
sk003c	Banska Bystrica	SK002	5 237	2
sk004c	Nitra	SK018	5 454	7
sk005c	PreSov	SK025	3 813	:
sk006c	Zilina	SK038	5 119	:
sk007c	Trnava	SK035	6 448	:
sk008c	Trencin	SK034	5 758	:
tr001c	Ankara	TR006	3 049	:

STSICD	UNEMPLOY
PL093	:
PL061	:
PL008	:
PL064	:
PL176	:
PL113	:
PL142	:
PL115	:
PL042	:
PL201	:
PL058	:
PL107	:
PL161	:
PL069	:
PL202	:
PL027	23,8
PL138	30,8
PL128	23,3
PL059	22,6
PL073	23,5
PT018	6,5
	6,7
PT022	9,3
PT007	6,2
PT015	4,0
PT009	5,2
PT025	8,9
PT021	5,5
PT006	4,8
PT014	4,9
RO020	7,1
RO033	:
RO096	7,6
RO038	13,7
RO018	16,7
RO070	6,0
RO006	12,8
RO005	5,4
RO090	7,3
RO100	7,6
RO075	17,1
RO023	23,7
RO053	17,2
RO003	11,0
SE036	:
	:
SE008	7,6
SE026	
SE012	:
SE042	
SE044	3,8
SE023	:
SE030	8,7
SI009	5,3
SI010	9,6
SK004	8,7
SK012	15,4
SK002	12,3
SK018	15,9
SK025	17,9
SK038	13,5
SK035	9,2
SK034	6,2
TR006	14,7

CITY_CODE	CITY_NAME	STSICD	GDP_HEAD	HEADQUARTERS
tr002c	Adana	TR068	2 592	
tr003c	Antalya	TR008	2 430	:
tr004c	Balikesir	TR011	2 222	:
tr005c	Bursa	TR017	2 778	:
tr006c	Denizli	TR022	2 363	:
tr007c	Diyarbakir	TR023	1 455	:
tr008c	Edirne	TR024	2 663	:
tr009c	Erzurum	TR027	1 176	:
tr010c	Gaziantep	TR029	1 765	:
tr011c	Hatay	TR072	1 947	:
tr012c	Istanbul	TR033	3 395	:
tr013c	Izmir	TR034	3 563	:
tr014c	Kars	TR038	982	:
tr015c	Kastamonu	TR039	1 974	:
tr016c	Kayseri	TR040	2 002	:
tr017c	Kocaeli (Izmit)	TR035	6 831	:
tr018c	Konya	TR043	1 722	:
tr019c	Malatya	TR045	1 570	:
tr020c	Manisa	TR046	2 724	:
tr021c	Nevsehir	TR052	2 346	:
tr022c	Samsun	TR056	1 861	:
tr023c	Siirt	TR057	1 231	:
tr024c	Trabzon	TR062	1 669	:
tr025c	Van	TR065	952	:
tr026c	Zonguldak	TR067	3 291	:
uk001c	London	UK132	35 706	985
uk001k	Inner London		:	:
uk002c	Birmingham	UK591	24 719	24
uk003c	Leeds	UK593	27 198	26
uk004c	Glasgow	UK122	30 747	34
uk005c	Bradford	UK599	19 155	17
uk006c	Liverpool	UK178	21 446	7
uk007c	Edinburgh	UK110	35 668	83
uk008c	Manchester	UK594	27 292	21
uk009c	Cardiff	UK066	25 694	7
uk010c	Sheffield	UK238	20 329	8
uk011c	Bristol	UK052	30 790	12
uk012c	Belfast	UK031	18 034	2
uk013c	Newcastle upon Tyne	UK598	20 046	18
uk014c	Leicester	UK173	26 393	2
uk015c	Derry	UK318	9 773	:
uk016c	Aberdeen	UK002	19 837	9
uk017c	Cambridge	UK062	24 554	9
uk018c	Exeter	UK112	17 531	31
uk019c	Lincoln	UK177	17 468	1
uk020c	Gravesham	UK597	20 048	0
uk021c	Stevenage	UK252	29 895	1
uk022c	Wrexham	UK299	21 916	2
uk023c	Portsmouth	UK221	25 287	0
uk024c	Worcester	UK296	19 692	1
uk025c	Coventry	UK087	:	:
uk026c	Kingston-upon-Hull	UK168	:	:
uk027c	Stoke-on-trent	UK595	:	:
uk028c	Wolverhampton	UK592	:	:
uk029c	Nottingham	UK208	:	:
uk030c	Wirral	UK596	:	:
Total				3 463

STSICD	UNEMPLOY
TR068	28,6
TR008	20,7
TR011	11,4
TR017	16,7
TR022	11,1
TR023	43,4
TR024	11,5
TR027	23,7
TR029	20,0
TR072	21,9
TR033	16,6
TR034	18,7
TR038	26,0
TR039	15,1
TR040	17,6
TR035	18,7
TR043	16,0
TR045	27,2
TR046	12,8
TR052	15,5
TR056	20,4
TR057	31,8
TR062	19,7
TR065	47,4
TR067	19,4
UK132	7,1
	9,2
UK591	8,5
UK593	4,5
UK122	7,8
UK599	5,1
UK178	8,0
UK110	5,1
UK594	8,7
UK066	5,6
UK238	6,7
UK052	4,9
UK031	7,8
UK598	7,6
UK173	8,0
UK318	12,0
UK002	5,9
UK062	5,2
UK112	5,0
UK177	6,1
UK597	3,1
UK252	3,0
UK299	2,5
UK221	6,5
UK296	3,3
UK087	5,5
UK168	7,2
UK595	4,8
UK592	6,8
UK208	9,1
UK596	5,1

NB:

:	… figure not available
(light grey shading)	… figure referring to 1999-2002 (i.e. figure for 2003-2006 not available)
(dark grey shading)	… figure referrring to 1994-1998
CITY_CODE	… city code used in Urban audit statistics
CITY_NAME	… city name used in Urban audit statistics
STSICD	… "Settlement Site Code" used in the GISCO reference data base
GDP_HEAD	… gross domestic product per head (in euros)
HEADQUARTERS	… number of companies quoted on the national stock exchange with headquarters within the town/city
UNEMPLOY	… unemployment rate (in %)

Appendix 7: Employment according to economic activities (Urban Audit 2003-2006, in %)

CITY_CODE	CITY_NAME	STSICD	A_B	C_D_E	F	G_H_I	J_K	L_P*
at001c	Vienna	AT022	0,6	12,7	5,9	32,4	21,8	26,6
at002c	Graz	AT006	1,2	20,4	5,4	30,0	18,7	24,3
at003c	Linz	AT014	0,4	15,6	6,5	23,4	28,0	26,1
at004c	Salzburg	AT016	:	:	:	0,0	:	
at005c	Innsbruck	AT007	:	:	:	0,0	:	
be001c	Brussels	BE014	0,1	6,8	3,3	25,5	27,1	37,2
be002c	Antwerpen	BE004	0,1	16,4	3,5	30,1	25,9	24,0
be003c	Gent	BE022	0,4	21,2	3,3	21,0	17,6	36,5
be004c	Charleroi	BE015	0,3	22,6	5,5	27,5	16,3	27,8
be005c	Liège	BE034	:	:	:	0,0	:	100,0
be006c	Brugge	BE013	0,7	12,2	3,2	29,3	15,0	39,6
be007c	Namur	BE046	0,5	7,6	4,6	22,3	13,0	52,0
bg001c	Sofia	BG020	2,3	17,9	6,5	34,4	16,7	22,2
bg002c	Plovdiv	BG014	12,1	28,2	5,4	28,2	6,0	20,1
bg003c	Varna	BG023	3,6	18,8	6,3	41,1	8,0	22,2
bg004c	Burgas	BG003	7,4	29,6	8,6	33,3	3,7	17,4
bg005c	Pleven	BG013	9,8	35,3	3,9	23,5	3,9	23,6
bg006c	Ruse	BG016	10,6	36,4	3,0	28,8	3,0	18,2
bg007c	Vidin	BG024	20,8	12,5	16,7	16,7	16,7	16,6
ch001c	Zurich	CH016	0,3	5,7	4,9	25,3	35,2	28,6
ch002c	Geneva	CH006	0,2	3,8	3,4	24,9	31,7	36,0
ch004c	Bern	CH002	0,5	6,5	4,5	25,3	21,1	42,1
ch005c	Lausanne	CH009	0,7	4,3	5,0	24,9	24,1	41,0
cy001c	Lefkosia/Nicosia	CY006	0,7	10,5	10,9	27,7	16,0	34,2
cz001c	Prague	CZ047	0,5	12,7	9,8	30,0	17,9	29,1
cz002c	Brno	CZ003	0,6	20,5	10,1	26,0	14,3	28,5
cz003c	Ostrava	CZ042	0,5	32,4	9,5	24,2	8,8	24,6
cz004c	Plzen	CZ046	0,4	25,0	8,6	30,0	11,5	24,5
cz005c	Usti nad Labem	CZ060	1,2	23,6	12,2	27,3	8,3	27,4
cz006c	Olomouc	CZ039	:	:	:	0,0	:	
cz007c	Liberec	CZ029	:	:	:	0,0	:	
cz008c	Ceske Budejovice	CZ005	:	:	:	0,0	:	
cz009c	Hradec Kralove	CZ015	:	:	:	0,0	:	
cz010c	Pardubice	CZ044	:	:	:	0,0	:	
cz011c	Zlin	CZ066	:	:	:	0,0	:	
cz012c	Kladno	CZ022	:	:	:	0,0	:	
cz013c	Karlovy Vary	CZ020	:	:	:	0,0	:	
cz014c	Jihlava	CZ018	:	:	:	0,0	:	
de001c	Berlin	DE057	0,4	10,1	5,3	23,1	22,2	38,9
de002c	Hamburg	DE221	0,7	13,0	3,9	28,3	26,0	28,1
de003c	Munich	DE370	1,0	16,9	2,8	20,5	28,9	29,9
de004c	Cologne	DE288	0,4	12,7	3,9	27,4	25,0	30,6
de005c	Frankfurt/Main	DE163	0,4	9,0	3,0	27,8	38,3	21,5
de006c	Essen	DE151	0,9	12,9	6,3	24,7	24,5	30,7
de007c	Stuttgart	DE526	0,8	20,7	3,8	17,5	27,5	29,7
de008c	Leipzig	DE314	0,4	11,1	6,4	23,3	25,8	33,0
de009c	Dresden	DE121	0,5	13,6	5,5	22,7	21,7	36,0
de010c	Dortmund	DE119	0,8	12,1	5,8	25,1	23,3	32,9
de011c	Düsseldorf	DE126	0,4	13,2	3,0	26,8	30,3	26,3
de012c	Bremen	DE077	1,0	20,2	4,6	28,1	18,3	27,8
de013c	Hannover	DE226	0,4	15,2	3,3	22,1	26,5	32,5
de014c	Nürnberg	DE400	1,7	18,7	3,2	26,2	27,1	23,1
de015c	Bochum	DE067	0,6	21,3	4,4	23,5	14,0	36,2
de016c	Wuppertal	DE600	0,8	26,2	4,0	23,1	16,7	29,2
de017c	Bielefeld	DE059	0,8	21,6	3,9	25,4	15,7	32,6
de018c	Halle/Saale	DE219	0,3	6,8	5,9	21,7	20,3	45,0
de019c	Magdeburg	DE339	0,2	8,8	6,7	20,3	21,1	42,9
de020c	Wiesbaden	DE583	0,9	11,3	4,0	20,4	27,5	35,9
de021c	Göttingen	DE204	0,5	15,2	2,6	20,6	17,6	43,5
de022c	Mühleim a.d.Ruhr	DE369	1,1	19,5	7,9	29,7	17,3	24,5

CITY_CODE	CITY_NAME	STSICD	A_B	C_D_E	F	G_H_I	J_K	L_P*
de023c	Moers	DE361	1,6	12,3	6,8	30,4	14,2	34,7
de025c	Darmstadt	DE103	0,5	20,4	2,7	20,0	22,5	33,9
de026c	Trier	DE532	1,6	13,5	4,1	27,2	12,4	41,2
de027c	Freiburg im Breisgau	DE167	0,5	12,0	2,9	24,6	16,9	43,1
de028c	Regensburg	DE444	0,3	26,0	2,4	22,9	16,9	31,5
de029c	Frankfurt/Oder	DE164	0,5	5,3	6,6	20,3	16,6	50,7
de030c	Weimar	DE565	0,4	8,9	6,1	23,2	16,8	44,6
de031c	Schwerin	DE490	0,3	9,0	5,9	22,0	19,2	43,6
de032c	Erfurt	DE144	0,8	11,1	6,3	23,1	21,9	36,8
de033c	Augsburg	DE025	1,0	21,9	4,8	22,1	18,5	31,7
de034c	Bonn	DE068	0,4	9,0	2,2	18,5	20,3	49,6
de035c	Karlsruhe	DE274	0,5	14,2	3,5	23,7	25,4	32,7
de036c	Mönchengladbach	DE362	1,0	20,7	5,7	28,3	16,4	27,9
de037c	Mainz	DE341	0,7	10,5	2,8	20,9	20,9	44,2
de039c	Kiel	DE283	0,4	13,0	3,2	22,0	19,6	41,8
de040c	Saarbrucken	DE468	0,7	15,8	3,3	22,8	26,3	31,1
de041c	Potsdam	DE431	0,5	4,4	4,5	17,4	24,6	48,7
de042c	Koblenz	DE287	0,9	10,7	2,6	24,3	19,4	42,1
dk001c	Copenhagen	DK013	0,1	5,9	2,0	23,9	25,3	42,8
dk001k	Kernel Copenhagen		:	:	:	:	:	:
dk002c	Aarhus	DK026	0,9	10,6	4,9	25,7	18,3	39,6
dk003c	Odense	DK017	2,8	11,0	5,5	25,1	15,1	40,5
dk004c	Aalborg	DK001	1,1	10,8	5,6	25,8	15,5	41,2
ee001c	Tallinn	EE002	:	21,1	9,2	29,9	12,5	27,3
ee002c	Tartu	EE003	:	21,1	10,3	27,4	8,5	32,7
es001c	Madrid	ES119	0,4	11,3	10,2	27,5	16,3	34,3
es002c	Barcelona	ES033	1,1	24,5	9,0	28,3	12,4	24,7
es003c	Valencia	ES206	3,9	21,9	10,8	27,6	9,8	26,0
es004c	Sevilla	ES188	5,7	12,6	9,9	29,6	9,3	32,9
es005c	Zaragoza	ES225	1,1	23,1	7,8	27,3	11,9	28,8
es006c	Malaga	ES121	4,4	6,5	17,8	29,4	9,3	32,6
es007c	Murcia	ES139	4,6	16,6	11,0	27,5	9,8	30,5
es008c	Las Palmas	ES108	1,6	7,8	10,5	35,5	11,8	32,8
es009c	Valladolid	ES208	1,4	20,0	9,0	26,4	11,4	31,8
es010c	Palma di Mallorca	ES148	2,1	7,8	15,3	39,0	9,0	26,8
es011c	Santiago de Compostela	ES184	6,0	16,9	12,5	26,2	8,6	29,8
es012c	Vitoria/Gasteiz	ES220	3,3	33,9	8,3	21,7	8,8	24,0
es013c	Oviedo	ES146	0,8	11,1	8,7	29,2	13,1	37,1
es014c	Pamplona	ES149	1,1	23,3	7,6	23,7	12,0	32,3
es015c	Santander	ES183	:	:	:	0,0	:	
es016c	Toledo	ES197	:	:	:	0,0	:	
es017c	Badajoz	ES030	18,6	8,1	12,3	22,9	5,9	32,2
es018c	Logrono	ES114	11,4	26,4	11,7	19,9	7,5	23,1
es019c	Bilbao	ES037	2,6	21,4	10,0	26,2	10,6	29,2
es020c	Cordoba	ES059	11,4	16,7	10,5	25,3	8,0	28,1
es021c	Alicante	ES016	3,1	17,2	15,9	27,7	9,9	26,2
es022c	Vigo	ES211	8,5	21,1	12,0	23,8	7,7	26,9
es023c	Gijon	ES086	4,2	17,8	12,7	26,8	9,3	29,2
es024c	Hospitalet de Llobregat(L')	ES335	1,1	24,5	9,0	28,3	12,4	24,7
es025c	Sta. Cruz de Tenerife	ES181	:	:	:	0,0	:	100,0
fi001c	Helsinki	FI003	0,1	8,7	4,5	25,8	24,2	36,7
fi001k	Kernel Helsinki		:	:	:	0,0	:	100,0
fi002c	Tampere	FI034	0,3	21,3	5,8	22,9	16,0	33,7
fi003c	Turku	FI036	0,4	16,2	5,6	24,4	16,3	37,1
fi004c	Oulu	FI023	0,6	18,4	7,1	20,3	16,3	37,3
fr001c	Paris	FR159	0,1	8,4	2,2	24,6	29,4	35,3
fr001k	Paris with "small ring"		:	:	:	0,0	:	100,0
fr003c	Lyon	FR124	0,3	17,5	4,6	24,0	19,4	34,2
fr004c	Toulouse	FR202	0,4	16,4	4,8	24,4	18,1	35,9
fr006c	Strasbourg	FR197	0,4	14,2	4,4	26,7	18,7	35,6
fr007c	Bordeaux	FR037	0,5	13,1	4,7	25,9	17,3	38,5
fr008c	Nantes	FR149	0,9	14,5	4,6	25,4	17,7	36,9
fr009c	Lille	FR118	0,7	15,9	4,5	25,2	17,2	36,5
fr010c	Montpellier	FR145	1,0	8,0	5,2	25,5	17,7	42,6

CITY_CODE	CITY_NAME	STSICD	A_B	C_D_E	F	G_H_I	J_K	L_P*
fr011c	Saint-Etienne	FR181	1,0	23,5	5,4	20,9	13,2	36,0
fr012c	Le Havre	FR112	0,5	17,3	5,2	28,8	13,1	35,1
fr013c	Rennes	FR171	1,1	14,6	5,0	24,2	15,9	39,2
fr014c	Amiens	FR009	0,5	16,1	3,8	23,7	12,4	43,5
fr015c	Rouen	FR176	0,4	13,7	5,9	25,9	15,7	38,5
fr016c	Nancy	FR148	0,4	10,0	4,8	24,4	15,5	44,9
fr017c	Metz	FR134	0,5	9,5	5,4	26,0	14,3	44,3
fr018c	Reims	FR170	0,7	15,2	5,4	24,8	15,6	38,3
fr019c	Orléans	FR156	1,1	15,0	5,2	24,6	17,0	37,1
fr020c	Dijon	FR074	1,1	13,6	5,6	25,4	14,5	39,8
fr021c	Poitiers	FR165	0,5	10,6	4,8	23,3	13,2	47,6
fr022c	Clermont-Ferrand	FR064	0,5	20,7	4,7	23,9	12,7	37,5
fr023c	Caen	FR045	0,5	15,9	4,4	23,5	14,3	41,4
fr024c	Limoges	FR119	0,9	17,6	4,6	24,6	11,2	41,1
fr025c	Besançon	FR033	0,8	16,2	4,2	22,1	12,6	44,1
fr026c	Grenoble	FR096	0,4	19,1	4,6	19,9	18,7	37,3
fr027c	Ajaccio	FR005	1,4	7,3	6,6	27,5	9,5	47,7
fr032c	Toulon	FR201	:	:	:	:	:	
fr035c	Tours	FR203	:	:	:	:	:	
fr202c	Aix-en-Provence	FR003	:	:	:	:	:	
fr203c	Marseille	FR128	0,4	10,5	4,5	26,4	14,8	43,4
fr205c	Nice	FR152	1,2	7,3	5,9	29,2	16,2	40,2
fr207c	Lens - Liévin	FR115	:	:	:	:	:	
gr001c	Athens	GR005	:	:	:	:	:	
gr001k	Kernel Athens		:	:	:	:	:	
gr002c	Thessaloniki	GR031	:	:	:	:	:	
gr003c	Patra	GR025	:	:	:	:	:	
gr004c	Irakleio	GR010	:	:	:	:	:	
gr005c	Larisa	GR023	:	:	:	:	:	
gr006c	Volos	GR035	:	:	:	:	:	
gr007c	Ioannina	GR009	:	:	:	:	:	
gr008c	Kavala	GR014	:	:	:	:	:	
gr009c	Kalamata	GR066	:	:	:	:	:	
hr001c	Zagreb	HR054	:	:	:	:	:	
hr002c	Rijeka	HR035	:	:	:	:	:	
hr003c	Slavonski Brod	HR043	:	:	:	:	:	
hr004c	Osijek	HR028	:	:	:	:	:	
hr005c	Split	HR045	:	:	:	:	:	
hu001c	Budapest	HU006	:	:	:	:	:	
hu002c	Miskolc	HU038	:	:	:	:	:	
hu003c	Nyiregyhaza	HU043	:	:	:	:	:	
hu004c	Pecs	HU049	:	:	:	:	:	
hu005c	Debrecen	HU009	:	:	:	:	:	
hu006c	Szeged	HU054	:	:	:	:	:	
hu007c	Gyor	HU018	:	:	:	:	:	
hu008c	Kecskemet	HU029	:	:	:	:	:	
hu009c	Szekesfehervar	HU055	:	:	:	:	:	
ie001c	Dublin	IE006	:	:	:	:	:	
ie002c	Cork	IE002	:	:	:	:	:	
ie003c	Limerick	IE007	:	:	:	:	:	
ie004c	Galway	IE005	:	:	:	:	:	
ie005c	Waterford	IE008	:	:	:	:	:	
it001c	Rome	IT344	:	8,8	8,1	37,4	33,5	12,2
it002c	Milan	IT240	:	13,1	4,5	32,5	42,1	7,8
it003c	Naples	IT267	:	12,5	7,5	42,0	27,4	10,6
it004c	Turin	IT410	:	19,9	7,6	30,7	32,9	8,9
it005c	Palermo	IT295	:	11,2	7,5	43,4	24,8	13,1
it006c	Genoa	IT174	:	17,1	8,4	40,9	24,9	8,7
it007c	Florence	IT154	:	13,7	6,6	41,1	28,9	9,7
it008c	Bari	IT042	:	13,2	8,0	40,2	29,6	9,0
it009c	Bologna	IT054	:	14,2	6,1	36,8	32,6	10,3
it010c	Catania	IT093	:	18,5	7,3	39,9	23,6	10,7
it011c	Venice	IT430	:	16,9	7,1	46,8	20,9	8,3
it012c	Verona	IT434	:	15,5	7,4	39,3	27,9	9,9

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it013c	Cremona	IT133	:	27,0	7,5	33,4	23,0	9,1
it014c	Trento	IT417	:	17,2	9,8	37,3	27,1	8,6
it015c	Trieste	IT421	:	13,7	7,7	40,3	29,3	9,0
it016c	Perugia	IT302	:	19,3	10,7	35,7	24,4	9,9
it017c	Ancona	IT019	:	16,2	6,7	39,8	24,1	13,2
it018c	l'Aquila	IT199	:	19,8	12,0	34,0	24,7	9,5
it019c	Pescara	IT304	:	12,5	8,6	43,1	25,6	10,2
it020c	Campobasso	IT069	:	11,5	15,3	42,0	22,4	8,8
it021c	Caserta	IT084	:	15,6	8,9	30,5	31,5	13,5
it022c	Taranto	IT402	:	36,2	7,1	30,1	19,0	7,6
it023c	Potenza	IT325	:	13,8	12,5	34,3	30,7	8,7
it024c	Catanzaro	IT094	:	8,8	12,7	43,1	24,2	11,2
it025c	Reggio di Calabria	IT335	:	11,1	10,2	47,5	19,9	11,3
it026c	Sassari	IT376	:	11,2	12,0	40,9	24,8	11,1
it027c	Cagliari	IT063	:	9,4	8,8	42,4	29,3	10,1
it028c	Padova	IT293	:	14,6	4,7	37,8	35,0	7,9
it029c	Brescia	IT058	:	23,3	5,4	30,5	31,8	9,0
it030c	Modena	IT246	:	27,1	7,3	30,8	25,0	9,8
it031c	Foggia	IT155	:	21,6	10,5	38,2	21,1	8,6
it032c	Salerno	IT353	:	16,0	7,2	40,5	26,6	9,7
lt001c	Vilnius	LT006	0,3	16,0	9,0	34,8	10,2	29,7
lt002c	Kaunas	LT002	0,4	24,9	9,6	29,8	6,1	29,2
lt003c	Panevezys	LT004	0,7	35,2	7,9	22,7	3,3	30,2
lu001c	Luxembourg	LU002	1,6	13,2	9,8	27,1	26,4	21,9
lv001c	Riga	LV004	0,5	16,3	6,9	35,1	15,1	26,1
lv002c	Liepaja	LV003	1,5	30,1	5,8	26,4	5,8	30,4
mt001c	Valletta	MT001	:	:	:	:	:	:
nl001c	The Hague	NL001	0,9	3,7	3,2	21,7	24,2	46,3
nl002c	Amsterdam	NL007	0,1	4,8	2,6	26,2	32,7	33,6
nl003c	Rotterdam	NL056	0,2	9,1	4,2	27,1	24,7	34,7
nl004c	Utrecht	NL066	0,2	5,5	4,0	22,5	29,7	38,1
nl005c	Eindhoven	NL022	0,2	18,0	4,3	21,6	26,8	29,1
nl006c	Tilburg	NL065	0,5	13,7	3,7	24,2	22,8	35,1
nl007c	Groningen	NL030	0,1	8,2	3,8	21,5	22,5	43,9
nl008c	Enschede	NL024	0,6	14,3	4,3	23,0	18,1	39,7
nl009c	Arnhem	NL009	0,3	8,4	3,4	18,9	28,1	40,9
nl010c	Heerlen	NL033	0,2	10,5	2,6	25,5	19,5	41,7
nl011c	Almere	NL086	1,0	8,2	5,0	32,4	25,4	28,0
nl012c	Breda	NL013	1,0	10,6	6,1	27,0	19,6	35,7
nl013c	Nijmegen	NL049	0,3	13,4	3,4	19,3	16,3	47,3
nl014c	Apeldoorn	NL008	0,9	11,1	4,9	22,5	21,6	39,0
nl015c	Leeuwarden	NL042	1,9	9,3	3,6	17,8	22,8	44,6
nl513c	Deventer	NL018	:	:	:	:	:	
nl514c	Alkmaar	NL003	:	:	:	:	:	
nl515c	Venlo	NL071	:	:	:	:	:	
nl516c	Helmond	NL034	:	:	:	:	:	
nl517c	Hengelo (O.)	NL035	:	:	:	:	:	
nl518c	Schiedam	NL057	:	:	:	:	:	
nl519c	Almelo	NL004	:	:	:	:	:	
nl520c	Lelystad	NL085	:	:	:	:	:	
no001c	Oslo	NO017	0,2	7,4	5,1	27,2	22,6	37,5
no002c	Bergen	NO003	0,6	12,0	6,2	25,7	16,2	39,3
no003c	Trondheim	NO029	0,6	8,9	7,1	25,3	17,0	41,1
no004c	Stavanger	NO025	0,7	20,3	4,8	22,5	14,7	37,0
no005c	Kristiansand	NO012	0,7	12,2	6,8	27,6	12,4	40,3
no006c	Tromso	NO028	2,2	5,8	6,4	25,6	11,9	48,1
pl001c	Warsaw	PL183	0,2	14,8	5,0	29,3	24,9	25,8
pl002c	Lodz	PL086	0,3	27,0	3,6	21,6	14,1	33,4
pl003c	Krakow	PL074	0,3	19,9	7,3	23,9	15,8	32,8
pl004c	Wroclaw	PL189	0,3	19,7	5,3	24,0	16,7	34,0
pl005c	Poznan	PL130	0,5	23,8	5,5	26,4	17,1	26,7
pl006c	Gdansk	PL034	0,3	21,6	5,4	24,6	15,0	33,1
pl007c	Szczecin	PL167	0,5	22,6	4,0	27,4	12,5	33,0
pl008c	Bydgoszcz	PL017	0,3	31,7	4,1	22,1	12,0	29,8

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pl009c	Lublin	PL093	0,4	16,4	4,5	24,6	11,6	42,5
pl010c	Katowice	PL061	0,2	23,0	6,3	25,8	17,7	27,0
pl011c	Bialystok	PL008	0,5	21,5	4,3	25,5	11,3	36,9
pl012c	Kielce	PL064	0,4	25,2	5,6	23,3	11,1	34,4
pl013c	Torun	PL176	0,3	33,9	4,6	21,7	10,8	28,7
pl014c	Olsztyn	PL113	0,4	20,6	5,7	26,4	13,4	33,5
pl015c	Rzeszow	PL142	0,1	24,7	7,3	23,4	12,3	32,2
pl016c	Opole	PL115	0,4	18,8	7,9	25,4	10,9	36,6
pl017c	Gorzow Wielkopolski	PL042	0,8	29,9	3,6	21,0	10,8	33,9
pl018c	Zielona Gora	PL201	0,2	22,5	3,5	24,6	17,0	32,2
pl019c	Jelenia Gora	PL058	0,4	32,5	2,1	21,0	11,3	32,7
pl020c	Nowy Sacz	PL107	0,2	27,5	7,5	27,3	7,1	30,4
pl021c	Suwalki	PL161	0,5	37,0	4,0	18,7	7,1	32,7
pl022c	Konin	PL069	0,4	32,0	7,9	21,8	9,7	28,2
pl023c	Zory	PL202	0,5	25,6	4,9	26,3	6,5	36,2
pl024c	Czestochowa	PL027	0,2	39,8	4,0	19,8	8,0	28,2
pl025c	Radom	PL138	0,3	27,3	3,7	22,0	8,4	38,3
pl026c	Plock	PL128	0,2	31,9	14,4	18,9	10,4	24,2
pl027c	Kalisz	PL059	0,2	37,9	5,3	19,6	9,1	27,9
pl028c	Koszalin	PL073	0,3	22,4	6,3	24,2	10,6	36,2
pt001c	Lisbon	PT018	0,5	7,8	8,0	29,3	19,5	34,9
pt001k	Kernel Lisbon		:	:	:	:	:	
pt002c	Oporto	PT022	0,5	12,2	10,5	29,4	14,6	32,8
pt003c	Braga	PT007	1,1	27,6	13,2	26,3	6,5	25,3
pt004c	Funchal	PT015	1,5	7,6	14,1	34,9	7,6	34,3
pt005c	Coimbra	PT009	1,0	13,4	8,9	26,2	7,8	42,7
pt006c	Setubal	PT025	2,4	21,2	11,7	27,9	7,9	28,9
pt007c	Ponta Delgada	PT021	6,5	9,5	12,7	26,6	7,3	37,4
pt008c	Aveiro	PT006	1,9	26,3	9,0	27,0	7,5	28,3
pt009c	Faro	PT014	4,4	6,9	11,8	34,0	9,6	33,3
ro001c	Bucuresti	RO020	:	:	:	:	:	
ro002c	Cluj-Napoca	RO033	:	:	:	:	:	
ro003c	Timisoara	RO096	:	:	:	:	:	
ro004c	Craiova	RO038	:	:	:	:	:	
ro005c	Braila	RO018	:	:	:	:	:	
ro006c	Oradea	RO070	:	:	:	:	:	
ro007c	Bacau	RO006	:	:	:	:	:	
ro008c	Arad	RO005	:	:	:	:	:	
ro009c	Sibiu	RO090	:	:	:	:	:	
ro010c	Targu Mures	RO100	:	:	:	:	:	
ro011c	Piatra Neamt	RO075	:	:	:	:	:	
ro012c	Calarasi	RO023	:	:	:	:	:	
ro013c	Giurgiu	RO053	:	:	:	:	:	
ro014c	Alba Iulia	RO003	:	:	:	:	:	
se001c	Stockholm	SE036	:	:	:	:	:	
se001k	Kernel Stockholm		:	:	:	:	:	
se002c	Goeteborg	SE008	0,2	17,9	4,6	23,9	19,7	33,7
se003c	Malmoe	SE026	0,3	12,5	5,6	26,5	18,4	36,7
se004c	Joenkoeping	SE012	1,3	18,4	5,0	24,6	10,4	40,3
se005c	Umea	SE042				0,0		100,0
se006c	Uppsala	SE044	1,0	9,7	6,1	17,4	22,2	43,6
se007c	Linkoeping	SE023	:	:	:	0,0	:	100,0
se008c	Oerebro	SE030	1,3	12,1	6,7	22,6	12,5	44,8
si001c	Ljubljana	SI009	0,4	14,2	7,7	25,9	19,2	32,6
si002c	Maribor	SI010	0,7	24,5	5,9	24,7	17,1	27,1
sk001c	Bratislava	SK004	0,4	14,5	5,6	30,6	23,9	25,0
sk002c	Kosice	SK012	0,7	25,7	5,5	28,1	13,0	27,0
sk003c	Banska Bystrica	SK002	3,7	20,2	6,4	26,4	11,9	31,4
sk004c	Nitra	SK018	5,1	28,1	7,9	23,6	9,5	25,8
sk005c	PreSov	SK025	1,2	23,5	7,9	24,8	8,0	34,6
sk006c	Zilina	SK038	0,8	22,2	12,6	28,7	11,8	23,9
sk007c	Trnava	SK035	0,9	26,8	9,2	26,9	10,6	25,6
sk008c	Trencin	SK034	1,2	34,2	6,0	23,1	11,0	24,5
tr001c	Ankara	TR006	:	23,7	12,1	42,5	14,7	7,0

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tr002c	Adana	TR068	:	31,3	4,5	46,7	9,2	8,3
tr003c	Antalya	TR008	:	11,4	3,3	71,3	7,4	6,6
tr004c	Balikesir	TR011	:	27,3	2,1	56,7	6,5	7,4
tr005c	Bursa	TR017	:	53,8	1,6	34,9	5,0	4,7
tr006c	Denizli	TR022	:	56,3	1,4	34,1	4,2	4,0
tr007c	Diyarbakir	TR023	:	19,8	3,0	63,7	6,1	7,4
tr008c	Edirne	TR024	:	51,1	0,8	39,7	3,9	4,5
tr009c	Erzurum	TR027	:	18,0	1,2	69,1	4,8	6,9
tr010c	Gaziantep	TR029	:	50,8	1,5	38,9	3,3	5,5
tr011c	Hatay	TR072	:	29,5	3,0	54,0	5,8	7,7
tr012c	Istanbul	TR033	:	41,5	2,6	40,1	10,5	5,3
tr013c	Izmir	TR034	:	36,6	3,0	45,1	9,3	6,0
tr014c	Kars	TR038	:	12,0	0,5	70,7	5,7	11,1
tr015c	Kastamonu	TR039	:	28,4	1,5	56,8	5,3	8,0
tr016c	Kayseri	TR040	:	46,8	2,7	39,0	4,9	6,6
tr017c	Kocaeli (Izmit)	TR035	:	45,5	6,0	36,8	5,7	6,0
tr018c	Konya	TR043	:	35,2	2,0	50,6	2,1	10,1
tr019c	Malatya	TR045	:	29,0	2,1	52,5	4,2	12,2
tr020c	Manisa	TR046	:	38,0	1,6	44,2	5,1	11,1
tr021c	Nevsehir	TR052	:	22,6	1,8	64,0	6,4	5,2
tr022c	Samsun	TR056	:	21,9	1,9	58,0	10,4	7,8
tr023c	Siirt	TR057	:	16,0	6,3	65,9	3,6	8,2
tr024c	Trabzon	TR062	:	22,7	3,4	60,8	6,3	6,8
tr025c	Van	TR065	:	13,0	1,6	74,0	3,8	7,6
tr026c	Zonguldak	TR067	:	47,5	1,5	42,2	3,7	5,1
uk001c	London	UK132	0,3	8,1	5,1	26,6	30,0	29,9
uk001k	Inner London		:	:	:	:	:	:
uk002c	Birmingham	UK591	0,3	17,9	5,8	25,3	19,6	31,1
uk003c	Leeds	UK593	0,5	14,9	6,3	28,1	21,8	28,4
uk004c	Glasgow	UK122	0,3	7,1	4,1	27,2	25,0	36,3
uk005c	Bradford	UK599	0,6	20,7	5,6	28,9	14,8	29,5
uk006c	Liverpool	UK178	0,3	8,9	4,6	27,3	17,8	41,1
uk007c	Edinburgh	UK110	0,5	8,1	4,5	24,3	29,3	33,3
uk008c	Manchester	UK594	0,2	8,8	3,6	30,4	25,3	31,7
uk009c	Cardiff	UK066	0,3	6,5	5,8	27,5	21,4	38,5
uk010c	Sheffield	UK238	0,4	16,5	6,3	28,2	15,6	33,0
uk011c	Bristol	UK052	0,3	9,9	6,3	26,6	26,0	30,9
uk012c	Belfast	UK031	0,2	10,0	4,1	25,0	18,7	42,0
uk013c	Newcastle upon Tyne	UK598	0,3	8,5	5,2	26,4	19,7	39,9
uk014c	Leicester	UK173	0,3	22,9	4,5	26,0	13,5	32,9
uk015c	Derry	UK318	1,1	17,1	7,0	25,2	10,2	39,4
uk016c	Aberdeen	UK002	0,7	22,1	6,5	26,6	18,2	25,9
uk017c	Cambridge	UK062	0,5	7,9	3,4	22,4	23,4	42,4
uk018c	Exeter	UK112	0,5	10,3	6,1	29,4	16,1	37,6
uk019c	Lincoln	UK177	0,6	15,3	6,2	32,1	11,6	34,2
uk020c	Gravesham	UK597	1,0	14,9	11,2	31,6	11,5	29,8
uk021c	Stevenage	UK252	0,4	19,0	6,1	27,0	21,2	26,3
uk022c	Wrexham	UK299	2,1	30,0	6,1	24,0	8,5	29,3
uk023c	Portsmouth	UK221	0,3	13,7	6,0	26,4	15,3	38,3
uk024c	Worcester	UK296	0,5	15,9	4,8	33,7	13,2	31,9
uk025c	Coventry	UK087	:	:	:	:	:	
uk026c	Kingston-upon-Hull	UK168	:	:	:	:	:	
uk027c	Stoke-on-trent	UK595	:	:	:	:	:	
uk028c	Wolverhampton	UK592	:	:	:	:	:	
uk029c	Nottingham	UK208	:	:	:	:	:	
uk030c	Wirral	UK596	:	:	:	:	:	

NB:

:	… figure not available
	… figure referring to 1999-2002 (i.e. figure for 2003-2006 not available)
CITY_CODE	… city code used for town or city in Urban audit statistics
CITY_NAME	… name of the town or city
STSICD	… "Settlement Site Code" used in the GISCO reference data base
A_B	… employment (jobs) in agriculture, hunting, forestry and fishing (in %)
C_D_E	… employment (jobs) in industry (in %)
F	… employment (jobs) in construction (in %)
G_H_I	… employment (jobs) in wholesale and retail trade, hotels and restaurants, transportation and storage
J_K	… employment (jobs) in financial and business services (in %)
L_P*	… figures refer almost exclusively to employment (jobs) in L_P (public administration and defence, education, health and social work, social and personal service activities); may also include Q (extra-territorial bodies and organisations) (in %)

Appendix 8: International meetings (Union of International Associations)

City	STSICD	MEETINGS_2003	MEETINGS_2005	MEETINGS_2007	MEETINGS_2003_2005_2007
Salzburg	AT016	30	-	-	30
Vienna	AT022	188	245	298	731
Brussels	BE014	182	189	229	600
Gent	BE022	-	-	21	21
Geneva	CH006	188	161	170	519
Zurich	CH016	27	20	38	85
Prague	CZ047	86	78	83	247
Berlin	DE057	111	94	115	320
Bonn	DE068	-	20	-	20
Frankfurt/Main	DE163	23	27	26	76
Hamburg	DE221	-	-	21	21
Munich	DE370	49	62	59	170
Trier	DE532	22	-	42	64
Copenhagen	DK013	115	98	72	285
Tallinn	EE002	25	:	:	25
Barcelona	ES033	122	162	161	445
Madrid	ES119	79	41	58	178
Sevilla	ES188	-	20	24	44
Valencia	ES206	27	26	52	105
Helsiniki	FI003	91	53	79	223
Turku	FI036	-	-	27	27
Espoo	FI057	-	-	23	23
Lyon	FR124	27	34	39	100
Montpellier	FR145	23	-	-	23
Nice	FR152	30	24	-	54
Paris	FR159	272	294	315	881
Strasbourg	FR197	90	44	41	175
Athens	GR005	59	55	67	181
Zagreb	HR054	-	21	-	21
Budapest	HU006	79	96	70	245
Dublin	IE006	45	42	43	130
Reykjiavik	IS001	22	24	-	46
Florence	IT154	29	28	29	86
Milan	IT240	34	-	32	66
Rome	IT344	111	88	76	275
Turin	IT410	-	44	23	67
Trieste	IT421	35	-	41	76
Venice	IT430	23	-	21	44
Vilnius	LT006	-	32	21	53
Luxemburg	LU002	-	31	31	62
Riga	LV004	20	-	-	20
The Hague	NL001	20	35	58	113
Amsterdam	NL007	77	98	120	295
Maastricht	NL045	44	85	87	216
Bergen	NO003		23	24	47
Oslo	NO017	64	40	70	174
Krakow	PL074	-	31	23	54
Pusan	PL130	-	23	42	65
Warsaw	PL183	44	33	-	77
Lisbon	PT018	60	64	104	228
Porto	PT022	-	-	25	25
Göteborg	SE008	39	21	-	60
Stockholm	SE036	97	87	93	277
Ljubljana	SI009	24	-	22	46
Antalya	TR008	-	-	21	21
Istanbul	TR033	58	83	73	214
Edinburgh	UK110	37	36	-	73
Glasgow	UK122	40	26	25	91
London	UK132	144	128	103	375
Total		3012	2966	3337	9315

NB:

CITY_NAME	… name of the town or city
STSICD	… "Settlement Site Code" used in the GISCO reference data base
MEETINGS_YEAR	… number of meetings held by international organisations with a minimum of 50 participants in that year
-	… less than 20 meetings

Appendix 9: Beds available in registered accommodation (Urban Audit 2003-2006)

CITY_CODE	CITY_NAME	STSICD	BEDS_AVAIL	BEDS_AVAIL_POP	BEDS_AVAIL_POP_LOW_S	BEDS_AVAIL_POP_HIGH_S
at001c	Vienna	AT022	48 061	30	28	30
at002c	Graz	AT006	5 851	25	22	25
at003c	Linz	AT014	5 543	30	27	30
at004c	Salzburg	AT016	13 314	91	79	91
at005c	Innsbruck	AT007	7 960	69	61	69
be001c	Brussels	BE014	31 865	32	32	32
be002c	Antwerpen	BE004	10 424	23	22	24
be003c	Gent	BE022	4 442	19	15	24
be004c	Charleroi	BE015	1 007	5	5	5
be005c	Liège	BE034	3 921	11	11	11
be006c	Brugge	BE013	9 109	78	73	81
be007c	Namur	BE046	2 038	19	11	25
bg001c	Sofia	BG020	6 828	6	:	:
bg002c	Plovdiv	BG014	3 162	9	:	:
bg003c	Varna	BG023	4 191	13	:	:
bg004c	Burgas	BG003	2 628	14	:	:
bg005c	Pleven	BG013	908	8	:	:
bg006c	Ruse	BG016	846	5	:	:
bg007c	Vidin	BG024	125	2	:	:
ch001c	Zurich	CH016	11 001	30	:	27
ch002c	Geneva	CH006	9 870	55	54	55
ch004c	Bern	CH002	3 140	20	19	20
ch005c	Lausanne	CH009	3 894	35	35	35
cy001c	Lefkosia/Nicosia	CY006	2 067	10	:	:
cz001c	Prague	CZ047	70 952	61	:	:
cz002c	Brno	CZ003	10 305	27	:	:
cz003c	Ostrava	CZ042	2 863	9	:	:
cz004c	Plzen	CZ046	3 044	18	:	:
cz005c	Usti nad Labem	CZ060	2 670	28	:	:
cz006c	Olomouc	CZ039	:	:	:	:
cz007c	Liberec	CZ029	:	:	:	:
cz008c	Ceske Budejovice	CZ005	:	:	:	:
cz009c	Hradec Kralove	CZ015	:	:	:	:
cz010c	Pardubice	CZ044	:	:	:	:
cz011c	Zlin	CZ066	:	:	:	:
cz012c	Kladno	CZ022	:	:	:	:
cz013c	Karlovy Vary	CZ020	:	:	:	:
cz014c	Jihlava	CZ018	:	:	:	:
de001c	Berlin	DE057	68 779	20	:	:
de002c	Hamburg	DE221	30 502	18	:	:
de003c	Munich	DE370	40 122	32	:	:
de004c	Cologne	DE288	23 368	24	:	:
de005c	Frankfurt/Main	DE163	25 330	39	:	:
de006c	Essen	DE151	6 306	11	:	:
de007c	Stuttgart	DE526	14 529	25	:	:
de008c	Leipzig	DE314	11 170	22	:	:
de009c	Dresden	DE121	14 520	30	:	:
de010c	Dortmund	DE119	5 570	9	:	:
de011c	Düsseldorf	DE126	16 528	29	:	:
de012c	Bremen	DE077	7 413	14	:	:
de013c	Hannover	DE226	10 899	21	:	:
de014c	Nürnberg	DE400	12 814	26	:	:
de015c	Bochum	DE067	2 981	8	:	:
de016c	Wuppertal	DE600	2 632	7	:	:
de017c	Bielefeld	DE059	3 822	12	:	:
de018c	Halle/Saale	DE219	2 389	10	:	:
de019c	Magdeburg	DE339	4 094	18	:	:
de020c	Wiesbaden	DE583	6 335	23	:	:
de021c	Göttingen	DE204	5 587	21	:	:
de022c	Mühleim a.d.Ruhr	DE369	1 483	9	:	:

CITY_CODE	CITY_NAME	STSICD	BEDS_AVAIL	BEDS_AVAIL_POP	BEDS_AVAIL_POP_LOW_S	BEDS_AVAIL_POP_HIGH_S
de023c	Moers	DE361	4 031	37	:	:
de025c	Darmstadt	DE103	3 458	25	:	:
de026c	Trier	DE532	4 321	43	:	:
de027c	Freiburg im Breisgau	DE167	5 241	25	:	:
de028c	Regensburg	DE444	3 790	29	:	:
de029c	Frankfurt/Oder	DE164	958	14	:	:
de030c	Weimar	DE565	3 405	53	:	:
de031c	Schwerin	DE490	2 624	27	:	:
de032c	Erfurt	DE144	4 016	20	:	:
de033c	Augsburg	DE025	3 208	12	:	:
de034c	Bonn	DE068	7 078	23	:	:
de035c	Karlsruhe	DE274	5 047	18	:	:
de036c	Mönchengladbach	DE362	1 813	7	:	:
de037c	Mainz	DE341	4 901	26	:	:
de039c	Kiel	DE283	3 344	14	:	:
de040c	Saarbrucken	DE468	4 082	22	:	:
de041c	Potsdam	DE431	4 684	32	:	:
de042c	Koblenz	DE287	3 796	35	:	:
dk001c	Copenhagen	DK013	:	:	34	:
dk001k	Kernel Copenhagen		:	:	:	:
dk002c	Aarhus	DK026	2 939	10	10	10
dk003c	Odense	DK017	1 909	10	10	:
dk004c	Aalborg	DK001	2 840	17	17	17
ee001c	Tallinn	EE002	10 280	26	26	26
ee002c	Tartu	EE003	1 522	15	13	15
es001c	Madrid	ES119	60 334	19	18	20
es002c	Barcelona	ES033	42 276	27	26	27
es003c	Valencia	ES206	12 041	15	15	16
es004c	Sevilla	ES188	15 588	22	21	22
es005c	Zaragoza	ES225	6 969	11	11	11
es006c	Malaga	ES121	4 730	9	8	10
es007c	Murcia	ES139	3 342	8	8	9
es008c	Las Palmas	ES108	5 575	15	15	15
es009c	Valladolid	ES208	2 909	9	9	9
es010c	Palma di Mallorca	ES148	29 770	81	39	108
es011c	Santiago de Compostela	ES184	6 433	70	61	74
es012c	Vitoria/Gasteiz	ES220	2 367	11	10	11
es013c	Oviedo	ES146	3 636	17	17	18
es014c	Pamplona	ES149	2 906	15	15	15
es015c	Santander	ES183	4 284	23	20	27
es016c	Toledo	ES197	3 343	45	42	47
es017c	Badajoz	ES030	:	:	:	:
es018c	Logrono	ES114	2 107	15	13	15
es019c	Bilbao	ES037	4 997	14	14	14
es020c	Cordoba	ES059	5 708	18	17	18
es021c	Alicante	ES016	7 300	24	23	24
es022c	Vigo	ES211	4 440	15	15	15
es023c	Gijon	ES086	4 123	15	15	16
es024c	Hospitalet de Llobregat(L')	ES335	:	:	:	:
es025c	Sta. Cruz de Tenerife	ES181	2 788	13	12	13
fi001c	Helsinki	FI003	14 580	26	25	26
fi001k	Kernel Helsinki		:	:	:	:
fi002c	Tampere	FI034	4 361	22	18	22
fi003c	Turku	FI036	3 669	21	21	22
fi004c	Oulu	FI023	2 570	21	20	22
fr001c	Paris	FR159	152 520	71	70	72
fr001k	Paris with "small ring"		:	:	:	:
fr003c	Lyon	FR124	21 552	18	17	18
fr004c	Toulouse	FR202	13 005	20	20	21
fr006c	Strasbourg	FR197	13 113	28	26	29
fr007c	Bordeaux	FR037	13 671	20	19	20
fr008c	Nantes	FR149	10 436	18	16	19
fr009c	Lille	FR118	12 567	11	11	12
fr010c	Montpellier	FR145	9 690	22	16	32

CITY_CODE	CITY_NAME	STSICD	BEDS_AVAIL	BEDS_AVAIL_POP	BEDS_AVAIL_POP_LOW_S	BEDS_AVAIL_POP_HIGH_S
fr011c	Saint-Etienne	FR181	3 054	8	7	8
fr012c	Le Havre	FR112	3 377	13	12	15
fr013c	Rennes	FR171	6 631	17	16	19
fr014c	Amiens	FR009	2 351	14	12	16
fr015c	Rouen	FR176	5 957	15	14	16
fr016c	Nancy	FR148	5 098	20	18	21
fr017c	Metz	FR134	3 970	18	17	20
fr018c	Reims	FR170	4 823	22	22	23
fr019c	Orléans	FR156	5 826	21	20	23
fr020c	Dijon	FR074	5 785	24	22	25
fr021c	Poitiers	FR165	6 944	54	48	58
fr022c	Clermont-Ferrand	FR064	6 881	26	20	34
fr023c	Caen	FR045	6 675	30	23	40
fr024c	Limoges	FR119	3 679	19	17	24
fr025c	Besançon	FR033	3 144	18	16	21
fr026c	Grenoble	FR096	6 083	15	15	16
fr027c	Ajaccio	FR005	2 488	36	13	52
fr032c	Toulon	FR201	13 848	33	11	66
fr035c	Tours	FR203	7 587	29	26	31
fr202c	Aix-en-Provence	FR003	9 604	28	20	39
fr203c	Marseille	FR128	13 583	13	11	17
fr205c	Nice	FR152	25 515	50	41	57
fr207c	Lens - Liévin	FR115	785	3	3	3
gr001c	Athens	GR005	:	:	24	30
gr001k	Kernel Athens		:	:	:	:
gr002c	Thessaloniki	GR031	:	:	5	18
gr003c	Patra	GR025	:	:	5	6
gr004c	Irakleio	GR010	:	:	11	:
gr005c	Larisa	GR023	1 880	14	4	14
gr006c	Volos	GR035	:	:	16	19
gr007c	Ioannina	GR009	1 986	25	10	25
gr008c	Kavala	GR014	2 007	31	15	31
gr009c	Kalamata	GR066	:	:	6	21
hr001c	Zagreb	HR054	:	:	:	:
hr002c	Rijeka	HR035	:	:	:	:
hr003c	Slavonski Brod	HR043	:	:	:	:
hr004c	Osijek	HR028	:	:	:	:
hr005c	Split	HR045	:	:	:	:
hu001c	Budapest	HU006	40 148	24	21	24
hu002c	Miskolc	HU038	3 983	22	15	22
hu003c	Nyiregyhaza	HU043	3 248	27	12	28
hu004c	Pecs	HU049	5 661	35	22	35
hu005c	Debrecen	HU009	5 889	29	15	30
hu006c	Szeged	HU054	5 898	37	21	38
hu007c	Gyor	HU018	4 149	33	24	33
hu008c	Kecskemet	HU029	2 101	19	10	20
hu009c	Szekesfehervar	HU055	1 591	15	9	15
ie001c	Dublin	IE006	38 214	81	:	:
ie002c	Cork	IE002	19 289	169	:	:
ie003c	Limerick	IE007	6 512	129	:	:
ie004c	Galway	IE005	19 771	321	:	:
ie005c	Waterford	IE008	6 773	159	:	:
it001c	Rome	IT344	115 980	45	:	:
it002c	Milan	IT240	47 676	37	:	:
it003c	Naples	IT267	11 052	11	:	:
it004c	Turin	IT410	14 211	16	:	:
it005c	Palermo	IT295	9 243	14	:	:
it006c	Genoa	IT174	8 515	14	:	:
it007c	Florence	IT154	37 440	102	:	:
it008c	Bari	IT042	5 440	17	:	:
it009c	Bologna	IT054	11 307	30	:	:
it010c	Catania	IT093	5 540	18	:	:
it011c	Venice	IT430	32 208	119	:	:
it012c	Verona	IT434	9 195	35	:	:

CITY_CODE	CITY_NAME	STSICD	BEDS_AVAIL	BEDS_AVAIL_POP	BEDS_AVAIL_POP_LOW_S	BEDS_AVAIL_POP_HIGH_S
it013c	Cremona	IT133	1 103	15	:	:
it014c	Trento	IT417	3 573	32	:	:
it015c	Trieste	IT421	5 049	24	:	:
it016c	Perugia	IT302	8 170	52	:	:
it017c	Ancona	IT019	2 718	27	:	:
it018c	l'Aquila	IT199	1 904	27	:	:
it019c	Pescara	IT304	1 988	16	:	:
it020c	Campobasso	IT069	533	10	:	:
it021c	Caserta	IT084	557	7	:	:
it022c	Taranto	IT402	2 354	12	:	:
it023c	Potenza	IT325	967	14	:	:
it024c	Catanzaro	IT094	904	10	:	:
it025c	Reggio di Calabria	IT335	1 363	7	:	:
it026c	Sassari	IT376	1 321	11	:	:
it027c	Cagliari	IT063	2 419	15	:	:
it028c	Padova	IT293	4 529	21	:	:
it029c	Brescia	IT058	2 842	15	:	:
it030c	Modena	IT246	3 956	22	:	:
it031c	Foggia	IT155	1 214	8	:	:
it032c	Salerno	IT353	1 117	8	:	:
lt001c	Vilnius	LT006	6 729	12	11	12
lt002c	Kaunas	LT002	1 204	3	3	3
lt003c	Panevezys	LT004	235	2	2	2
lu001c	Luxembourg	LU002	4 999	60	60	60
lv001c	Riga	LV004	8 693	12	:	:
lv002c	Liepaja	LV003	304	3	:	11
mt001c	Valletta	MT001	37 101	102	:	:
nl001c	The Hague	NL001	6 261	13	13	13
nl002c	Amsterdam	NL007	37 763	51	:	:
nl003c	Rotterdam	NL056	:	:	:	:
nl004c	Utrecht	NL066	2 520	10	:	:
nl005c	Eindhoven	NL022	2 556	12	12	12
nl006c	Tilburg	NL065	682	3	3	3
nl007c	Groningen	NL030	1 500	8	:	8
nl008c	Enschede	NL024	1 500	10	:	:
nl009c	Arnhem	NL009	1 509	11	:	:
nl010c	Heerlen	NL033	883	9	9	9
nl011c	Almere	NL086	310	2	2	2
nl012c	Breda	NL013	1 290	8	8	8
nl013c	Nijmegen	NL049	976	6	6	6
nl014c	Apeldoorn	NL008	2 142	14	14	14
nl015c	Leeuwarden	NL042	672	7	:	:
nl513c	Deventer	NL018	:	:	:	:
nl514c	Alkmaar	NL003	:	:	:	:
nl515c	Venlo	NL071	:	:	:	:
nl516c	Helmond	NL034	:	:	:	:
nl517c	Hengelo (O.)	NL035	:	:	:	:
nl518c	Schiedam	NL057	:	:	:	:
nl519c	Almelo	NL004	:	:	:	:
nl520c	Lelystad	NL085	:	:	:	:
no001c	Oslo	NO017	15 349	29	28	30
no002c	Bergen	NO003	7 018	30	28	29
no003c	Trondheim	NO029	4 063	26	23	27
no004c	Stavanger	NO025	3 476	31	28	31
no005c	Kristiansand	NO012	3 427	46	30	45
no006c	Tromso	NO028	2 249	36	35	37
pl001c	Warsaw	PL183	21 870	13	13	13
pl002c	Lodz	PL086	3 466	4	4	4
pl003c	Krakow	PL074	15 286	20	18	20
pl004c	Wroclaw	PL189	7 264	11	11	11
pl005c	Poznan	PL130	7 271	13	12	13
pl006c	Gdansk	PL034	10 564	23	12	23
pl007c	Szczecin	PL167	5 304	13	12	13
pl008c	Bydgoszcz	PL017	1 797	5	4	5

CITY_CODE	CITY_NAME	STSICD	BEDS_AVAIL	BEDS_AVAIL_POP	BEDS_AVAIL_POP_LOW_S	BEDS_AVAIL_POP_HIGH_S
pl009c	Lublin	PL093	2 522	7	6	7
pl010c	Katowice	PL061	2 608	8	8	8
pl011c	Bialystok	PL008	1 363	5	5	5
pl012c	Kielce	PL064	1 378	7	6	7
pl013c	Torun	PL176	1 775	9	8	9
pl014c	Olsztyn	PL113	5 543	32	11	32
pl015c	Rzeszow	PL142	1 654	10	10	10
pl016c	Opole	PL115	725	6	5	6
pl017c	Gorzow Wielkopolski	PL042	1 010	8	8	8
pl018c	Zielona Gora	PL201	1 298	11	10	11
pl019c	Jelenia Gora	PL058	2 544	29	23	29
pl020c	Nowy Sacz	PL107	700	8	5	8
pl021c	Suwalki	PL161	708	10	7	10
pl022c	Konin	PL069	364	4	4	4
pl023c	Zory	PL202	249	4	4	4
pl024c	Czestochowa	PL027	2 519	10	8	10
pl025c	Radom	PL138	841	4	4	4
pl026c	Plock	PL128	405	3	3	3
pl027c	Kalisz	PL059	714	7	5	7
pl028c	Koszalin	PL073	499	5	5	5
pt001c	Lisbon	PT018	31 851	60	54	60
pt001k	Kernel Lisbon		:	:	:	:
pt002c	Oporto	PT022	8 550	36	35	36
pt003c	Braga	PT007	1 897	11	10	11
pt004c	Funchal	PT015	19 288	191	183	191
pt005c	Coimbra	PT009	2 302	16	16	16
pt006c	Setubal	PT025	1 998	17	16	17
pt007c	Ponta Delgada	PT021	3 081	48	38	48
pt008c	Aveiro	PT006	1 107	15	15	15
pt009c	Faro	PT014	1 464	25	24	25
ro001c	Bucuresti	RO020	9 903	5	:	:
ro002c	Cluj-Napoca	RO033	2 741	9	:	:
ro003c	Timisoara	RO096	2 814	9	:	:
ro004c	Craiova	RO038	849	3	:	:
ro005c	Braila	RO018	1 506	7	:	:
ro006c	Oradea	RO070	795	4	:	:
ro007c	Bacau	RO006	632	3	:	:
ro008c	Arad	RO005	1 976	12	:	:
ro009c	Sibiu	RO090	2 121	14	:	:
ro010c	Targu Mures	RO100	1 303	9	:	:
ro011c	Piatra Neamt	RO075	845	8	:	:
ro012c	Calarasi	RO023	493	7	:	:
ro013c	Giurgiu	RO053	883	13	:	:
ro014c	Alba Iulia	RO003	414	6	:	:
se001c	Stockholm	SE036	25 218	33	30	34
se001k	Kernel Stockholm		:	:	:	:
se002c	Goeteborg	SE008	13 516	28	27	30
se003c	Malmoe	SE026	5 932	22	20	23
se004c	Joenkoeping	SE012	3 960	33	28	36
se005c	Umea	SE042	2 452	23	19	25
se006c	Uppsala	SE044	2 436	13	12	14
se007c	Linkoeping	SE023	2 601	19	17	20
se008c	Oerebro	SE030	2 842	23	21	24
si001c	Ljubljana	SI009	4 922	18	:	:
si002c	Maribor	SI010	1 022	9	:	:
sk001c	Bratislava	SK004	11 361	27	27	27
sk002c	Kosice	SK012	3 975	17	17	17
sk003c	Banska Bystrica	SK002	1 831	22	22	22
sk004c	Nitra	SK018	1 549	18	18	18
sk005c	PreSov	SK025	822	9	9	9
sk006c	Zilina	SK038	1 053	12	12	12
sk007c	Trnava	SK035	709	10	10	10
sk008c	Trencin	SK034	1 044	18	18	18
tr001c	Ankara	TR006	:	:	:	:

CITY_CODE	CITY_NAME	STSICD	BEDS_AVAIL	BEDS_AVAIL_POP	BEDS_AVAIL_POP_LOW_S	BEDS_AVAIL_POP_HIGH_S
tr002c	Adana	TR068	:	:	:	:
tr003c	Antalya	TR008	:	:	:	:
tr004c	Balikesir	TR011	:	:	:	:
tr005c	Bursa	TR017	:	:	:	:
tr006c	Denizli	TR022	:	:	:	:
tr007c	Diyarbakir	TR023	:	:	:	:
tr008c	Edirne	TR024	:	:	:	:
tr009c	Erzurum	TR027	:	:	:	:
tr010c	Gaziantep	TR029	:	:	:	:
tr011c	Hatay	TR072	:	:	:	:
tr012c	Istanbul	TR033	:	:	:	:
tr013c	Izmir	TR034	:	:	:	:
tr014c	Kars	TR038	:	:	:	:
tr015c	Kastamonu	TR039	:	:	:	:
tr016c	Kayseri	TR040	:	:	:	:
tr017c	Kocaeli (Izmit)	TR035	:	:	:	:
tr018c	Konya	TR043	:	:	:	:
tr019c	Malatya	TR045	:	:	:	:
tr020c	Manisa	TR046	:	:	:	:
tr021c	Nevsehir	TR052	:	:	:	:
tr022c	Samsun	TR056	:	:	:	:
tr023c	Siirt	TR057	:	:	:	:
tr024c	Trabzon	TR062	:	:	:	:
tr025c	Van	TR065	:	:	:	:
tr026c	Zonguldak	TR067	:	:	:	:
uk001c	London	UK132	169 416	23	:	:
uk001k	Inner London		:	:	:	:
uk002c	Birmingham	UK591	16 793	17	27	27
uk003c	Leeds	UK593	8 475	12	:	:
uk004c	Glasgow	UK122	:	:	:	:
uk005c	Bradford	UK599	4 014	8	:	:
uk006c	Liverpool	UK178	5 911	13	:	:
uk007c	Edinburgh	UK110	37 284	82	67	82
uk008c	Manchester	UK594	21 784	50	:	:
uk009c	Cardiff	UK066	:	:	:	:
uk010c	Sheffield	UK238	4 660	9	:	:
uk011c	Bristol	UK052	6 191	16	:	:
uk012c	Belfast	UK031	4 022	14		:
uk013c	Newcastle upon Tyne	UK598	6 277	24	:	:
uk014c	Leicester	UK173	2 544	9	:	:
uk015c	Derry	UK318	1 385	13		:
uk016c	Aberdeen	UK002	:	:	:	:
uk017c	Cambridge	UK062	2 993	26	:	:
uk018c	Exeter	UK112	3 208	45	:	:
uk019c	Lincoln	UK177	2 247	26	:	:
uk020c	Gravesham	UK597	924	10	:	:
uk021c	Stevenage	UK252	576	7	7	7
uk022c	Wrexham	UK299	2 263	17	:	:
uk023c	Portsmouth	UK221	4 550	24	25	26
uk024c	Worcester	UK296	1 432	15	:	:
uk025c	Coventry	UK087	:	:	:	31
uk026c	Kingston-upon-Hull	UK168	:	:	:	:
uk027c	Stoke-on-trent	UK595	1 586	7	7	7
uk028c	Wolverhampton	UK592	2 186	9	:	:
uk029c	Nottingham	UK208	:	:	:	:
uk030c	Wirral	UK596	:	:	:	:

NB:

:	… figure not available
	… figure referring to 1999-2002 (i.e. figure for 2003-2006 not available)
	… figure referrring to 1994-1998
CITY_CODE	… city code used for town or city in Urban audit statistics
CITY_NAME	… name of the town or city
STSICD	… "Settlement Site Code" used in the GISCO reference data base
BEDS_AVAIL	… number of beds available
BEDS_AVAIL_POP	… number of beds available per 1000 residents
BEDS_AVAIL_POP_LOW_S	… number of beds available per 1000 residents during the low season
BEDS_AVAIL_POP_HIGH_S	… number of beds available per 1000 residents during the high season

Appendix 10: Results from the categorisation of data on the Urban Audit cities

CITY_CODE	CITY_NAME	STSICD	CLUSTER	WORKING_POP_CLASS	GDP_HEAD_CLASS	HEADQUARTERS_CLASS	NACE_J_K_CLASS	ECO_IMPORT_CLASS	BEDS_AVAIL	BEDS_POP_CLASS	TOUR_IMPORT_CLASS	MEETINGS_2003_2005_2007_CLASS	TOUR_IMPORT_CLASS_CORR_MEETINGS
at001c	Vienna	AT022	1	5 Very large population	2	2	3	2,25 Little economic importance	4	3	4 Large touristic importance	5 Very large	4 Large touristic importance
cz001c	Prague	CZ047	1	4 Large population	2	2	2	2,00 Little economic importance	4	4	4 Large touristic importance	4 Large	4 Large touristic importance
de001c	Berlin	DE057	1	5 Very large population	3	1	3	2,50 Medium economic importance	4	2	4 Large touristic importance	5 Very large	4 Large touristic importance
es001c	Madrid	ES119	1	5 Very large population	3		2	2,67 Medium economic importance	4	1	4 Large touristic importance	4 Large	4 Large touristic importance
es002c	Barcelona	ES033	1	5 Very large population	3		2	2,67 Medium economic importance	4	2	4 Large touristic importance	5 Very large	4 Large touristic importance
hu001c	Budapest	HU006	1	5 Very large population	2	2		2,00 Little economic importance	4	2	4 Large touristic importance	4 Large	4 Large touristic importance
pl001c	Warsaw	PL183	1	5 Very large population	2	4	3	2,75 Medium economic importance	3	1	3 Medium touristic importance	3 Medium	3 Medium touristic importance
pt001c	Lisboa	PT018	1	5 Very large population	3	2	2	2,50 Medium economic importance	3	4	4 Large touristic importance	4 Large	4 Large touristic importance
gr001c	Athens	GR005	1	5 Very large population		1		1,00 Very little economic importance		2	2 Small touristic importance	4 Large	3 Medium touristic importance
tr012c	Istanbul	TR033	1	5 Very large population	1		2	1,33 Very little economic importance				4 Large	3 Medium touristic importance
at002c	Graz	AT006	2	2 Small population		1	2	1,50 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
be003c	Gent	BE022	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	2 Small	2 Small touristic importance
be004c	Charleroi	BE015	2	2 Small population	2	1	2	1,75 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
be007c	Namur	BE046	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
ch002c	Geneva	CH006	2	2 Small population			4	4,00 Large economic importance	1	4	3 Medium touristic importance	5 Very large	3 Medium touristic importance
ch004c	Bern	CH002	2	2 Small population			3	3,00 Medium economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
cy001c	Lefkosia/Nicosia	CY006	2	2 Small population	2		2	2,00 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de002c	Hamburg	DE221	2	5 Very large population	4	2	4	3,50 Large economic importance	3	1	3 Medium touristic importance	2 Small	3 Medium touristic importance
de018c	Halle/Saale	DE219	2	2 Small population	3	1	3	2,50 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de019c	Magdeburg	DE339	2	2 Small population	3	1	3	2,50 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de020c	Wiesbaden	DE583	2	2 Small population	4	2	4	3,50 Large economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
de021c	Göttingen	DE204	2	2 Small population	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
de022c	Mühleim a.d.Ruhr	DE369	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de025c	Darmstadt	DE103	2	2 Small population	5	1	3	3,50 Large economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
de027c	Freiburg im Breisgau	DE167	2	2 Small population	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
de028c	Regensburg	DE444	2	2 Small population	5	1	2	3,25 Medium economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
de029c	Frankfurt/Oder	DE164	2	1 Very small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de031c	Schwerin	DE490	2	2 Small population	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
de032c	Erfurt	DE144	2	2 Small population	3	1	3	2,50 Medium economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
de033c	Augsburg	DE025	2	2 Small population	4	1	2	2,75 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de035c	Karlsruhe	DE274	2	2 Small population	4	1	4	3,25 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de036c	Mönchengladbach	DE362	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de037c	Mainz	DE341	2	2 Small population	4	1	3	3,00 Medium economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
de039c	Kiel	DE283	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de040c	Saarbrucken	DE468	2	2 Small population		1	4	2,50 Medium economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
dk003c	Odense	DK017	2	2 Small population	3		2	2,67 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
dk004c	Aalborg	DK001	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
es012c	Vitoria/Gasteiz	ES220	2	2 Small population	3		1	2,33 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
es013c	Oviedo	ES146	2	2 Small population	3		2	2,67 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
es014c	Pamplona	ES149	2	2 Small population	3		2	2,67 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
es015c	Santander	ES183	2	2 Small population	3			3,00 Medium economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
es018c	Logrono	ES114	2	2 Small population	3		1	2,33 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
es023c	Gijon	ES086	2	2 Small population	2		1	1,67 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
es025c	Sta. Cruz de Tenerife	ES181	2	2 Small population	3			3,00 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
fi002c	Tampere	FI034	2	2 Small population	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
fi003c	Turku	FI036	2	2 Small population	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	2 Small	2 Small touristic importance
fi004c	Oulu	FI023	2	2 Small population	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
fr006c	Strasbourg	FR197	2	3 Medium-sized populatio	3	1	2	2,25 Little economic importance	2	2	2 Small touristic importance	4 Large	3 Medium touristic importance
fr012c	Le Havre	FR112	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
fr014c	Amiens	FR009	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
fr016c	Nancy	FR148	2	2 Small population	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
fr017c	Metz	FR134	2	2 Small population	2	1	2	1,75 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
fr018c	Reims	FR170	2	2 Small population	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
fr019c	Orléans	FR156	2	2 Small population	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
fr020c	Dijon	FR074	2	2 Small population	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance

CITY_ CODE	CITY_NAME	STSICD	CLUSTER	WORKING_POP_CLASS	GDP_HEAD _CLASS	HEADQUAR TERS_CLASS	NACE_J_K_ CLASS	ECO_IMPORT_CLASS	BEDS_ AVAIL	BEDS_POP_ CLASS	TOUR_IMPORT_CLASS	MEETINGS_2003_ 2005_2007_CLASS	TOUR_IMPORT_CLASS_CORR_ MEETINGS
fr022c	Clermont-Ferrand	FR064	2	2 Small population	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
fr024c	Limoges	FR119	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
fr025c	Besançon	FR033	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
fr032c	Toulon	FR201	2	3 Medium-sized populatio	3	1		1,75 Little economic importance	2	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
fr035c	Tours	FR203	2	2 Small population	3			3,00 Medium economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
fr207c	Lens - Liévin	FR115	2	2 Small population	2			2,00 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it013c	Cremona	IT133	2	1 Very small population	2	1	3	2,00 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it015c	Trieste	IT421	2	2 Small population	3	3	4	3,25 Medium economic importance	1	2	2 Small touristic importance	3 Medium	2 Small touristic importance
it017c	Ancona	IT019	2	2 Small population	2	2	3	2,25 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
it018c	l'Aquila	IT199	2	1 Very small population	2	1	3	2,00 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
it019c	Pescara	IT304	2	2 Small population	2	1	4	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it020c	Campobasso	IT069	2	1 Very small population	2	1	3	2,00 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it021c	Caserta	IT084	2	2 Small population	2	1	5	2,50 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it022c	Taranto	IT402	2	2 Small population	2	1	2	1,75 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it023c	Potenza	IT325	2	1 Very small population	2	1	5	2,50 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it024c	Catanzaro	IT094	2	2 Small population	2	1	3	2,00 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it025c	Reggio di Calabria	IT335	2	2 Small population	2	1	2	1,75 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it026c	Sassari	IT376	2	2 Small population	2	1	3	2,00 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it027c	Cagliari	IT063	2	2 Small population	2	2	4	2,50 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it028c	Padova	IT293	2	2 Small population			4	4,00 Large economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
it029c	Brescia	IT058	2	2 Small population		1	5	3,00 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it030c	Modena	IT246	2	2 Small population			3	3,00 Medium economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
it031c	Foggia	IT155	2	2 Small population			3	3,00 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it032c	Salerno	IT353	2	2 Small population			3	3,00 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
lu001c	Luxembourg	LU002	2	2 Small population	4	3	4	3,75 Large economic importance	1	4	3 Medium touristic importance	3 Medium	3 Medium touristic importance
nl004c	Utrecht	NL066	2	2 Small population	5	1	4	3,75 Large economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
nl005c	Eindhoven	NL022	2	2 Small population	3	1	4	2,75 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
nl006c	Tilburg	NL065	2	2 Small population	3	1	3	2,50 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
nl007c	Groningen	NL030	2	2 Small population	4	1	3	3,00 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
nl008c	Enschede	NL024	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
nl009c	Arnhem	NL009	2	2 Small population	3	1	4	2,75 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
nl010c	Heerlen	NL033	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
nl011c	Almere	NL086	2	2 Small population	3		4	3,33 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
nl012c	Breda	NL013	2	2 Small population			2	2,00 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
nl013c	Nijmegen	NL049	2	2 Small population			2	2,00 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
nl014c	Apeldoorn	NL008	2	2 Small population			3	3,00 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
nl015c	Leeuwarden	NL042	2	2 Small population			3	3,00 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
no003c	Trondheim	NO029	2	2 Small population	3		2	2,67 Medium economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
se003c	Malmoe	SE026	2	2 Small population	3	2	2	2,50 Medium economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
se005c	Umea	SE042	2	2 Small population	3	1		1,75 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
se006c	Uppsala	SE044	2	2 Small population	3	2	3	2,75 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
se007c	Linkoeping	SE023	2	2 Small population	3	1		1,75 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
se008c	Oerebro	SE030	2	2 Small population	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
si001c	Ljubljana	SI009	2	2 Small population			2	2,00 Little economic importance	1	1	1 Very small touristic importance	2 Small	2 Small touristic importance
si002c	Maribor	SI010	2	2 Small population			2	2,00 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
uk012c	Belfast	UK031	2	2 Small population	2	1	2	1,75 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
uk013c	Newcastle upon Tyne	UK598	2	2 Small population	3	2	2	2,50 Medium economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
uk014c	Leicester	UK173	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
uk017c	Cambridge	UK062	2	2 Small population	3	1	3	2,50 Medium economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
uk019c	Lincoln	UK177	2	2 Small population	2	1	2	1,75 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
uk020c	Gravesham	UK597	2	2 Small population	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
uk021c	Stevenage	UK252	2	2 Small population	3	1	3	2,50 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
uk022c	Wrexham	UK299	2	2 Small population	3	1	1	2,00 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
uk023c	Portsmouth	UK221	2	2 Small population	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance

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uk024c	Worcester	UK296	2	2 Small population	2	1	2	1,75 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
at003c	Linz	AT014	3	2 Small population		1	4	2,50 Medium economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
be006c	Brugge	BE013	3	2 Small population	3	1	2	2,25 Little economic importance	1	4	3 Medium touristic importance	1 Very small	3 Medium touristic importance
ch005c	Lausanne	CH009	3	2 Small population			3	3,00 Medium economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
de023c	Moers	DE361	3	2 Small population	2	1	2	1,75 Little economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
de026c	Trier	DE532	3	2 Small population	3	1	2	2,25 Little economic importance	1	3	3 Medium touristic importance	3 Medium	3 Medium touristic importance
de041c	Potsdam	DE431	3	2 Small population	3	1	3	2,50 Medium economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
de042c	Koblenz	DE287	3	2 Small population	5	1	2	3,25 Medium economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
es011c	Santiago de Compostela	ES184	3	2 Small population	2		1	1,67 Little economic importance	1	4	3 Medium touristic importance	1 Very small	3 Medium touristic importance
es016c	Toledo	ES197	3	2 Small population	2			2,00 Little economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
fr021c	Poitiers	FR165	3	2 Small population	3	1	2	2,25 Little economic importance	1	4	3 Medium touristic importance	1 Very small	3 Medium touristic importance
fr023c	Caen	FR045	3	2 Small population	3	1	2	2,25 Little economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
fr027c	Ajaccio	FR005	3	1 Very small population	3		1	2,33 Little economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
ie002c	Cork	IE002	3	2 Small population	3			3,00 Medium economic importance	2	5	4 Large touristic importance	1 Very small	4 Large touristic importance
ie003c	Limerick	IE007	3	1 Very small population	3			3,00 Medium economic importance	1	5	3 Medium touristic importance	1 Very small	3 Medium touristic importance
ie004c	Galway	IE005	3	1 Very small population	2			2,00 Little economic importance	2	5	4 Large touristic importance	1 Very small	4 Large touristic importance
it012c	Verona	IT434	3	2 Small population	3	1	4	2,75 Medium economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
it014c	Trento	IT417	3	2 Small population	3	2	4	3,00 Medium economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
it016c	Perugia	IT302	3	2 Small population	2	2	3	2,25 Little economic importance	1	4	3 Medium touristic importance	1 Very small	3 Medium touristic importance
no002c	Bergen	NO003	3	2 Small population	3		2	2,67 Medium economic importance	1	3	3 Medium touristic importance	2 Small	3 Medium touristic importance
no004c	Stavanger	NO025	3	2 Small population	3		2	2,67 Medium economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
no005c	Kristiansand	NO012	3	1 Very small population	3		2	2,67 Medium economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
no006c	Tromso	NO028	3	1 Very small population	3		2	2,67 Medium economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
pt002c	Porto	PT022	3	2 Small population	2		2	2,00 Little economic importance	1	3	3 Medium touristic importance	2 Small	3 Medium touristic importance
se004c	Joenkoeping	SE012	3	2 Small population	3	1	2	2,25 Little economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
uk018c	Exeter	UK112	3	2 Small population	2	3	2	2,25 Little economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
it011c	Venice	IT430	3	2 Small population	3	3	3	3,00 Medium economic importance	3	5	5 Very large touristic importance	2 Small	5 Very large touristic importance
mt001c	Valletta	MT001	3	2 Small population	2	2		2,00 Little economic importance	3	5	5 Very large touristic importance	1 Very small	5 Very large touristic importance
at004c	Salzburg	AT016	4	2 Small population		1		1,00 Very little economic importance	2	4	4 Large touristic importance	2 Small	4 Large touristic importance
at005c	Innsbruck	AT007	4	2 Small population		1		1,00 Very little economic importance	1	4	3 Medium touristic importance	1 Very small	3 Medium touristic importance
bg004c	Burgas	BG003	4	2 Small population	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
bg005c	Pleven	BG013	4	2 Small population	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
bg006c	Ruse	BG016	4	2 Small population	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
bg007c	Vidin	BG024	4	1 Very small population	1	1	2	1,25 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
cz004c	Plzen	CZ046	4	2 Small population	1	1	2	1,25 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
cz005c	Usti nad Labem	CZ060	4	2 Small population	1	1	1	1,00 Very little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
de030c	Weimar	DE565	4	1 Very small population	2	1	2	1,75 Little economic importance	1	4	3 Medium touristic importance	1 Very small	3 Medium touristic importance
ee002c	Tartu	EE003	4	2 Small population	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
gr003c	Patra	GR025	4	2 Small population		1		1,00 Very little economic importance		1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
gr004c	Irakleio	GR010	4	2 Small population		1		1,00 Very little economic importance		1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
gr005c	Larisa	GR023	4	2 Small population		1		1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
gr006c	Volos	GR035	4	2 Small population		1		1,00 Very little economic importance		1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
gr007c	Ioannina	GR009	4	2 Small population		1		1,00 Very little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
gr008c	Kavala	GR014	4	1 Very small population		1		1,00 Very little economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
gr009c	Kalamata	GR066	4	1 Very small population		1		1,00 Very little economic importance		1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
hu002c	Miskolc	HU038	4	2 Small population	1	1		1,00 Very little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
hu003c	Nyiregyhaza	HU043	4	2 Small population	1	1		1,00 Very little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
hu004c	Pecs	HU049	4	2 Small population	1	1		1,00 Very little economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
hu005c	Debrecen	HU009	4	2 Small population	1	1		1,00 Very little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
hu006c	Szeged	HU054	4	2 Small population	1	1		1,00 Very little economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
hu007c	Gyor	HU018	4	2 Small population	1	1		1,00 Very little economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
hu008c	Kecskemet	HU029	4	2 Small population	1	1		1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
hu009c	Szekesfehervar	HU055	4	2 Small population	1	1		1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
lt003c	Panevezys	LT004	4	2 Small population	1		1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance

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lv002c	Liepaja	LV003	4	2 Small population	1		1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl012c	Kielce	PL064	4	2 Small population	1	1	2	1,25 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl013c	Torun	PL176	4	2 Small population	1	1	2	1,25 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl014c	Olsztyn	PL113	4	2 Small population	1	1	2	1,25 Very little economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
pl015c	Rzeszow	PL142	4	2 Small population	1	1	2	1,25 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl016c	Opole	PL115	4	2 Small population	1	1	2	1,25 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl017c	Gorzow Wielkopolski	PL042	4	2 Small population	1	1	2	1,25 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl018c	Zielona Gora	PL201	4	2 Small population	1	1	2	1,25 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl019c	Jelenia Gora	PL058	4	2 Small population	1	1	2	1,25 Very little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
pl020c	Nowy Sacz	PL107	4	2 Small population	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl021c	Suwalki	PL161	4	1 Very small population	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl022c	Konin	PL069	4	2 Small population	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl023c	Zory	PL202	4	1 Very small population	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl024c	Czestochowa	PL027	4	2 Small population	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl025c	Radom	PL138	4	2 Small population	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl026c	Plock	PL128	4	2 Small population	1	1	2	1,25 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl027c	Kalisz	PL059	4	2 Small population	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pl028c	Koszalin	PL073	4	2 Small population	1	1	2	1,25 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pt003c	Braga	PT007	4	2 Small population	2	1	1	1,50 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pt004c	Funchal	PT015	4	2 Small population	2	1	1	1,50 Little economic importance	2	5	4 Large touristic importance	1 Very small	4 Large touristic importance
pt005c	Coimbra	PT009	4	2 Small population	2	1	1	1,50 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pt006c	Setubal	PT025	4	2 Small population	2	1	1	1,50 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pt007c	Ponta Delgada	PT021	4	1 Very small population	2	1	1	1,50 Little economic importance	1	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
pt008c	Aveiro	PT006	4	2 Small population	2	1	1	1,50 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
pt009c	Faro	PT014	4	1 Very small population	2	1	1	1,50 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
ro005c	Braila	RO018	4	2 Small population	1			1,00 Very small economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
ro006c	Oradea	RO070	4	2 Small population	1			1,00 Very small economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
ro007c	Bacau	RO006	4	2 Small population	1			1,00 Very small economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
ro008c	Arad	RO005	4	2 Small population	1			1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
ro009c	Sibiu	RO090	4	2 Small population	1			1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
ro010c	Targu Mures	RO100	4	2 Small population	1			1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
ro011c	Piatra Neamt	RO075	4	2 Small population	1			1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
ro012c	Calarasi	RO023	4	2 Small population	1			1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
ro013c	Giurgiu	RO053	4	2 Small population	1			1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
ro014c	Alba Iulia	RO003	4	2 Small population	1			1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
sk002c	Kosice	SK012	4	2 Small population	1	2	2	1,50 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
sk003c	Banska Bystrica	SK002	4	2 Small population	1	1	2	1,25 Very little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
sk004c	Nitra	SK018	4	2 Small population	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
sk005c	PreSov	SK025	4	2 Small population	1		1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
sk006c	Zilina	SK038	4	2 Small population	1		2	1,33 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
sk007c	Trnava	SK035	4	2 Small population	1		2	1,33 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
sk008c	Trencin	SK034	4	1 Very small population	1		2	1,33 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
uk015c	Derry	UK318	4	2 Small population	1		2	1,33 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
be001c	Brussels	BE014	5	4 Large population	5	3	4	4,25 Large economic importance	3	3	3 Medium touristic importance	5 Very large	3 Medium touristic importance
de003c	Munich	DE370	5	4 Large population	5	1	4	3,75 Large economic importance	4	3	4 Large touristic importance	4 Large	4 Large touristic importance
de004c	Cologne	DE288	5	4 Large population	4	2	4	3,50 Large economic importance	3	2	3 Medium touristic importance	1 Very small	3 Medium touristic importance
it002c	Milan	IT240	5	4 Large population	3	4	5	3,75 Large economic importance	4	3	4 Large touristic importance	3 Medium	4 Large touristic importance
nl002c	Amsterdam	NL007	5	4 Large population	5	2	5	4,25 Large economic importance	3	4	4 Large touristic importance	4 Large	4 Large touristic importance
se001c	Stockholm	SE036	5	4 Large population	5	4		4,67 Very large economic importance	3	3	3 Medium touristic importance	4 Large	3 Medium touristic importance
be002c	Antwerpen	BE004	6	3 Medium-sized populatio	3	2	4	3,00 Medium economic importance	2	2	2 Small touristic importance	1 Very small	2 Small touristic importance
de008c	Leipzig	DE314	6	3 Medium-sized populatio	3	1	4	2,75 Medium economic importance	2	2	2 Small touristic importance	1 Very small	2 Small touristic importance
de009c	Dresden	DE121	6	3 Medium-sized populatio	3	3	3	3,00 Medium economic importance	2	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
de013c	Hannover	DE226	6	3 Medium-sized populatio	4	1	4	3,25 Medium economic importance	2	2	2 Small touristic importance	1 Very small	2 Small touristic importance
de014c	Nürnberg	DE400	6	3 Medium-sized populatio	4	1	4	3,25 Medium economic importance	2	2	2 Small touristic importance	1 Very small	2 Small touristic importance

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de034c	Bonn	DE068	6	3 Medium-sized populatio	3	1	3	2,50 Medium economic importance	1	2	2 Small touristic importance	2 Small	2 Small touristic importance
es003c	Valencia	ES206	6	4 Large population	3		1	2,33 Little economic importance	2	1	2 Small touristic importance	4 Large	3 Medium touristic importance
es004c	Sevilla	ES188	6	3 Medium-sized populatio	3		1	2,33 Little economic importance	2	2	2 Small touristic importance	2 Small	2 Small touristic importance
es021c	Alicante	ES016	6	3 Medium-sized populatio	3		1	2,33 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
fr003c	Lyon	FR124	6	4 Large population	3	3	2	2,75 Medium economic importance	3	1	3 Medium touristic importance	4 Large	3 Medium touristic importance
fr004c	Toulouse	FR202	6	3 Medium-sized populatio	3	2	2	2,50 Medium economic importance	2	2	2 Small touristic importance	1 Very small	2 Small touristic importance
fr007c	Bordeaux	FR037	6	3 Medium-sized populatio	3	1	2	2,25 Little economic importance	2	2	2 Small touristic importance	1 Very small	2 Small touristic importance
fr008c	Nantes	FR149	6	3 Medium-sized populatio	3	1	2	2,25 Little economic importance	2	1	2 Small touristic importance	1 Very small	2 Small touristic importance
fr009c	Lille	FR118	6	4 Large population	3	2	2	2,50 Medium economic importance	2	1	2 Small touristic importance	1 Very small	2 Small touristic importance
fr010c	Montpellier	FR145	6	3 Medium-sized populatio	3	1	2	2,25 Little economic importance	1	2	2 Small touristic importance	2 Small	2 Small touristic importance
fr203c	Marseille	FR128	6	4 Large population	3	2	2	2,50 Medium economic importance	2	1	2 Small touristic importance	1 Very small	2 Small touristic importance
it003c	Naples	IT267	6	4 Large population	2	4	4	3,00 Medium economic importance	2	1	2 Small touristic importance	1 Very small	2 Small touristic importance
it004c	Turin	IT410	6	4 Large population	3	2	5	3,25 Medium economic importance	2	1	2 Small touristic importance	3 Medium	2 Small touristic importance
it009c	Bologna	IT054	6	3 Medium-sized populatio	3	1	5	3,00 Medium economic importance	2	3	3 Medium touristic importance	1 Very small	3 Medium touristic importance
se002c	Goeteborg	SE008	6	3 Medium-sized populatio	4		2	2,50 Medium economic importance	2	2	2 Small touristic importance	3 Medium	2 Small touristic importance
sk001c	Bratislava	SK004	6	3 Medium-sized populatio	2	4	3	2,75 Medium economic importance	2	2	2 Small touristic importance	1 Very small	2 Small touristic importance
uk002c	Birmingham	UK591	6	4 Large population	3		2	2,67 Medium economic importance	2	1	2 Small touristic importance	1 Very small	2 Small touristic importance
be005c	Liège	BE034	7	3 Medium-sized populatio	3	1		2,33 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
bg001c	Sofia	BG020	7	4 Large population	1	4	2	2,00 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
bg002c	Plovdiv	BG014	7	3 Medium-sized populatio	1	2	1	1,25 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
bg003c	Varna	BG023	7	3 Medium-sized populatio	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
cz002c	Brno	CZ003	7	3 Medium-sized populatio	1	1	2	1,25 Very little economic importance	2	2	2 Small touristic importance	1 Very small	2 Small touristic importance
cz003c	Ostrava	CZ042	7	3 Medium-sized populatio	1	1	1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de006c	Essen	DE151	7	3 Medium-sized populatio	3	1	3	2,50 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de010c	Dortmund	DE119	7	3 Medium-sized populatio	3	1	3	2,50 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de012c	Bremen	DE077	7	3 Medium-sized populatio	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de015c	Bochum	DE067	7	3 Medium-sized populatio	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de016c	Wuppertal	DE600	7	3 Medium-sized populatio	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
de017c	Bielefeld	DE059	7	3 Medium-sized populatio	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
dk002c	Aarhus	DK026	7	3 Medium-sized populatio	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
ee001c	Tallinn	EE002	7	3 Medium-sized populatio	2	1	2	1,75 Little economic importance	2	2	2 Small touristic importance	2 Small	2 Small touristic importance
es005c	Zaragoza	ES225	7	3 Medium-sized populatio	3		2	2,67 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
es006c	Malaga	ES121	7	3 Medium-sized populatio	2		1	1,67 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
es007c	Murcia	ES139	7	3 Medium-sized populatio	2		1	1,67 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
es008c	Las Palmas	ES108	7	3 Medium-sized populatio	3		2	2,67 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
es009c	Valladolid	ES208	7	3 Medium-sized populatio	3		2	2,67 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
es019c	Bilbao	ES037	7	3 Medium-sized populatio	3		2	2,67 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
es020c	Cordoba	ES059	7	3 Medium-sized populatio	2		1	1,67 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
es022c	Vigo	ES211	7	3 Medium-sized populatio	3		1	2,33 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
fi001c	Helsinki	FI003	7	4 Large population	4	4	3	3,75 Large economic importance	2	2	2 Small touristic importance	4 Large	2 Small touristic importance
fr011c	Saint-Etienne	FR181	7	3 Medium-sized populatio	2	1	2	1,75 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
fr013c	Rennes	FR171	7	3 Medium-sized populatio	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
fr015c	Rouen	FR176	7	3 Medium-sized populatio	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
fr026c	Grenoble	FR096	7	3 Medium-sized populatio	3	1	2	2,25 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
fr202c	Aix-en-Provence	FR003	7	3 Medium-sized populatio	3	1		1,75 Little economic importance	1	2	2 Small touristic importance	1 Very small	2 Small touristic importance
gr002c	Thessaloniki	GR031	7	3 Medium-sized population		2		2,00 Little economic importance		1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it005c	Palermo	IT295	7	3 Medium-sized populatio	2	3	3	2,50 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it006c	Genoa	IT174	7	3 Medium-sized populatio	2	1	3	2,00 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it008c	Bari	IT042	7	3 Medium-sized populatio	2	2	4	2,50 Medium economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
it010c	Catania	IT093	7	3 Medium-sized populatio	2	1	3	2,00 Little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
lt001c	Vilnius	LT006	7	3 Medium-sized populatio	1		2	1,33 Very little economic importance	1	1	1 Very small touristic importance	3 Medium	2 Small touristic importance
lt002c	Kaunas	LT002	7	3 Medium-sized populatio	1		1	1,00 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
lv001c	Riga	LV004	7	4 Large population	1		2	1,33 Very little economic importance	1	1	1 Very small touristic importance	2 Small	2 Small touristic importance
nl001c	The Hague	NL001	7	3 Medium-sized populatio	3	1	3	2,50 Medium economic importance	1	1	1 Very small touristic importance	4 Large	1 Very small touristic importance
pl002c	Lodz	PL086	7	4 Large population	1	1	2	1,25 Very little economic importance	1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance

CITY_CODE	CITY_NAME	STSICD	CLUSTER	WORKING_POP_CLASS		GDP_HEAD_CLASS	HEADQUARTERS_CLASS	NACE_J_K_CLASS	ECO_IMPORT_CLASS		BEDS_AVAIL	BEDS_POP_CLASS	TOUR_IMPORT_CLASS		MEETINGS_2003_2005_2007_CLASS		TOUR_IMPORT_CLASS_CORR_MEETINGS	
pl003c	Krakow	PL074	7	4	Large population	1	2	2	1,50	Little economic importance	2	2	2	Small touristic importance	3	Medium	2	Small touristic importance
pl004c	Wroclaw	PL189	7	3	Medium-sized populatio	1	2	2	1,50	Little economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
pl005c	Poznan	PL130	7	3	Medium-sized populatio	2	1	2	1,75	Little economic importance	1	1	1	Very small touristic importance	3	Medium	2	Small touristic importance
pl006c	Gdansk	PL034	7	3	Medium-sized populatio	1	1	2	1,25	Very little economic importance	2	2	2	Small touristic importance	1	Very small	2	Small touristic importance
pl007c	Szczecin	PL167	7	3	Medium-sized populatio	1	1	2	1,25	Very little economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
pl008c	Bydgoszcz	PL017	7	3	Medium-sized populatio	1	1	2	1,25	Very little economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
pl009c	Lublin	PL093	7	3	Medium-sized populatio	1	1	2	1,25	Very little economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
pl010c	Katowice	PL061	7	3	Medium-sized populatio	1	2	2	1,50	Little economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
pl011c	Bialystok	PL008	7	3	Medium-sized populatio	1	1	2	1,25	Very little economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
ro001c	Bucuresti	RO020	7	5	Very large population	1			1,00	Very small economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
ro002c	Cluj-Napoca	RO033	7	3	Medium-sized populatio	1			1,00	Very small economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
ro003c	Timisoara	RO096	7	3	Medium-sized populatio	1			1,00	Very small economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
ro004c	Craiova	RO038	7	3	Medium-sized populatio	1			1,00	Very small economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
uk003c	Leeds	UK593	7	3	Medium-sized populatio	3	2	3	2,75	Medium economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
uk005c	Bradford	UK599	7	3	Medium-sized populatio	2	2	2	2,00	Little economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
uk006c	Liverpool	UK178	7	3	Medium-sized populatio	3	1	2	2,25	Little economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
uk010c	Sheffield	UK238	7	3	Medium-sized populatio	3	1	2	2,25	Little economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
uk011c	Bristol	UK052	7	3	Medium-sized populatio	3	2	4	3,00	Medium economic importance	1	1	1	Very small touristic importance	1	Very small	1	Very small touristic importance
ch001c	Zurich	CH016	8	3	Medium-sized population			4	4,00	Large economic importance	2	3	3	Medium touristic importance	3	Medium	3	Medium touristic importance
de005c	Frankfurt/Main	DE163	8	3	Medium-sized populatio	5	3	5	4,50	Very large economic importance	3	3	3	Medium touristic importance	3	Medium	3	Medium touristic importance
de007c	Stuttgart	DE526	8	3	Medium-sized populatio	5	2	4	4,00	Large economic importance	2	2	2	Small touristic importance	1	Very small	2	Small touristic importance
de011c	Düsseldorf	DE126	8	3	Medium-sized populatio	5	2	5	4,25	Large economic importance	2	2	2	Small touristic importance	1	Very small	2	Small touristic importance
dk001c	Copenhagen	DK013	8	3	Medium-sized populatio	5		4	4,67	Very large economic importance		3	3	Medium touristic importance	4	Large	3	Medium touristic importance
no001c	Oslo	NO017	8	3	Medium-sized populatio	5		3	4,33	Large economic importance	2	2	2	Small touristic importance	4	Large	2	Small touristic importance
es010c	Palma di Mallorca	ES148	9	3	Medium-sized populatio	3		1	2,33	Little economic importance	3	4	4	Large touristic importance	1	Very small	4	Large touristic importance
fr205c	Nice	FR152	9	3	Medium-sized populatio	3	1	2	2,25	Little economic importance	3	4	4	Large touristic importance	3	Medium	4	Large touristic importance
ie001c	Dublin	IE006	9	3	Medium-sized populatio	3			3,00	Medium economic importance	3	4	4	Large touristic importance	4	Large	4	Large touristic importance
it007c	Florence	IT154	9	3	Medium-sized populatio	3	1	4	2,75	Medium economic importance	3	5	5	Very large touristic importance	3	Medium	5	Very large touristic importance
uk007c	Edinburgh	UK110	9	3	Medium-sized populatio	3	4	4	3,50	Large economic importance	3	4	4	Large touristic importance	3	Medium	4	Large touristic importance
uk008c	Manchester	UK594	9	3	Medium-sized populatio	3	2	4	3,00	Medium economic importance	3	4	4	Large touristic importance	1	Very small	4	Large touristic importance
fr001c	Paris	FR159	10	5	Very large population	5	5	4	4,75	Very large economic importance	5	4	5	Very large touristic importance	5	Very large	5	Very large touristic importance
it001c	Rome	IT344	10	5	Very large population	3	3	5	3,50	Large economic importance	5	3	5	Very large touristic importance	4	Large	5	Very large touristic importance
uk001c	London	UK132	10	5	Very large population	4	5	5	4,50	Very large economic importance	5	2	5	Very large touristic importance	5	Very large	5	Very large touristic importance
cz006c	Olomouc	CZ039		2	Small population										1	Very small		
cz007c	Liberec	CZ029		2	Small population										1	Very small		
cz008c	Ceske Budejovice	CZ005		2	Small population										1	Very small		
cz009c	Hradec Kralove	CZ015		2	Small population										1	Very small		
cz010c	Pardubice	CZ044		2	Small population										1	Very small		
cz011c	Zlin	CZ066		2	Small population										1	Very small		
cz012c	Kladno	CZ022		1	Very small population										1	Very small		
cz013c	Karlovy Vary	CZ020		1	Very small population										1	Very small		
cz014c	Jihlava	CZ018		1	Very small population										1	Very small		
es017c	Badajoz	ES030		2	Small population	2		1	1,67	Little economic importance					1	Very small		
es024c	Hospitalet de Llobregat(L'	ES335		2	Small population	2		2	2,00	Little economic importance					1	Very small		
hr001c	Zagreb	HR054		4	Large population										2	Small		
hr002c	Rijeka	HR035		2	Small population										1	Very small		
hr003c	Slavonski Brod	HR043		1	Very small population										1	Very small		
hr004c	Osijek	HR028		2	Small population										1	Very small		
hr005c	Split	HR045		2	Small population										1	Very small		
ie005c	Waterford	IE008		1	Very small population						1	5	3	Medium touristic importance	1	Very small	3	Medium touristic importance
nl003c	Rotterdam	NL056		3	Medium-sized populatio	3	2	3	2,75	Medium economic importance					1	Very small		
nl513c	Deventer	NL018		2	Small population										1	Very small		
nl514c	Alkmaar	NL003		2	Small population										1	Very small		
nl515c	Venlo	NL071		2	Small population										1	Very small		
nl516c	Helmond	NL034		2	Small population										1	Very small		

CITY_CODE	CITY_NAME	STSICD	CLUSTER	WORKING_POP_CLASS	GDP_HEAD_CLASS	HEADQUARTERS_CLASS	NACE_J_K_CLASS	ECO_IMPORT_CLASS	BEDS_AVAIL	BEDS_POP_CLASS	TOUR_IMPORT_CLASS	MEETINGS_2003_2005_2007_CLASS	TOUR_IMPORT_CLASS_CORR_MEETINGS
nl517c	Hengelo (O,)	NL035		2 Small population								1 Very small	
nl518c	Schiedam	NL057		2 Small population								1 Very small	
nl519c	Almelo	NL004		1 Very small population								1 Very small	
nl520c	Lelystad	NL085		1 Very small population								1 Very small	
tr001c	Ankara	TR006		5 Very large population	1		2	1,33 Very little economic importance				1 Very small	
tr002c	Adana	TR068		4 Large population	1		1	1,00 Very little economic importance				1 Very small	
tr003c	Antalya	TR008		3 Medium-sized populatio	1		1	1,00 Very little economic importance				2 Small	
tr004c	Balikesir	TR011		2 Small population	1		1	1,00 Very little economic importance				1 Very small	
tr005c	Bursa	TR017		4 Large population	1		1	1,00 Very little economic importance				1 Very small	
tr006c	Denizli	TR022		3 Medium-sized populatio	1		1	1,00 Very little economic importance				1 Very small	
tr007c	Diyarbakir	TR023		3 Medium-sized populatio	1		1	1,00 Very little economic importance				1 Very small	
tr008c	Edirne	TR024		2 Small population	1		1	1,00 Very little economic importance				1 Very small	
tr009c	Erzurum	TR027		3 Medium-sized populatio	1		1	1,00 Very little economic importance				1 Very small	
tr010c	Gaziantep	TR029		4 Large population	1		1	1,00 Very little economic importance				1 Very small	
tr011c	Hatay	TR072		2 Small population	1		1	1,00 Very little economic importance				1 Very small	
tr013c	Izmir	TR034		5 Very large population	1		1	1,00 Very little economic importance				1 Very small	
tr014c	Kars	TR038		1 Very small population	1		1	1,00 Very little economic importance				1 Very small	
tr015c	Kastamonu	TR039		1 Very small population	1		1	1,00 Very little economic importance				1 Very small	
tr016c	Kayseri	TR040		3 Medium-sized populatio	1		1	1,00 Very little economic importance				1 Very small	
tr017c	Kocaeli (Izmit)	TR035		2 Small population	1		1	1,00 Very little economic importance				1 Very small	
tr018c	Konya	TR043		4 Large population	1		1	1,00 Very little economic importance				1 Very small	
tr019c	Malatya	TR045		3 Medium-sized populatio	1		1	1,00 Very little economic importance				1 Very small	
tr020c	Manisa	TR046		2 Small population	1		1	1,00 Very little economic importance				1 Very small	
tr021c	Nevsehir	TR052		1 Very small population	1		1	1,00 Very little economic importance				1 Very small	
tr022c	Samsun	TR056		3 Medium-sized populatio	1		2	1,33 Very little economic importance				1 Very small	
tr023c	Siirt	TR057		2 Small population	1		1	1,00 Very little economic importance				1 Very small	
tr024c	Trabzon	TR062		2 Small population	1		1	1,00 Very little economic importance				1 Very small	
tr025c	Van	TR065		2 Small population	1		1	1,00 Very little economic importance				1 Very small	
tr026c	Zonguldak	TR067		2 Small population	1		1	1,00 Very little economic importance				1 Very small	
uk004c	Glasgow	UK122		3 Medium-sized populatio	3	3	4	3,25 Medium economic importance				3 Medium	
uk009c	Cardiff	UK066		3 Medium-sized populatio	3	1	3	2,50 Medium economic importance				1 Very small	
uk016c	Aberdeen	UK002		2 Small population	2	1	2	1,75 Little economic importance				1 Very small	
uk025c	Coventry	UK087		3 Medium-sized population						3		1 Very small	
uk026c	Kingston-upon-Hull	UK168		2 Small population								1 Very small	
uk027c	Stoke-on-trent	UK595		2 Small population					1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
uk028c	Wolverhampton	UK592		2 Small population					1	1	1 Very small touristic importance	1 Very small	1 Very small touristic importance
uk029c	Nottingham	UK208		2 Small population								1 Very small	
uk030c	Wirral	UK596		2 Small population								1 Very small	

NB:

Cluster 1 … Very large population, Medium/little economic importance, large (medium) touristic importance
Cluster 2 … Small population, small/medium economic importance, small/very small touristic importance
Cluster 3 … Small population, little/medium economic importance, medium touristic importance
Cluster 4 … Small population, very small economic importance, very small touristic importance
Cluster 5 … Large population, large economic importance, medium/large touristic importance
Cluster 6 … Medium-sized (large) population, medium (small) economic importance, small (medium) touristic importance
Cluster 7 … Medium-sized population, small (partly very small or medium) economic importance, very small/small touristic importance
Cluster 8 … Medium-sized population, large/very large economic importance, small/medium touristic importance
Cluster 9 … Medium-sized population, medium/little economic importance but large touristic importance
Cluster 10 … Very large population, large/very large economic importance, very large touristic importance

… town/citiy whose assignment to this cluster is questionable
… town/city whose touristic importance influenced by the number of beds available per 1000 residents
… town/city whose touristic importance has been revised by information on meetings

CITY_CODE … city code used for town or city in Urban audit statistics
CITY_NAME … name of the town or city
STSICD … "Settlement Site Code" used in the GISCO reference data base
CLUSTER … results from hierarchical clustering: average linkage within groups, Squared Euclidean distance, 10 clusters)
WORKING_POP_CLASS … population of working age (15-64 years old)
GDP_HEAD_CLASS … gross domestic product per head (in euros)
HEADQUARTERS_CLASS … number of companies quoted on the national stock exchange with headquarters within the town/city
NACE_J_K … employment (jobs) in financial and business services (in %)
ECO_IMPORT_CLASS … economic importance
BEDS_CLASS … number of beds available
BEDS_POP_CLASS … number of beds available per 1000 residents
TOUR_IMPORT_CLASS … touristic importance
MEETINGS_2003_2005_2007 … meetings held by international organisations with a minimum of 50 participants in 2003, 2005 and 2007
TOUR_IMPORT_CLASS_CORR_MEETINGS … touristic importance after figures for certain towns/cities has been revised

Appendix 11: Results from hierarchical clustering of Urban Audit cities

CITY_ CODE	CITY_NAME	STSICD	Average linkage within groups																
			Squared euclidean distance											Euclidean distance			City Block distance		
			5 clusters	6 clusters	7 clusters	8 clusters	9 clusters	10 clusters	11 clusters	12 clusters	13 clusters	14 clusters	15 clusters	10 clusters	11 clusters	12 clusters	10 clusters	11 clusters	12 clusters
at001c	Vienna	AT022	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
cz001c	Prague	CZ047	1	1	1	1	1	1	1	1	1	1	1	7	7	7	8	8	9
de001c	Berlin	DE057	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
es001c	Madrid	ES119	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
es002c	Barcelona	ES033	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
hu001c	Budapest	HU006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
pl001c	Warsaw	PL183	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
pt001c	Lisboa	PT018	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
gr001c	Athens	GR005	1	1	1	1	1	1	1	1	13	14	14	4	4	4	2	2	2
tr012c	Istanbul	TR033	1	1	1	1	1	1	1	1	13	14	14	4	4	4	2	2	2
at002c	Graz	AT006	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
be003c	Gent	BE022	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
ch002c	Geneva	CH006	2	2	2	2	2	2	2	2	2	2	2	9	10	10	3	3	3
ch004c	Bern	CH002	2	2	2	2	2	2	2	2	2	2	2	9	10	10	4	4	7
de020c	Wiesbaden	DE583	2	2	2	2	2	2	2	2	2	2	2	9	10	10	4	4	7
de021c	Göttingen	DE204	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
de025c	Darmstadt	DE103	2	2	2	2	2	2	2	2	2	2	2	9	10	10	4	4	7
de027c	Freiburg im Breisgau	DE167	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
de028c	Regensburg	DE444	2	2	2	2	2	2	2	2	2	2	2	9	10	10	4	4	7
de031c	Schwerin	DE490	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
de032c	Erfurt	DE144	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
de037c	Mainz	DE341	2	2	2	2	2	2	2	2	2	2	2	9	10	10	4	4	7
de040c	Saarbrucken	DE468	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
es015c	Santander	ES183	2	2	2	2	2	2	2	2	2	2	2	9	10	10	4	4	7
fi002c	Tampere	FI034	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
fi003c	Turku	FI036	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
fi004c	Oulu	FI023	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
fr006c	Strasbourg	FR197	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
fr016c	Nancy	FR148	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
fr018c	Reims	FR170	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
fr019c	Orléans	FR156	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
fr020c	Dijon	FR074	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
fr022c	Clermont-Ferrand	FR064	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
fr032c	Toulon	FR201	2	2	2	2	2	2	2	2	2	2	2	3	3	3	4	4	7
fr035c	Tours	FR203	2	2	2	2	2	2	2	2	2	2	2	9	10	10	4	4	7
it015c	Trieste	IT421	2	2	2	2	2	2	2	2	2	2	2	9	10	10	4	4	7
it017c	Ancona	IT019	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
it018c	l'Aquila	IT199	2	2	2	2	2	2	2	2	2	2	2	4	4	4	4	4	7
it028c	Padova	IT293	2	2	2	2	2	2	2	2	2	2	2	9	10	10	4	4	7
it030c	Modena	IT246	2	2	2	2	2	2	2	2	2	2	2	9	10	10	4	4	7
lu001c	Luxembourg	LU002	2	2	2	2	2	2	2	2	2	2	2	9	10	10	3	3	3
no003c	Trondheim	NO029	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
se003c	Malmoe	SE026	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
se005c	Umea	SE042	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
se008c	Oerebro	SE030	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
si001c	Ljubljana	SI009	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
uk013c	Newcastle upon Tyne	UK598	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
uk017c	Cambridge	UK062	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
uk019c	Lincoln	UK177	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7
uk023c	Portsmouth	UK221	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	7

CITY_ CODE	CITY_NAME	STSICD	Average linkage within groups																
			Squared euclidean distance											Euclidean distance			City Block distance		
			5 clusters	6 clusters	7 clusters	8 clusters	9 clusters	10 clusters	11 clusters	12 clusters	13 clusters	14 clusters	15 clusters	10 clusters	11 clusters	12 clusters	10 clusters	11 clusters	12 clusters
be004c	Charleroi	BE015	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
be007c	Namur	BE046	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
cy001c	Lefkosia/Nicosia	CY006	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
de002c	Hamburg	DE221	2	2	2	2	2	2	2	7	7	7	7	8	8	8	2	2	2
de018c	Halle/Saale	DE219	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
de019c	Magdeburg	DE339	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
de022c	Mühleim a.d.Ruhr	DE369	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
de029c	Frankfurt/Oder	DE164	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
de033c	Augsburg	DE025	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
de035c	Karlsruhe	DE274	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
de036c	Mönchengladbach	DE362	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
de039c	Kiel	DE283	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
dk003c	Odense	DK017	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
dk004c	Aalborg	DK001	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
es012c	Vitoria/Gasteiz	ES220	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
es013c	Oviedo	ES146	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
es014c	Pamplona	ES149	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
es018c	Logrono	ES114	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
es023c	Gijon	ES086	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
es025c	Sta. Cruz de Tenerife	ES181	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
fr012c	Le Havre	FR112	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
fr014c	Amiens	FR009	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
fr017c	Metz	FR134	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
fr024c	Limoges	FR119	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
fr025c	Besançon	FR033	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
fr207c	Lens - Liévin	FR115	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
it013c	Cremona	IT133	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
it019c	Pescara	IT304	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
it020c	Campobasso	IT069	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
it021c	Caserta	IT084	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
it022c	Taranto	IT402	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
it023c	Potenza	IT325	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
it024c	Catanzaro	IT094	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
it025c	Reggio di Calabria	IT335	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
it026c	Sassari	IT376	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
it027c	Cagliari	IT063	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
it029c	Brescia	IT058	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
it031c	Foggia	IT155	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
it032c	Salerno	IT353	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
nl004c	Utrecht	NL066	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
nl005c	Eindhoven	NL022	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
nl006c	Tilburg	NL065	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
nl007c	Groningen	NL030	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
nl008c	Enschede	NL024	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
nl009c	Arnhem	NL009	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
nl010c	Heerlen	NL033	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
nl011c	Almere	NL086	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
nl012c	Breda	NL013	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
nl013c	Nijmegen	NL049	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
nl014c	Apeldoorn	NL008	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8

CITY_ CODE	CITY_NAME	STSICD	Average linkage within groups																
			Squared euclidean distance											Euclidean distance			City Block distance		
			5 clusters	6 clusters	7 clusters	8 clusters	9 clusters	10 clusters	11 clusters	12 clusters	13 clusters	14 clusters	15 clusters	10 clusters	11 clusters	12 clusters	10 clusters	11 clusters	12 clusters
nl015c	Leeuwarden	NL042	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
se006c	Uppsala	SE044	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
se007c	Linkoeping	SE023	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
si002c	Maribor	SI010	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
uk012c	Belfast	UK031	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
uk014c	Leicester	UK173	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
uk020c	Gravesham	UK597	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
uk021c	Stevenage	UK252	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
uk022c	Wrexham	UK299	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
uk024c	Worcester	UK296	2	2	2	2	2	2	2	7	7	7	7	7	7	7	7	7	8
be005c	Liège	BE034	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
bg001c	Sofia	BG020	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
de006c	Essen	DE151	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
de010c	Dortmund	DE119	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
de012c	Bremen	DE077	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
de015c	Bochum	DE067	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
de016c	Wuppertal	DE600	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
de017c	Bielefeld	DE059	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
dk002c	Aarhus	DK026	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
es005c	Zaragoza	ES225	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
es008c	Las Palmas	ES108	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
es009c	Valladolid	ES208	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
es019c	Bilbao	ES037	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
es022c	Vigo	ES211	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
fi001c	Helsinki	FI003	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
fr013c	Rennes	FR171	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
fr015c	Rouen	FR176	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
fr026c	Grenoble	FR096	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
gr002c	Thessaloniki	GR031	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
it005c	Palermo	IT295	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
it006c	Genoa	IT174	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
it008c	Bari	IT042	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
it010c	Catania	IT093	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
nl001c	The Hague	NL001	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
uk003c	Leeds	UK593	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
uk005c	Bradford	UK599	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
uk006c	Liverpool	UK178	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
uk010c	Sheffield	UK238	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
uk011c	Bristol	UK052	2	2	2	7	7	7	7	8	8	8	8	8	8	8	8	8	9
bg002c	Plovdiv	BG014	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
bg003c	Varna	BG023	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
cz002c	Brno	CZ003	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
cz003c	Ostrava	CZ042	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
ee001c	Tallinn	EE002	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
es006c	Malaga	ES121	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
es007c	Murcia	ES139	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
es020c	Cordoba	ES059	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
fr011c	Saint-Etienne	FR181	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
fr202c	Aix-en-Provence	FR003	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
lt001c	Vilnius	LT006	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9

CITY_ CODE	CITY_NAME	STSICD	Average linkage within groups																
			Squared euclidean distance											Euclidean distance			City Block distance		
			5 clusters	6 clusters	7 clusters	8 clusters	9 clusters	10 clusters	11 clusters	12 clusters	13 clusters	14 clusters	15 clusters	10 clusters	11 clusters	12 clusters	10 clusters	11 clusters	12 clusters
lt002c	Kaunas	LT002	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
lv001c	Riga	LV004	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
pl002c	Lodz	PL086	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
pl003c	Krakow	PL074	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
pl004c	Wroclaw	PL189	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
pl005c	Poznan	PL130	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
pl006c	Gdansk	PL034	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
pl007c	Szczecin	PL167	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	2	2
pl008c	Bydgoszcz	PL017	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
pl009c	Lublin	PL093	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
pl010c	Katowice	PL061	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
pl011c	Bialystok	PL008	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
ro001c	Bucuresti	RO020	2	2	2	7	7	7	7	8	8	9	9	8	8	8	2	8	9
ro002c	Cluj-Napoca	RO033	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
ro003c	Timisoara	RO096	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
ro004c	Craiova	RO038	2	2	2	7	7	7	7	8	8	9	9	8	8	8	8	8	9
bg004c	Burgas	BG003	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	4	4
bg005c	Pleven	BG013	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	3	3
bg006c	Ruse	BG016	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
bg007c	Vidin	BG024	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
cz004c	Plzen	CZ046	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
cz005c	Usti nad Labem	CZ060	2	4	4	4	4	4	8	9	9	10	10	4	4	4	4	2	2
de030c	Weimar	DE565	2	4	4	4	4	4	8	9	9	10	10	2	2	2	3	2	2
ee002c	Tartu	EE003	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	4	4
gr003c	Patra	GR025	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	4	4
gr004c	Irakleio	GR010	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
gr005c	Larisa	GR023	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	4	4
gr006c	Volos	GR035	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	4	4
gr007c	Ioannina	GR009	2	4	4	4	4	4	8	9	9	10	10	4	4	4	4	4	4
gr008c	Kavala	GR014	2	4	4	4	4	4	8	9	9	10	10	2	2	2	4	4	4
gr009c	Kalamata	GR066	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	4	4
hu002c	Miskolc	HU038	2	4	4	4	4	4	8	9	9	10	10	4	4	4	4	4	4
hu003c	Nyiregyhaza	HU043	2	4	4	4	4	4	8	9	9	10	10	4	4	4	4	2	2
hu005c	Debrecen	HU009	2	4	4	4	4	4	8	9	9	10	10	4	4	4	4	2	2
hu008c	Kecskemet	HU029	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
hu009c	Szekesfehervar	HU055	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
lt003c	Panevezys	LT004	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
lv002c	Liepaja	LV003	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pl012c	Kielce	PL064	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	4	4
pl013c	Torun	PL176	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pl015c	Rzeszow	PL142	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pl016c	Opole	PL115	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pl017c	Gorzow Wielkopolski	PL042	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pl018c	Zielona Gora	PL201	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	4	4
pl019c	Jelenia Gora	PL058	2	4	4	4	4	4	8	9	9	10	10	4	4	4	4	2	2
pl020c	Nowy Sacz	PL107	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pl021c	Suwalki	PL161	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pl022c	Konin	PL069	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pl023c	Zory	PL202	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pl024c	Czestochowa	PL027	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2

CITY_ CODE	CITY_NAME	STSICD	Average linkage within groups																
			Squared euclidean distance											Euclidean distance			City Block distance		
			5 clusters	6 clusters	7 clusters	8 clusters	9 clusters	10 clusters	11 clusters	12 clusters	13 clusters	14 clusters	15 clusters	10 clusters	11 clusters	12 clusters	10 clusters	11 clusters	12 clusters
pl025c	Radom	PL138	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pl026c	Plock	PL128	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pl027c	Kalisz	PL059	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pl028c	Koszalin	PL073	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pt003c	Braga	PT007	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	3	3
pt005c	Coimbra	PT009	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pt006c	Setubal	PT025	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pt007c	Ponta Delgada	PT021	2	4	4	4	4	4	8	9	9	10	10	2	2	2	3	3	3
pt008c	Aveiro	PT006	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
pt009c	Faro	PT014	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
ro005c	Braila	RO018	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
ro006c	Oradea	RO070	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
ro007c	Bacau	RO006	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
ro008c	Arad	RO005	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
ro009c	Sibiu	RO090	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
ro010c	Targu Mures	RO100	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
ro011c	Piatra Neamt	RO075	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
ro012c	Calarasi	RO023	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
ro013c	Giurgiu	RO053	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
ro014c	Alba Iulia	RO003	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
sk002c	Kosice	SK012	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
sk003c	Banska Bystrica	SK002	2	4	4	4	4	4	8	9	9	10	10	4	4	4	4	4	4
sk004c	Nitra	SK018	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
sk005c	PreSov	SK025	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
sk006c	Zilina	SK038	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
sk007c	Trnava	SK035	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
sk008c	Trencin	SK034	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
uk015c	Derry	UK318	2	4	4	4	4	4	8	9	9	10	10	4	4	4	2	2	2
at004c	Salzburg	AT016	2	4	4	4	4	4	4	4	4	4	4	4	4	4	2	2	2
at005c	Innsbruck	AT007	2	4	4	4	4	4	4	4	4	4	4	2	2	2	4	4	4
hu004c	Pecs	HU049	2	4	4	4	4	4	4	4	4	4	4	2	2	2	4	2	2
hu006c	Szeged	HU054	2	4	4	4	4	4	4	4	4	4	4	2	2	2	4	2	2
hu007c	Gyor	HU018	2	4	4	4	4	4	4	4	4	4	4	2	2	2	4	2	2
pl014c	Olsztyn	PL113	2	4	4	4	4	4	4	4	4	4	4	2	2	2	4	2	2
pt004c	Funchal	PT015	2	4	4	4	4	4	4	4	4	4	4	2	2	2	3	2	2
at003c	Linz	AT014	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
be006c	Brugge	BE013	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
ch005c	Lausanne	CH009	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
de023c	Moers	DE361	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
de026c	Trier	DE532	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
de041c	Potsdam	DE431	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
de042c	Koblenz	DE287	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
es011c	Santiago de Compostela	ES184	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
es016c	Toledo	ES197	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
fr021c	Poitiers	FR165	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
fr023c	Caen	FR045	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
fr027c	Ajaccio	FR005	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
ie002c	Cork	IE002	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
ie003c	Limerick	IE007	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
ie004c	Galway	IE005	3	3	3	3	3	3	3	3	3	3	3	3	3	3	7	7	8
it012c	Verona	IT434	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	7	8
it014c	Trento	IT417	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

CITY_ CODE	CITY_NAME	STSICD	Average linkage within groups																
			Squared euclidean distance											Euclidean distance			City Block distance		
			5 clusters	6 clusters	7 clusters	8 clusters	9 clusters	10 clusters	11 clusters	12 clusters	13 clusters	14 clusters	15 clusters	10 clusters	11 clusters	12 clusters	10 clusters	11 clusters	12 clusters
it016c	Perugia	IT302	3	3	3	3	3	**3**	3	3	3	3	3	3	3	3	3	3	3
no002c	Bergen	NO003	3	3	3	3	3	**3**	3	3	3	3	3	3	3	3	3	3	3
no004c	Stavanger	NO025	3	3	3	3	3	**3**	3	3	3	3	3	3	3	3	3	4	7
no005c	Kristiansand	NO012	3	3	3	3	3	**3**	3	3	3	3	3	3	3	3	3	3	3
no006c	Tromso	NO028	3	3	3	3	3	**3**	3	3	3	3	3	3	3	3	3	3	3
pt002c	Porto	PT022	3	3	3	3	3	**3**	3	3	3	3	3	3	3	3	3	3	3
se004c	Joenkoeping	SE012	3	3	3	3	3	**3**	3	3	3	3	3	3	3	3	3	3	3
uk018c	Exeter	UK112	3	3	3	3	3	**3**	3	3	3	3	3	3	3	3	3	3	3
mt001c	Valletta	MT001	3	3	3	3	3	**3**	3	3	3	3	15	4	4	4	4	3	3
it011c	Venice	IT430	3	3	3	3	3	**3**	3	3	3	3	15	7	7	7	7	3	3
es010c	Palma di Mallorca	ES148	3	3	3	3	8	**9**	10	11	11	12	12	3	3	11	7	10	11
fr205c	Nice	FR152	3	3	3	3	8	**9**	10	11	11	12	12	3	3	11	7	10	11
ie001c	Dublin	IE006	3	3	3	3	8	**9**	10	11	11	12	12	3	3	11	7	10	11
it007c	Florence	IT154	3	3	3	3	8	**9**	10	11	11	12	12	2	2	2	7	7	8
uk007c	Edinburgh	UK110	3	3	3	3	8	**9**	10	11	11	12	12	3	3	11	7	10	11
uk008c	Manchester	UK594	3	3	3	3	8	**9**	10	11	11	12	12	3	3	11	7	10	11
be001c	Brussels	BE014	4	5	5	5	5	**5**	5	5	5	5	5	5	5	5	5	5	5
de003c	Munich	DE370	4	5	5	5	5	**5**	5	5	5	5	5	5	5	5	5	5	5
de004c	Cologne	DE288	4	5	5	5	5	**5**	5	5	5	5	5	7	7	7	6	6	6
it002c	Milan	IT240	4	5	5	5	5	**5**	5	5	5	5	5	5	5	5	5	5	5
nl002c	Amsterdam	NL007	4	5	5	5	5	**5**	5	5	5	5	5	5	5	5	5	5	5
se001c	Stockholm	SE036	4	5	5	5	5	**5**	5	5	5	5	5	5	5	5	5	5	5
fr001c	Paris	FR159	4	5	7	8	9	**10**	11	12	12	13	13	10	11	12	10	11	12
it001c	Rome	IT344	4	5	7	8	9	**10**	11	12	12	13	13	1	1	1	10	11	12
uk001c	London	UK132	4	5	7	8	9	**10**	11	12	12	13	13	10	11	12	10	11	12
be002c	Antwerpen	BE004	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
de008c	Leipzig	DE314	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
de009c	Dresden	DE121	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
de013c	Hannover	DE226	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
de014c	Nürnberg	DE400	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
de034c	Bonn	DE068	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
es003c	Valencia	ES206	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
es004c	Sevilla	ES188	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
es021c	Alicante	ES016	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
fr003c	Lyon	FR124	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
fr004c	Toulouse	FR202	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
fr007c	Bordeaux	FR037	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
fr008c	Nantes	FR149	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
fr009c	Lille	FR118	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
fr010c	Montpellier	FR145	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
fr203c	Marseille	FR128	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
it003c	Naples	IT267	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
it004c	Turin	IT410	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
it009c	Bologna	IT054	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
se002c	Goeteborg	SE008	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
sk001c	Bratislava	SK004	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
uk002c	Birmingham	UK591	5	6	6	6	6	**6**	6	6	6	6	6	6	6	6	6	6	6
ch001c	Zurich	CH016	5	6	6	6	6	**8**	9	10	10	11	11	9	9	9	9	9	10
de005c	Frankfurt/Main	DE163	5	6	6	6	6	**8**	9	10	10	11	11	9	9	9	9	9	10
de007c	Stuttgart	DE526	5	6	6	6	6	**8**	9	10	10	11	11	9	9	9	9	9	10
de011c	Düsseldorf	DE126	5	6	6	6	6	**8**	9	10	10	11	11	9	9	9	9	9	10
dk001c	Copenhagen	DK013	5	6	6	6	6	**8**	9	10	10	11	11	9	9	9	9	9	10
no001c	Oslo	NO017	5	6	6	6	6	**8**	9	10	10	11	11	9	9	9	9	9	10

Appendix 12: Passenger and freight traffic at European airports in 2007

Airport Name	APSICD	PASS_TOT_CARRIED	FREIGHT_TOT_LOAD_UNLOAD	MOV_TOT	MOV_PASS	MOV_ALL_CARGO
Graz	AT0001	918 072	452	17 270	17 270	:
Innsbruck	AT0002	839 739	481	13 351	13 351	:
Klagenfurt	AT0003	464 728	31	8 282	8 282	:
Linz	AT0005	730 114	1 567	13 784	13 499	285
Salzburg	AT0006	1 913 205	185	21 148	21 148	:
Vienna	AT0008	18 718 682	204 934	251 216	247 018	4 198
Antwerpen/Deurne	BE0001	140 526	911	22 686	22 686	:
Brussles/National	BE0004	17 744 943	734 206	240 341	215 695	24 646
Charleroi	BE0005	2 443 184	22	16 099	16 092	7
Liege/Bierset	BE0011	328 571	363 680	26 815	2 654	24 161
Oostende	BE0012	167 979	104 763	10 288	7 858	2 430
Burgas	BG0004	1 946 888	1 212	14 886	14 823	63
Sofia	BG0025	2 723 388	17 380	37 435	34 456	2 979
Varna	BG0031	1 493 385	147	13 020	13 020	:
Geneva	CH0005	10 734 901	36 426	127 873	126 365	1 508
Lugano	CH0007	186 764	67	6 298	6 298	:
Zurich	CH0013	20 717 105	279 020	223 707	223 140	567
Larnaka	CY0004	5 260 249	40 458	52 066	51 451	615
Pafos	CY0005	1 744 093	1 566	17 859	17 847	12
Ostrava/Mosnov	CZ0030	298 430	1 967	7 224	5 676	1 548
Prague/Ruzyne	CZ0035	12 359 044	54 940	164 055	161 410	2 645
Brno/Turany	CZ0043	380 042	3 004	5 772	5 146	626
Berlin Schoenefeld	DE0012	6 306 353	8 287	55 114	53 666	1 448
Berlin Tegel	DE0013	13 331 182	19 686	145 320	143 607	1 713
Berlin Tempelhof	DE0014	349 174	381	17 720	17 720	:
Bremen	DE0021	2 219 485	820	31 737	31 737	:
Dortmund	DE0036	2 090 361	11	22 936	22 936	:
Dresden	DE0037	1 804 180	407	28 120	28 120	:
Duesseldorf	DE0039	17 782 173	57 669	223 397	218 215	5 182
Erfurt	DE0043	305 135	4 006	7 301	5 442	1 859
Frankfurt/Main	DE0051	53 855 515	2 162 220	484 590	458 560	26 030
Friedrichshafen	DE0054	621 742	0	11 731	11 731	:
Frankfurt-Hahn	DE0066	3 953 156	111 728	33 996	30 351	3 645
Hamburg	DE0068	12 690 114	39 860	151 752	149 833	1 919
Hannover	DE0071	5 587 377	16 697	70 479	68 350	2 129
Karlsruhe	DE0083	960 639	1 154	11 319	10 431	888
Cologne/Bonn	DE0090	10 404 466	709 329	138 289	109 723	28 566
Rostock/Laage	DE0092	171 141	389	3 060	3 060	:
Niederrhein/Weeze	DE0093	846 054	44	6 432	6 432	:
Leipzig/Halle	DE0100	2 359 419	86 104	41 368	32 095	9 273
Lubeck	DE0105	597 403	0	4 974	4 974	:
Munich	DE0117	33 815 514	265 301	407 591	403 087	4 504
Munster/Osnabrueck	DE0118	1 554 724	42	21 851	21 851	:
Nurnberg	DE0128	4 230 156	11 745	57 919	55 852	2 067
Paderborn/Lippstadt	DE0134	1 208 813	93	14 054	14 054	:
Saarbrucken	DE0144	309 523	25	8 780	8 780	:
Stuttgart	DE0153	10 270 885	27 904	139 723	137 352	2 371
Westerland/Sylt	DE0162	109 632	0	2 891	2 891	:
Aalborg	DK0001	983 599	1 358	14 386	13 879	507
Aarhus	DK0002	566 990	2 353	10 357	9 858	499
Billund	DK0003	2 183 687	3 332	34 284	33 272	1 012
Esbjerg	DK0004	179 175	225	9 506	9 506	:
Karup	DK0005	218 926	7	6 217	6 217	:
Copenhagen/Kastrup	DK0006	21 293 465	246 794	250 170	241 831	8 339
Bornholm	DK0010	227 213	1 073	5 734	5 294	440
Tallinn/Ulemiste	EE0016	1 722 505	22 634	30 805	28 971	1 834
Alicante	ES0003	9 085 224	3 506	74 408	73 908	500
Almeria	ES0004	1 199 785	22	14 127	14 127	:
Lanzarote/Arrecife	ES0006	5 469 263	4 691	46 752	45 005	1 747

Airport Name	APSICD	PASS_TOT_CARRIED	FREIGHT_TOT_LOAD_UNLOAD	MOV_TOT	MOV_PASS	MOV_ALL_CARGO
Aviles/Asturias	ES0007	1 555 666	195	17 192	17 192	:
Barcelona	ES0009	32 742 866	92 141	339 020	330 481	8 539
Bilbao	ES0010	4 268 180	3 124	53 530	53 047	483
Girona/Costa Brava	ES0013	4 745 411	169	34 354	34 354	:
Granada	ES0015	1 446 325	44	13 688	13 688	:
Hierro	ES0016	181 917	260	4 184	4 184	:
Ibiza	ES0017	4 718 535	5 234	48 159	46 624	1 535
Jerez	ES0018	1 523 618	57	13 301	13 301	:
La Coruna	ES0019	1 261 393	282	12 727	12 727	:
Las Palmas/Gran Canaria	ES0020	10 042 597	35 793	99 385	93 603	5 782
Madrid Barajas	ES0021	51 208 323	341 589	470 315	458 421	11 894
Menorca/Mahon	ES0022	2 753 381	4 150	29 573	28 272	1 301
Malaga	ES0023	13 568 620	6 006	115 498	114 922	576
Melilla	ES0024	326 706	311	9 145	9 145	:
Murcia/San Javier	ES0026	1 995 559	0	16 565	16 565	:
Palma de Mallorca	ES0027	23 166 658	21 061	184 605	178 197	6 408
Pamplona	ES0028	489 721	30	9 978	9 978	:
Puerto del Rosario/Fuertoventura	ES0029	4 518 927	2 491	39 392	38 620	772
Reus	ES0031	1 293 448	8	8 175	8 175	:
San Sebastian	ES0034	465 105	62	9 745	9 745	:
Santa Cruz de la Palma	ES0035	1 144 440	1 344	19 114	19 063	51
Santander	ES0036	759 316	6	13 575	13 575	:
Santiago	ES0037	1 987 434	3 589	20 693	19 705	988
Sevilla	ES0039	4 472 689	6 608	48 091	46 106	1 985
Tenerife North	ES0041	4 133 887	26 450	57 908	56 619	1 289
Tenerife South/Reina Sofia	ES0042	8 325 011	8 482	56 282	52 945	3 337
Valencia	ES0044	5 892 158	11 747	77 023	75 064	1 959
Valladolid	ES0045	487 935	15	9 497	9 497	:
Vigo	ES0046	1 406 708	1 786	16 079	15 498	581
Vitoria	ES0047	167 802	19 332	8 392	2 719	5 673
Zaragoza	ES0048	509 652	19 397	8 237	6 737	1 500
Helsinki Vantaa	FI0005	13 145 027	141 280	174 751	168 584	6 167
Ivalo	FI0008	145 605	22	1 391	1 391	:
Joensuu	FI0011	143 243	108	3 003	3 003	:
Jyvaskyla	FI0012	138 841	68	4 399	4 399	:
Kittila	FI0017	244 405	14	1 978	1 978	:
Kuopio	FI0019	303 885	88	5 559	5 559	:
Kuusamo	FI0020	107 594	23	1 271	1 271	:
Oulu	FI0031	840 236	3 259	10 666	9 804	862
Rovaniemi	FI0038	450 035	418	4 926	4 926	:
Tampere-Pirkkala	FI0041	687 600	170	10 004	10 004	:
Turku	FI0044	308 473	3 458	9 534	8 075	1 459
Vaasa	FI0046	321 840	972	7 846	7 846	:
Chambery-Aix-les-Bains	FR0003	231 431	0	4 113	4 113	:
Ajaccio	FR0005	1 023 838	5 461	13 303	12 638	665
Avignon-Caumont	FR0015	103 353	0	3 953	3 953	:
Basel-Mulhouse	FR0017	4 280 201	44 083	69 765	68 970	795
Bastia-Poretta	FR0018	857 672	6 656	12 081	10 868	1 213
Beauvais	FR0019	2 154 547	78	15 875	15 856	19
Bergerac-Roumaniere	FR0021	243 478	0	2 840	2 840	:
Biarritz-Bayonne-Angle	FR0023	924 612	0	10 487	10 487	:
Bordeaux Merignac	FR0025	3 407 614	9 024	51 942	50 009	1 933
Brest-Guipavas	FR0029	839 805	1 732	15 510	14 542	968
Caen-Carpiquet	FR0034	111 535	5	3 834	3 834	:
Calvi-Ste-Catherine	FR0038	271 912	10	5 080	5 080	:
Carcassonne-Salvaza	FR0042	471 318	0	3 222	3 222	:
Châlons-Vatry	FR0050	4 456	37 184	1 352	288	1 064
Châteauroux	FR0054	3 196	7 301	832	129	703
Clermont Ferrand	FR0055	542 106	1 606	20 495	20 001	494
Dinard-Pleurtuit	FR0064	178 516	13	2 474	2 474	:
Grenoble-Saint-Geoirs	FR0067	468 557	0	4 553	4 553	:

Airport Name	APSICD	PASS_TOT_CARRIED	FREIGHT_TOT_LOAD_UNLOAD	MOV_TOT	MOV_PASS	MOV_ALL_CARGO
La Rochelle - Ile de Re	FR0072	220 054	0	4 256	4 256	:
Lille-Lesquin	FR0082	1 037 424	225	18 400	18 400	:
Limoges	FR0083	390 217	0	7 219	7 219	:
Lorient	FR0084	213 530	0	4 936	4 936	:
Tarbes Lourdes Pyrenees	FR0086	441 259	298	5 374	5 374	:
Lyon Saint-Exupéry	FR0088	7 192 586	36 829	132 076	128 734	3 342
Marseille-Provence	FR0091	6 804 131	51 350	98 482	90 891	7 591
Montpellier-Mediterrannee	FR0102	1 284 754	5 743	15 389	14 901	488
Nantes Atlantique	FR0107	2 518 810	11 601	39 224	37 767	1 457
Nice	FR0109	10 381 225	11 534	173 584	172 042	1 542
Nimes Arles Camargue	FR0110	225 697	0	1 850	1 850	:
Paris CDG	FR0116	59 549 883	1 434 770	569 281	521 400	47 881
Paris Orly	FR0118	26 415 520	76 693	238 384	238 363	21
Pau-Pyrenees	FR0119	761 344	2 887	10 461	9 904	557
Perpignan-Rivesaltes	FR0122	422 701	0	4 338	4 338	:
Poitiers-Biard	FR0125	105 053	0	3 086	3 086	:
Quimper-Pluguffan	FR0129	136 797	0	2 531	2 531	:
Rennes-St-Jacques	FR0130	524 109	12 085	18 452	16 520	1 932
Rodez-Marcillac	FR0132	140 199	0	4 091	4 091	:
Strasbourg	FR0151	1 700 476	3 765	35 481	35 011	470
Figari-Sud-Corse	FR0152	343 694	0	6 251	6 251	:
Toulon-Hyeres	FR0155	640 967	0	10 516	10 516	:
Toulouse Blagnac	FR0156	6 111 201	55 078	78 631	78 074	557
Metz Nancy-Lorraine	FR0177	314 211	0	7 907	7 907	:
Alexandroupolis	GR0003	305 143	731	3 500	3 500	:
Araxos	GR0005	127 536	0	1 344	1 344	:
Kefallinia	GR0006	369 702	35	4 106	4 106	:
Chania	GR0008	1 882 834	2 095	15 430	15 378	52
Chios	GR0009	248 543	658	4 852	4 852	:
Kerkyra	GR0010	1 999 457	947	15 584	15 584	:
Ioannina	GR0013	140 874	11	2 320	2 320	:
Heraklion	GR0014	5 438 369	3 170	46 012	44 326	1 686
Kalamata	GR0015	111 198	0	980	980	:
Kavala	GR0018	344 575	452	4 116	4 116	:
Kos	GR0021	1 641 681	1 134	14 524	13 764	760
Limnos	GR0024	123 318	448	3 056	3 056	:
Mikonos	GR0027	427 458	142	6 874	6 874	:
Mytilini	GR0028	550 594	1 148	8 876	8 464	412
Aktio	GR0032	321 761	1	3 260	3 260	:
Rodos	GR0033	3 625 962	3 143	32 776	31 754	1 022
Samos	GR0035	481 987	671	7 010	7 010	:
Skiathos	GR0036	255 664	0	2 526	2 526	:
Thessaloniki	GR0042	4 167 969	9 427	50 244	47 586	2 658
Santorini	GR0043	746 674	252	8 966	8 966	:
Zakynthos	GR0046	988 947	0	7 046	7 046	:
Karpathos	GR0048	178 853	116	3 588	3 588	:
Athens	GR0059	16 525 385	98 029	193 123	183 621	9 502
Dubrovnik/Cilipi	HR0001	273 434	911	3 295	3 295	:
Split/Kastela	HR0007	212 368	932	3 660	3 660	:
Zagreb/Pleso	HR0011	511 072	8 405	8 470	6 783	1 687
Budapest/Ferihegy	HU0012	8 580 261	67 591	114 647	109 674	4 973
Connaught Regional airport	IE0002	559 528	9	4 826	4 826	:
Cork	IE0003	3 170 048	5 545	35 025	33 542	1 483
Dublin	IE0004	23 204 324	111 325	200 891	195 779	5 112
Kerry	IE0005	390 489	0	5 771	5 771	:
Shannon	IE0006	3 154 714	27 005	26 733	24 484	2 249
Keflavik	IS0002	130 572	46 904	2 147	:	2 147
Alghero/Fertilia	IT0002	1 302 916	742	12 348	12 348	:
Ancona	IT0005	487 762	6 080	12 352	10 928	1 424
Bari-Palese Macchie	IT0009	2 364 836	3 920	27 963	26 738	1 225
Bergamo/Orio al serio	IT0010	5 697 002	133 797	56 912	47 146	9 766

Airport Name	APSICD	PASS_TOT_CARRIED	FREIGHT_TOT_ LOAD_UNLOAD	MOV_TOT	MOV_PASS	MOV_ALL_ CARGO
Bologna	IT0011	4 240 551	18 692	59 501	56 384	3 117
Brindisi/Casale	IT0014	929 468	257	9 472	9 472	:
Cagliari	IT0015	2 649 284	4 887	30 266	28 492	1 774
Catania	IT0017	6 051 871	8 257	58 083	56 017	2 066
Forli'	IT0022	710 796	39	5 924	5 924	:
Genova	IT0023	1 106 110	1 450	20 223	19 718	505
Brescia/Montichiari	IT0024	185 727	43 385	7 329	2 318	5 011
Lamezia/Terme	IT0031	1 435 147	2 065	13 482	13 050	432
Lampedusa	IT0032	188 259	2	3 181	3 181	:
Milan Linate	IT0038	9 912 338	22 744	99 147	97 941	1 206
Milan Malpensa	IT0039	23 631 886	482 580	257 810	250 031	7 779
Trieste/Ronchi dei Legionari	IT0040	737 612	377	12 343	12 343	:
Naples	IT0041	5 723 148	4 637	64 061	63 495	566
Olbia/Costa Smeralda	IT0043	1 696 769	1 475	18 738	17 930	808
Palermo/Punta Raisi	IT0045	4 486 531	4 381	49 484	47 805	1 679
Pantelleria	IT0046	165 924	4	4 307	4 307	:
Parma	IT0047	141 886	0	3 958	3 958	:
Florence	IT0048	1 910 257	39	32 589	32 584	5
Pescara	IT0050	364 605	3 171	6 989	5 948	1 041
Pisa	IT0052	3 706 816	12 374	38 525	36 988	1 537
Reggio di Calabria	IT0056	547 814	324	8 611	8 611	:
Rimini	IT0057	487 261	1 598	5 699	5 553	146
Rome Ciampino	IT0060	5 348 499	22 537	55 131	52 374	2 757
Rome Fiumicino	IT0061	32 404 476	153 900	332 933	327 645	5 288
Turin/Caselle	IT0064	3 483 330	3 000	54 275	53 914	361
Trapani/Birgi	IT0065	510 703	20	8 066	8 066	:
Treviso-Sant'Angelo	IT0066	1 529 833	17 549	14 821	12 926	1 895
Venice	IT0068	7 006 801	13 156	83 561	83 081	480
Verona/Villafranca	IT0069	3 435 332	848	38 429	38 429	:
Kaunas	LT0010	389 219	0	2 810	2 810	:
Vilnius	LT0028	1 713 694	5 782	29 648	29 145	503
Luxembourg	LU0001	1 634 465	702 760	51 346	38 367	12 979
Riga International	LV0012	3 155 797	7 197	44 170	43 608	562
Malta/Luqa	MT0002	2 971 368	17 990	28 188	27 354	834
Amsterdam/Schiphol	NL0001	47 756 988	1 650 967	443 677	426 174	17 503
Eindhoven/Welschap	NL0006	1 450 634	473	14 521	14 521	:
Eelde/Groningen	NL0009	139 514	0	2 934	2 934	:
Maastricht	NL0011	138 045	57 811	10 912	7 152	3 760
Rotterdam/Zestienhoven	NL0012	1 068 430	18	18 505	18 505	:
Alesund/Vigra	NO0001	750 236	0	10 075	10 075	:
Alta	NO0002	392 529	435	7 908	7 908	:
Tromso	NO0004	1 692 051	3 143	32 230	29 804	2 426
Bardufoss	NO0006	177 248	127	2 090	2 090	:
Bodo	NO0008	1 553 215	0	36 247	36 247	:
Trondheim/Vaernes	NO0010	3 507 262	988	46 924	46 924	:
Evenes	NO0011	480 442	0	6 888	6 888	:
Oslo/Gardermoen	NO0015	17 989 202	66 439	226 221	216 228	9 993
Haugesund/Karmoy	NO0020	457 276	0	8 828	8 828	:
Kirkenes/Hoybuktmoen	NO0022	254 582	0	6 519	6 519	:
Kristiansand/Kjevik	NO0024	844 457	0	15 083	15 083	:
Kristiansund/Kvernberget	NO0025	268 430	0	7 645	7 645	:
Molde/Aro	NO0031	397 511	642	7 551	7 551	:
Floro	NO0035	101 033	113	5 410	5 410	:
Mo I Rana/Rossvoll	NO0037	113 292	269	5 925	5 925	:
Bergen/Flesland	NO0039	4 397 571	3 929	74 032	70 359	3 673
Vadso	NO0042	108 654	321	6 090	6 090	:
Stavanger/Solo	NO0050	3 329 774	3 140	54 370	50 466	3 904
Torp	NO0053	1 317 563	0	22 975	22 975	:
Stokmarknes/Skagen	NO0054	104 858	69	5 162	5 162	:
Bronnoysund/Bronnoy	NO0067	110 380	274	6 274	6 274	:
Gdansk - Rebiechowo	PL0024	1 702 978	4 728	27 224	24 974	2 250

Airport Name	APSICD	PASS_TOT_CARRIED	FREIGHT_TOT_LOAD_UNLOAD	MOV_TOT	MOV_PASS	MOV_ALL_CARGO
Krakow	PL0049	3 075 871	1 003	38 722	38 082	640
Poznan	PL0107	854 195	1 264	12 220	11 775	445
Wroclaw/Strachowice	PL0121	1 270 560	1 164	17 861	17 135	726
Warsaw/Okecie	PL0130	9 228 796	41 343	147 985	141 213	6 772
Katowice/Pyrzowice	PL0141	1 806 636	405	17 604	17 604	:
Faro	PT0010	5 470 712	679	41 057	41 057	:
Madeira	PT0012	2 418 477	8 691	21 095	20 766	329
Horta	PT0013	200 755	1 270	4 293	4 291	2
Lisbon	PT0014	13 393 182	94 466	141 905	139 877	2 028
Ponta Delgada	PT0019	941 046	8 034	11 564	11 549	15
Porto	PT0020	3 986 860	32 569	51 179	48 904	2 275
Porto Santo	PT0021	145 777	353	2 782	2 782	:
Santa Maria	PT0022	100 573	217	2 429	2 429	:
Lajes	PT0028	480 267	4 405	9 947	9 640	307
Bucharest/Baneasa	RO0019	966 734	919	11 525	11 525	:
Bucharest/Otopeni	RO0021	4 937 757	17 350	118 141	66 344	51 797
Cluj-Napoca/Someseni	RO0038	375 203	254	8 075	8 075	:
Timisoara/Giarmata	RO0111	908 412	808	22 681	22 681	:
Angelholm Helsingborg	SE0003	394 860	:	6 540	6 540	:
Goteborg/Landvetter	SE0020	4 354 855	50 958	62 062	57 870	4 192
Goteborg City	SE0021	746 626	11	6 085	6 085	:
Kalmar	SE0035	174 170	0	3 741	3 741	:
Karlstad	SE0038	119 511	1 185	4 893	4 392	501
Kiruna	SE0039	191 864	508	2 750	2 750	:
Lulea	SE0050	930 209	1 604	12 166	11 543	623
Malmoe	SE0052	1 869 608	33 358	27 030	19 266	7 764
Stockholm/Skavsta	SE0057	1 994 526	645	14 541	14 541	:
Ostersund	SE0063	374 344	:	5 325	5 325	:
Ronneby	SE0066	220 157	20	4 530	4 530	:
Skelleftea	SE0070	235 723	126	4 516	4 516	:
Stockholm/Arlanda	SE0074	17 904 163	121 449	205 251	198 071	7 180
Stockholm/Bromma	SE0076	1 809 169	314	36 785	36 785	:
Sundsvall-Harnosand	SE0079	336 472	2 433	8 423	7 242	1 181
UMEA	SE0083	811 549	5 918	13 402	10 755	2 647
Stockholm/Vasteras	SE0085	181 851	93	1 439	1 439	:
Vaxjo/Kronoberg	SE0086	170 115	1 185	4 129	3 719	410
Visby	SE0090	318 006	1 788	11 465	10 206	1 259
Ljubliana/Joze Pucnik	SI0002	1 504 446	12 515	35 360	8 531	26 829
Svalbard/Longyear	SJ0001	125 949	323	4 114	4 114	:
Bratislava	SK0006	1 975 719	2 037	22 223	21 862	361
Kosice	SK0009	431 416	246	6 799	6 799	:
Aberdeen	UK0001	3 411 102	3 626	102 829	101 642	1 187
Belfast City	UK0007	2 186 866	1 100	39 925	39 924	1
Belfast International	UK0008	5 236 051	49 886	51 804	47 703	4 101
Birmingham	UK0014	9 133 991	13 610	104 480	104 127	353
Blackpool	UK0017	557 636	41	12 688	12 688	:
Bournemouth	UK0019	1 083 379	10 581	12 186	10 263	1 923
Bristol	UK0021	5 883 855	2 924	58 741	58 137	604
Cardiff	UK0025	2 093 463	2 391	23 038	22 630	408
Coventry	UK0035	598 916	9 172	7 496	5 574	1 922
East Midlands (Nottingham)	UK0042	5 406 442	318 447	61 493	42 049	19 444
Edinburgh	UK0043	9 036 809	45 965	115 177	110 046	5 131
Exeter	UK0046	1 011 380	5 059	16 812	16 205	607
Doncaster Sheffield	UK0050	1 062 457	1 594	8 645	8 600	45
London Gatwick	UK0051	35 165 530	176 635	258 917	258 767	150
Glasgow	UK0053	8 725 906	4 347	93 654	93 070	584
London Heathrow	UK0061	67 852 320	1 393 243	475 786	472 899	2 887
Humberside	UK0064	465 872	144	12 731	12 731	:
Inverness	UK0065	697 445	572	15 052	15 052	:
Kirkwall	UK0072	131 903	0	10 810	10 810	:
Leeds Bradford	UK0076	2 860 045	115	39 599	39 599	:

Airport Name	APSICD	PASS_TOT_CARRIED	FREIGHT_TOT_	MOV_TOT	MOV_PASS	MOV_ALL_
Liverpool	UK0080	5 463 108	3 709	45 769	45 142	627
London/City	UK0082	2 912 123	0	77 274	77 274	:
City of Derry (Eglington)	UK0083	427 586	0	5 733	5 733	:
London Luton	UK0085	9 919 361	38 095	83 318	80 433	2 885
Manchester	UK0089	21 891 306	166 131	206 498	203 692	2 806
Kent International	UK0090	15 556	28 389	611	164	447
Newquay	UK0094	352 548	0	10 262	10 262	:
Norwich	UK0096	699 177	188	22 283	22 283	:
Prestwick	UK0100	2 420 709	31 517	20 337	18 474	1 863
Scatsta	UK0103	252 894	766	11 199	11 199	:
Southampton	UK0107	1 965 380	297	47 016	47 016	:
London Stansted	UK0109	23 759 157	225 315	191 520	181 175	10 345
Stornoway	UK0110	126 203	559	7 429	7 429	:
Durham Tees Valley	UK0113	726 567	790	10 773	10 773	:
Newcastle	UK0130	5 623 527	9 268	58 392	57 314	1 078

NB:

:	… figure not available
	… figure refers to freight on board
	… figure refers to 2006
	… figure refers to 2008
APSICD	… Airport Site Code
PASS_TOT_CARRIED	… total number of passengers carried
FREIGHT_TOT_LOAD_UNLOAD	… total number of tons of freight loaded and unloaded
MOV_TOT	… total number of aircraft movements
MOV_PASS	… number of passenger aircraft movements
MOV_ALL_CARGO	… number of freighter aircraft movements

Appendix 13: Passenger traffic at European airports in 2006 (descending order)

Airport Name	APSICD	PASS_TOT_CARRIED	CHART_SHARE_TOT	LCC_SHARE_TOT
London Heathrow	UK0061	67 339 120	0,1	5,0
Paris CDG	FR0116	56 448 699	4,2	5,0
Frankfurt/Main	DE0051	52 403 633	1,5	1,6
Amsterdam/Schiphol	NL0001	45 997 955	9,3	11,0
Madrid Barajas	ES0021	45 063 930	3,5	:
London Gatwick	UK0051	34 080 137	26,4	27,5
Munich	DE0117	30 608 976	2,3	14,9
Barcelona	ES0009	29 895 310	3,9	:
Rome Fiumicino	IT0061	28 949 569	3,1	8,5
Paris Orly	FR0118	25 603 532	5,3	12,0
London Stansted	UK0109	23 679 209	3,9	88,0
Palma de Mallorca	ES0027	22 396 944	24,5	54,3
Manchester	UK0089	22 123 762	38,6	:
Milan Malpensa	IT0039	21 619 524	9,1	9,1
Dublin	IE0004	21 062 514	8,7	40,0
Copenhagen/Kastrup	DK0006	20 694 179	6,9	:
Zurich	CH0013	19 298 560	7,0	:
Stockholm/Arlanda	SE0074	17 539 343	0,0	:
Vienna	AT0008	16 808 336	5,8	13,2
Brussles/National	BE0004	16 592 519	18,2	:
Duesseldorf	DE0039	16 510 893	7,3	22,6
Oslo/Gardermoen	NO0015	16 271 576	4,8	:
Athens	GR0059	15 073 202	3,4	10,0
Malaga	ES0023	13 035 622	12,2	50,8
Lisbon	PT0014	12 280 563	5,1	20,0
Helsinki Vantaa	FI0005	12 142 226	8,7	
Hamburg	DE0068	11 874 542	4,1	26,7
Berlin Tegel	DE0013	11 768 513	2,8	40,0
Prague/Ruzyne	CZ0035	11 513 003	14,8	:
Stuttgart	DE0153	10 020 611	8,4	36,4
Las Palmas/Gran Canaria	ES0020	9 967 227	34,9	:
Nice	FR0109	9 926 252	1,3	34,0
Geneva	CH0005	9 816 477	5,5	35,9
Cologne/Bonn	DE0090	9 812 815	5,2	68,2
Milan Linate	IT0038	9 692 652	0,1	11,5
London Luton	UK0085	9 414 820	8,1	70,0
Birmingham	UK0014	9 055 954	28,8	:
Alicante	ES0003	8 860 913	18,4	57,0
Glasgow	UK0053	8 820 457	22,3	:
Edinburgh	UK0043	8 606 639	3,4	:
Tenerife South/Reina Sofia	ES0042	8 526 646	54,9	27,3
Budapest/Ferihegy	HU0012	8 245 920	7,4	:
Warsaw/Okecie	PL0130	8 116 876	7,3	:
Lyon Saint-Exupéry	FR0088	6 661 182	15,4	3,5
Venice	IT0068	6 268 280	4,8	24,6
Berlin Schoenefeld	DE0012	6 013 186	6,0	75,0
Marseille-Provence	FR0091	5 958 171	8,0	6,0
Toulouse Blagnac	FR0156	5 899 070	10,7	12,0
Bristol	UK0021	5 710 222	24,2	:
Hannover	DE0071	5 609 156	10,9	30,1
Lanzarote/Arrecife	ES0006	5 456 498	47,4	17,4
Newcastle	UK0130	5 407 359	31,6	:
Catania	IT0017	5 370 112	11,5	31,5
Heraklion	GR0014	5 345 652	79,9	:
Bergamo/Orio al serio	IT0010	5 181 864	11,0	85,5
Faro	PT0010	5 075 089	32,3	55,0
Naples	IT0041	5 018 440	11,8	24,1
Belfast International	UK0008	5 015 050	14,0	:
Liverpool	UK0080	4 962 460	5,7	:
Valencia	ES0044	4 943 516	3,7	37,2
Larnaka	CY0004	4 883 974	1,1	:
Rome Ciampino	IT0060	4 854 916	1,7	98,5

Airport Name	APSICD	PASS_TOT_CARRIED	CHART_SHARE_TOT	LCC_SHARE_TOT
East Midlands (Nottingham)	UK0042	4 720 819	32,5	:
Ibiza	ES0017	4 387 589	35,7	33,5
Puerto del Rosario/Fuertoventura	ES0029	4 323 967	37,4	37,6
Goteborg/Landvetter	SE0020	4 281 204	0,0	:
Palermo/Punta Raisi	IT0045	4 246 555	7,0	30,1
Bergen/Flesland	NO0039	4 094 234	4,5	:
Basel-Mulhouse	FR0017	4 017 127	13,5	44,8
Nurnberg	DE0128	4 000 547	14,0	18,5
Tenerife North	ES0041	3 977 391	1,2	1,7
Bologna	IT0011	3 954 094	17,8	11,7
Bilbao	ES0010	3 861 498	4,8	12,9
Sevilla	ES0039	3 840 907	5,1	28,0
Thessaloniki	GR0042	3 802 854	19,7	:
Girona/Costa Brava	ES0013	3 588 050	10,0	86,2
Frankfurt-Hahn	DE0066	3 509 041	0,0	100,0
Bucharest/Otopeni	RO0021	3 498 350	4,7	:
Rodos	GR0033	3 491 522	77,0	:
Porto	PT0020	3 402 743	6,3	:
Trondheim/Vaernes	NO0010	3 227 756	4,4	:
Bordeaux Merignac	FR0025	3 225 846	7,0	6,8
Turin/Caselle	IT0064	3 206 967	8,2	9,7
Aberdeen	UK0001	3 162 591	22,6	:
Stavanger/Solo	NO0050	3 082 615	5,9	:
Pisa	IT0052	3 003 170	3,1	61,8
Cork	IE0003	2 992 475	12,9	30,0
Shannon	IE0006	2 980 084	8,5	55,0
Verona/Villafranca	IT0069	2 933 672	40,3	7,1
Leeds Bradford	UK0076	2 787 217	15,7	:
Malta/Luqa	MT0002	2 699 870	21,6	:
Menorca/Mahon	ES0022	2 643 385	41,2	18,4
Riga International	LV0012	2 488 069	6,3	:
Cagliari	IT0015	2 464 084	5,6	6,3
Prestwick	UK0100	2 394 928	6,6	:
London/City	UK0082	2 358 124	0,1	:
Madeira	PT0012	2 338 028	24,2	:
Nantes Atlantique	FR0107	2 332 414	29,8	:
Keflavik	IS0002	2 278 036	:	:
Krakow	PL0049	2 220 133	5,9	:
Charleroi	BE0005	2 154 583	0,1	99,0
Leipzig/Halle	DE0100	2 127 991	24,5	20,0
Belfast City	UK0007	2 105 597	0,5	:
Strasbourg	FR0151	2 001 491	5,3	:
Kerkyra	GR0010	1 997 776	85,2	:
Cardiff	UK0025	1 993 097	47,1	:
Dortmund	DE0036	1 957 655	5,5	55,6
Bari-Palese Macchie	IT0009	1 951 843	6,5	26,0
Santiago	ES0037	1 934 958	4,6	21,9
Southampton	UK0107	1 912 702	1,0	:
Beauvais	FR0019	1 887 858	0,7	100,0
Malmoe	SE0052	1 883 298	0,0	:
Salzburg	AT0006	1 843 927	36,7	54,6
Pafos	CY0005	1 830 350	0,5	:
Billund	DK0003	1 804 451	47,0	:
Dresden	DE0037	1 790 348	9,8	28,6
Stockholm/Skavsta	SE0057	1 773 473	0,0	:
Chania	GR0008	1 760 959	75,0	:
Olbia/Costa Smeralda	IT0043	1 725 230	6,7	22,0
Bremen	DE0021	1 677 624	8,9	8,9
Murcia/San Javier	ES0026	1 646 029	2,7	85,1
Stockholm/Bromma	SE0076	1 637 739	0,2	:
Luxembourg	LU0001	1 597 404	2,2	:
Tromso	NO0004	1 596 893	0,9	:
Kos	GR0021	1 573 117	84,0	:
Tallinn/Ulemiste	EE0016	1 533 132	11,9	:
Florence	IT0048	1 518 623	1,2	3,9

Airport Name	APSICD	PASS_TOT_CARRIED	CHART_SHARE_TOT	LCC_SHARE_TOT
Munster/Osnabrueck	DE0118	1 502 174	12,6	25,4
Vilnius	LT0028	1 446 507	17,6	:
Bodo	NO0008	1 443 137	0,9	:
Reus	ES0031	1 370 282	51,3	46,6
Katowice/Pyrzowice	PL0141	1 359 378	18,9	:
Aviles/Asturias	ES0007	1 348 348	5,5	:
Lamezia/Terme	IT0031	1 340 826	23,3	16,9
Treviso-Sant'Angelo	IT0066	1 327 798	2,5	97,3
Montpellier-Mediterrannee	FR0102	1 322 966	0,6	18,0
Jerez	ES0018	1 299 561	5,4	:
Gdansk - Rebiechowo	PL0024	1 249 753	4,7	:
Paderborn/Lippstadt	DE0134	1 226 849	14,4	:
Vigo	ES0046	1 187 665	1,3	0,1
Eindhoven/Welschap	NL0006	1 177 383	25,0	:
Torp	NO0053	1 147 604	5,1	:
Santa Cruz de la Palma	ES0035	1 108 703	7,4	:
Genova	IT0023	1 068 966	4,0	16,5
Granada	ES0015	1 065 578	2,4	:
Alghero/Fertilia	IT0002	1 059 453	8,8	45,8
Rotterdam/Zestienhoven	NL0012	1 047 155	18,3	:
Almeria	ES0004	1 039 730	19,4	:
La Coruna	ES0019	1 006 138	0,6	:
Zakynthos	GR0046	1 000 635	97,0	:
Ajaccio	FR0005	984 677	10,1	:
Exeter	UK0046	970 614	26,9	:
Bournemouth	UK0019	960 773	19,9	:
Lille-Lesquin	FR0082	925 488	27,0	:
Lulea	SE0050	913 416	0,0	:
Durham Tees Valley	UK0113	911 224	29,0	:
Ponta Delgada	PT0019	909 678	19,5	:
Doncaster Sheffield	UK0050	899 307	30,2	:
Graz	AT0001	873 162	29,4	:
Wroclaw/Strachowice	PL0121	865 903	5,7	:
Biarritz-Bayonne-Angle	FR0023	864 792	1,2	
Oulu	FI0031	848 131	6,8	:
Bastia-Poretta	FR0018	820 804	10,5	
Brindisi/Casale	IT0014	818 197	4,9	30,5
Karlsruhe	DE0083	813 554	10,5	:
UMEA	SE0083	801 679	0,0	:
Brest-Guipavas	FR0029	795 301	11,6	:
Kristiansand/Kjevik	NO0024	790 221	3,0	:
Innsbruck	AT0002	785 300	48,7	:
Aalborg	DK0001	777 320	14,9	:
Pau-Pyrenees	FR0119	762 874	0,8	:
Timisoara/Giarmata	RO0111	750 070	0,6	:
Norwich	UK0096	745 192	26,0	:
Linz	AT0005	719 539	41,8	:
Alesund/Vigra	NO0001	707 825	4,2	:
Santorini	GR0043	678 235	53,4	:
Bucharest/Baneasa	RO0019	671 380	99,9	:
Inverness	UK0065	670 894	1,7	:
Trieste/Ronchi dei Legionari	IT0040	664 839	11,5	18,5
Lubeck	DE0105	658 498	1,4	98,5
Santander	ES0036	648 492	2,5	41,9
Poznan	PL0107	643 855	25,0	:
Toulon-Hyeres	FR0155	635 522	7,4	:
Berlin Tempelhof	DE0014	632 797	640,0	:
Tampere-Pirkkala	FI0041	631 676	3,3	:
Friedrichshafen	DE0054	630 196	12,0	:
Forli'	IT0022	621 406	4,4	94,7
Coventry	UK0035	609 859	0,7	:
Connaught Regional airport	IE0002	609 193	12,8	:
Niederrhein/Weeze	DE0093	582 519	1,4	98,0
Clermont Ferrand	FR0055	552 800	4,1	:
Blackpool	UK0017	552 641	6,6	:

Airport Name	APSICD	PASS_TOT_CARRIED	CHART_SHARE_TOT	LCC_SHARE_TOT
Aarhus	DK0002	547 485	9,8	:
Goteborg City	SE0021	536 223	0,5	:
Humberside	UK0064	515 889	62,2	:
Mytilini	GR0028	489 688	28,1	:
Ancona	IT0005	469 700	9,8	23,9
Rennes-St-Jacques	FR0130	460 392	3,0	:
Evenes	NO0011	459 246	2,2	:
Samos	GR0035	450 918	57,7	:
Tarbes Lourdes Pyrenees	FR0086	449 047	79,1	:
Perpignan-Rivesaltes	FR0122	447 203	1,4	:
Valladolid	ES0045	446 567	18,8	:
Rovaniemi	FI0038	432 399	23,5	:
Grenoble-Saint-Geoirs	FR0067	430 419	50,0	:
Zaragoza	ES0048	429 559	17,3	47,5
Carcassonne-Salvaza	FR0042	427 547	0,2	100,0
Alta	NO0002	418 742	17,2	:
Molde/Aro	NO0031	418 171	9,3	:
Haugesund/Karmoy	NO0020	417 869	5,2	:
Klagenfurt	AT0003	403 301	7,7	:
Ostersund	SE0063	396 360	0,0	:
Mikonos	GR0027	396 262	50,5	:
Kerry	IE0005	392 214	8,5	:
Saarbrucken	DE0144	380 152	21,5	0,0
Limoges	FR0083	375 242	2,1	68,0
Kefallinia	GR0006	372 973	86,6	:
Pamplona	ES0028	364 072	4,8	:
San Sebastian	ES0034	363 051	1,2	:
Angelholm Helsingborg	SE0003	362 911	0,0	:
Brno/Turany	CZ0043	355 432	56,7	:
Erfurt	DE0043	348 916	39,1	0,0
Lajes	PT0028	347 341	34,9	:
Newquay	UK0094	343 143	0,4	:
City of Derry (Eglington)	UK0083	341 719	6,1	:
Turku	FI0044	339 674	9,7	:
Sundsvall-Harnosand	SE0079	337 840	0,2	:
Pescara	IT0050	332 854	7,1	53,3
Kuopio	FI0019	332 010	12,6	:
Kavala	GR0018	320 165	0,3	:
Metz Nancy-Lorraine	FR0177	319 086	36,8	:
Rimini	IT0057	317 595	73,4	15,5
Trapani/Birgi	IT0065	313 773	1,6	10,3
Figari-Sud-Corse	FR0152	312 822	17,6	:
Vaasa	FI0046	306 014	5,3	:
Melilla	ES0024	303 493	0,2	:
Liege/Bierset	BE0011	297 728	100,0	:
Visby	SE0090	290 206	0,1	:
Aktio	GR0032	288 555	89,9	:
Alexandroupolis	GR0003	277 919	1,0	:
Maastricht	NL0011	273 416	31,2	:
Ostrava/Mosnov	CZ0030	269 719	59,7	:
Bergerac-Roumaniere	FR0021	269 620	0,4	100,0
Calvi-Ste-Catherine	FR0038	267 620	24,0	:
Scatsta	UK0103	255 147	100,0	:
Skiathos	GR0036	248 661	93,5	:
Kittila	FI0017	245 086	35,7	:
Kristiansund/Kvernberget	NO0025	243 897	2,8	:
Kaunas	LT0010	242 553	2,3	:
Kirkenes/Hoybuktmoen	NO0022	239 318	1,0	:
Chios	GR0009	232 341	11,8	:
Nimes Arles Camargue	FR0110	226 664	1,0	98,0
Cluj-Napoca/Someseni	RO0038	225 812	2,1	:
Brescia/Montichiari	IT0024	225 470	33,1	66,0
Lorient	FR0084	225 025	2,5	:
Skelleftea	SE0070	220 432	0,3	:
Bornholm	DK0010	219 499	1,3	:

Airport Name	APSICD	PASS_TOT_CARRIED	CHART_SHARE_TOT	LCC_SHARE_TOT
Karup	DK0005	210 915	4,3	:
Ronneby	SE0066	209 806		:
Horta	PT0013	196 940	0,2	:
Chambery-Aix-les-Bains	FR0003	194 460	72,0	:
Esbjerg	DK0004	194 145	39,4	:
Stockholm/Vasteras	SE0085	188 483	3,1	:
Lugano	CH0007	185 605	0,4	:
La Rochelle - Ile de Re	FR0072	179 821	0,8	:
Kiruna	SE0039	171 434	0,0	:
Bardufoss	NO0006	168 688	3,6	:
Hierro	ES0016	168 478	0,2	:
Vitoria	ES0047	166 136	26,9	47,8
Dinard-Pleurtuit	FR0064	163 687	0,6	:
Karpathos	GR0048	161 186	59,8	:
Vaxjo/Kronoberg	SE0086	158 265	0,1	:
Kalmar	SE0035	157 036	0,0	:
Rostock/Laage	DE0092	153 300	26,5	:
Ivalo	FI0008	153 150	20,1	:
Porto Santo	PT0021	150 050	16,3	:
Jyvaskyla	FI0012	149 130	9,7	:
Rodez-Marcillac	FR0132	148 154	0,5	:
Joensuu	FI0011	146 570	5,0	:
Quimper-Pluguffan	FR0129	139 356	0,8	:
Eelde/Groningen	NL0009	134 015	89,6	:
Limnos	GR0024	129 567	2,1	:
Ioannina	GR0013	126 239	0,4	
Parma	IT0047	120 909	11,9	52,2
Stornoway	UK0110	120 288	0,2	:
Antwerpen/Deurne	BE0001	119 502	60,4	:
Poitiers-Biard	FR0125	119 218	7,2	:
Kirkwall	UK0072	116 837	0,2	:
Karlstad	SE0038	113 101	0,0	:
Svalbard/Longyear	SJ0001	112 941	0,6	:
Araxos	GR0005	111 864	98,5	:
Kuusamo	FI0020	110 138	21,7	:
Caen-Carpiquet	FR0034	105 881	19,9	:
Mo I Rana/Rossvoll	NO0037	104 104	0,1	:
Stokmarknes/Skagen	NO0054	100 407	0,0	:
Bronnoysund/Bronnoy	NO0067	99 604	3,4	:
Vadso	NO0042	99 546	0,0	:
Santa Maria	PT0022	96 680	37,2	:
Kalamata	GR0015	93 991	100,0	:
Floro	NO0035	93 041	0,0	:
Westerland/Sylt	DE0162	82 940	2,3	:
Avignon-Caumont	FR0015	81 852	3,5	:
Kent International	UK0090	9 845	100,0	:
Châlons-Vatry	FR0050	8 448	58,1	:
Oostende	BE0012	:	:	:
Burgas	BG0004	:	:	:
Sofia	BG0025	:	:	:
Varna	BG0031	:	:	:
Châteauroux	FR0054	:	:	:
Dubrovnik/Cilipi	HR0001	:	:	:
Split/Kastela	HR0007	:	:	:
Zagreb/Pleso	HR0011	:	:	:
Lampedusa	IT0032	:	:	:
Pantelleria	IT0046	:	:	:
Reggio di Calabria	IT0056	:	:	:
Ljubliana/Joze Pucnik	SI0002	:	:	:
Bratislava	SK0006	:	:	:
Kosice	SK0009	:	:	:

NB:

:	… figure not available
APSICD	… Airport Site Code
PASS_TOT_CARRIED	… total number of passengers carried (Eurostat)
CHART_SHARE_TOT	… charter traffic as a proportion of the total number of passengers (in %, Eurostata)
LCC_SHARE_TOTAL	… low cost traffic as a proportion of the total number of passengers (in %, different sources, own calculations)

Appendix 14: Freight traffic at European airports in 2006 (descending order)

Airport Name	APSICD	FREIGHT_TOT_LOAD_UNLOAD	MOV_ALL_CARGO
Frankfurt/Main	DE0051	2 117 936	25 905
Amsterdam/Schiphol	NL0001	1 566 726	16 854
London Heathrow	UK0061	1 342 646	2 834
Paris CDG	FR0116	1 340 423	48 536
Brussles/National	BE0004	713 535	24 230
Cologne/Bonn	DE0090	690 998	28 420
Luxembourg	LU0001	633 747	11 519
Milan Malpensa	IT0039	417 555	5 989
Madrid Barajas	ES0021	344 241	11 711
Liege/Bierset	BE0011	323 242	22 366
East Midlands (Nottingham)	UK0042	298 283	18 357
Zurich	CH0013	265 546	355
London Stansted	UK0109	241 331	10 964
Munich	DE0117	238 089	4 560
London Gatwick	UK0051	219 873	1 470
Vienna	AT0008	201 830	4 490
Manchester	UK0089	150 267	2 225
Rome Fiumicino	IT0061	140 203	4 791
Bergamo/Orio al serio	IT0010	139 378	9 076
Helsinki Vantaa	FI0005	123 512	6 067
Frankfurt-Hahn	DE0066	113 180	4 480
Dublin	IE0004	107 558	5 471
Athens	GR0059	102 447	9 098
Oostende	BE0012	98 525	:
Lisbon	PT0014	98 194	1 540
Barcelona	ES0009	97 914	9 118
Paris Orly	FR0118	75 985	19
Budapest/Ferihegy	HU0012	64 882	6 375
Keflavik	IS0002	61 784	2 147
Duesseldorf	DE0039	59 328	3 975
Toulouse Blagnac	FR0156	58 521	483
Prague/Ruzyne	CZ0035	54 875	2 583
Maastricht	NL0011	54 140	3 599
Edinburgh	UK0043	50 939	6 010
Belfast International	UK0008	50 399	4 574
Marseille-Provence	FR0091	49 517	7 871
Larnaka	CY0004	43 018	953
Lyon Saint-Exupéry	FR0088	40 548	4 662
Las Palmas/Gran Canaria	ES0020	38 869	4 879
Hamburg	DE0068	37 901	2 180
Châlons-Vatry	FR0050	37 612	1 032
Geneva	CH0005	37 000	1 531
Warsaw/Okecie	PL0130	36 925	8 035
Basel-Mulhouse	FR0017	35 822	276
Porto	PT0020	34 423	2 076
Shannon	IE0006	31 069	2 309
Prestwick	UK0100	28 545	1 549
Stuttgart	DE0153	28 523	4 164
Leipzig/Halle	DE0100	26 812	4 235
Milan Linate	IT0038	26 705	1 712
Palma de Mallorca	ES0027	23 743	8 445
Tenerife North	ES0041	23 311	815
Rome Ciampino	IT0060	22 168	3 249
Kent International	UK0090	20 841	322
Vitoria	ES0047	19 903	5 829
Treviso-Sant'Angelo	IT0066	19 402	1 977
Berlin Tegel	DE0013	19 042	1 927
Bucharest/Otopeni	RO0021	18 789	47 135
Brescia/Montichiari	IT0024	18 735	363
Malta/Luqa	MT0002	18 061	941
London Luton	UK0085	17 993	1 712

Airport Name	APSICD	FREIGHT_TOT_LOAD_UNLOAD	MOV_ALL_CARGO
Hannover	DE0071	15 702	1 963
Bologna	IT0011	15 623	3 078
Birmingham	UK0014	14 718	364
Venice	IT0068	13 941	851
Nice	FR0109	13 925	2 007
Riga International	LV0012	11 715	821
Pisa	IT0052	11 528	1 454
Valencia	ES0044	11 297	1 747
Nurnberg	DE0128	11 199	2 199
Nantes Atlantique	FR0107	11 067	2 088
Rennes-St-Jacques	FR0130	10 730	2 565
Bournemouth	UK0019	10 564	2 081
Bordeaux Merignac	FR0025	10 538	2 012
Tallinn/Ulemiste	EE0016	10 053	1 708
Liverpool	UK0080	9 857	2 231
Coventry	UK0035	9 732	2 061
Thessaloniki	GR0042	9 253	2 422
Tenerife South/Reina Sofia	ES0042	9 146	2 635
Ponta Delgada	PT0019	8 597	4
Catania	IT0017	8 350	1 620
Berlin Schoenefeld	DE0012	8 075	1 532
Bastia-Poretta	FR0018	7 556	2 138
Cork	IE0003	7 192	1 444
Sevilla	ES0039	6 625	1 873
Ljubliana/Joze Pucnik	SI0002	6 593	6 414
Glasgow	UK0053	6 369	616
Ajaccio	FR0005	6 213	1 272
Oslo/Gardermoen	NO0015	6 150	5 550
Bergen/Flesland	NO0039	6 110	2 794
Montpellier-Mediterrannee	FR0102	6 065	504
Malaga	ES0023	5 885	990
Zaragoza	ES0048	5 778	1 279
Exeter	UK0046	5 609	671
Stavanger/Solo	NO0050	5 599	2 629
Vilnius	LT0028	5 564	509
Lanzarote/Arrecife	ES0006	5 432	1 303
Palermo/Punta Raisi	IT0045	5 152	1 560
Bratislava	SK0006	5 064	540
Tromso	NO0004	5 022	1 227
Naples	IT0041	5 017	674
Trondheim/Vaernes	NO0010	4 689	421
Oulu	FI0031	4 052	1 284
Santiago	ES0037	3 928	948
Alicante	ES0003	3 925	496
Billund	DK0003	3 671	972
Turin/Caselle	IT0064	3 600	490
Brno/Turany	CZ0043	2 629	486
Madeira	PT0012	927	21
Metz Nancy-Lorraine	FR0177	607	283
Charleroi	BE0005	1	3
Copenhagen/Kastrup	DK0006	0	7 890
Newcastle	UK0130	8 191	1 022
Malmoe	SE0052	:	7 483
Stockholm/Arlanda	SE0074	:	6 590
Goteborg/Landvetter	SE0020	:	3 550
Sofia	BG0025	:	:
Châteauroux	FR0054	:	:

NB:

:	… figure not available
	… figure refers to freight on board
	… figure published by the airport
APSICD	… Airport Site Code
FREIGHT_TOT_LOAD_UNLOAD	… total number of tons of freight loaded and unloaded (Eurostat)
MOV_ALL_CARGO	… number of freighter aircraft movements (Eurostat)

Appendix 15: European routes from/to London Heathrow airport 2006 (Eurostat)

ORIGIN_AIRPORT - DESTINATION_AIRPORT	ORIGIN_AIRPORT	DESTINATION_AIRPORT		TRAFFIC_FIGURES_2006					
	CODE	CODE_1	CODE_2	CRD	BRD	CAF	CAF_DEP	SEATS	SEATS_DEP_CAF
LONDON HEATHROW airport - NEW YORK/JFK airport	UK0061	USA	AMERIN	2 752 033	2 079 976	13 229	6 613	2 873 120	4 157 257
LONDON HEATHROW airport - CHICAGO - O'HARE INTL airport	UK0061	USA	AMERIN	1 520 779	1 104 947	7 948	3 975	1 601 089	2 210 358
LONDON HEATHROW airport - LOS ANGELES INTL airport	UK0061	USA	AMERIN	1 429 425	939 611	6 200	3 102	1 618 229	1 877 759
LONDON HEATHROW airport - HONG KONG/INTL airport	UK0061	HONG KONG	ASIAEA	1 416 789	1 254 889	6 594	3 298	1 799 013	2 510 965
LONDON HEATHROW airport - DUBAI INTL airport	UK0061	UE0001	ASIAWE	1 374 451	1 092 485	6 817	3 365	1 569 418	2 185 542
LONDON HEATHROW airport - SINGAPORE/CHANGI airport	UK0061	SINGAPORE	ASIASE	1 086 322	893 082	5 173	2 589	1 602 349	1 785 482
LONDON HEATHROW airport - TORONTO/LESTER B. PEARSON INTL airport	UK0061	CANADA	AMERIN	1 045 770	603 578	5 034	2 519	1 046 761	1 206 697
LONDON HEATHROW airport - WASHINGTON DULLES INTL airport	UK0061	USA	AMERIN	1 040 222	664 376	5 139	2 571	1 040 479	1 330 187
LONDON HEATHROW airport - SAN FRANCISCO/INTL airport	UK0061	USA	AMERIN	1 027 495	606 255	3 629	1 814	1 027 501	1 212 675
LONDON HEATHROW airport - MUMBAI/CHHATRAPATI SHIVAJI INTL. airport	UK0061	INDIA	ASIASO	1 006 862	663 314	4 521	2 245	899 954	1 345 960
LONDON HEATHROW airport - JOHANNESBURG INTERNATIONAL AIRPORT airport	UK0061	SOUTH AFRICA	AFRICS	997 694	598 778	3 610	1 801	997 061	1 197 128
LONDON HEATHROW airport - BOSTON/GENERAL EDWARD LAWRENCE LOGAN INTL airport	UK0061	USA	AMERIN	931 456	550 964	4 280	2 140	931 456	1 102 481
LONDON HEATHROW airport - NARITA INTL airport	UK0061	JAPAN	ASIAEA	915 000	577 980	3 677	1 839	915 000	1 149 479
LONDON HEATHROW airport - MIAMI INTERNATIONAL, FL. airport	UK0061	USA	AMERIN	837 465	487 478	3 134	1 565	837 465	974 286
LONDON HEATHROW airport - SYDNEY/SYDNEY (KINGSFORD SMITH) INTL airport	UK0061	AUSTRALIA	AUSTRA	796 929	:	:	:	:	:
LONDON HEATHROW airport - NEWARK LIBERTY INTERNATIONAL, NJ. airport	UK0061	USA	AMERIN	689 110	461 066	3 500	1 753	689 439	921 733
LONDON HEATHROW airport - DELHI/INDIRA GANDHI INTL airport	UK0061	INDIA	ASIASO	599 594	567 650	3 466	1 756	783 431	1 115 199
LONDON HEATHROW airport - ISTANBUL/ATATURK airport	UK0061	TR0003	ASIAWE	577 540	387 431	4 073	2 037	577 634	774 710
LONDON HEATHROW airport - VANCOUVER INTL, B.C. airport	UK0061	CANADA	AMERIN	574 634	306 576	2 133	1 068	574 634	613 384
LONDON HEATHROW airport - CAPE TOWN INT airport	UK0061	SOUTH AFRICA	AFRICS	555 785	348 830	1 918	960	555 701	698 164
LONDON HEATHROW airport - TEL-AVIV/BEN GURION AIRPORT airport	UK0061	IL0002	ASIAWE	516 782	326 783	2 607	1 303	516 800	655 149
LONDON HEATHROW airport - LARNAKA airport	UK0061	CY0004	ASIAWE	506 488	303 910	2 301	1 149	486 340	608 705
LONDON HEATHROW airport - BANGKOK/BANGKOK INTL AIRPORT airport	UK0061	THAILAND	ASIASE	500 979	:	2 643	1 319	815 252	:
LONDON HEATHROW airport - SEPANG/KL INTERNATIONAL AIRPORT airport	UK0061	MALAYSIA	ASIASO	491 503	266 195	1 797	874	480 516	532 390
LONDON HEATHROW airport - NAIROBI/JOMO KENYATTA AIRPORT airport	UK0061	KENYA	AFRICE	447 379	339 743	1 886	950	432 978	680 483
LONDON HEATHROW airport - DOHA INTERNATIONAL airport	UK0061	QA0001	ASIAWE	411 677	282 243	2 006	1 003	372 451	566 019
LONDON HEATHROW airport - MONTREAL/PIERRE ELLIOT TRUDEAU INTL airport	UK0061	CANADA	AMERIN	376 512	214 207	1 807	904	376 512	428 799
LONDON HEATHROW airport - LAGOS/MURTALA MUHAMMED airport	UK0061	NIGERIA	AFRICW	365 806	277 477	1 752	948	370 184	553 186
LONDON HEATHROW airport - BAHRAIN INTERNATIONAL airport	UK0061	BAHREIN	ASIAWE	359 099	282 380	2 153	1 061	393 364	562 301
LONDON HEATHROW airport - MELBOURNE/MELBOURNE INTL airport	UK0061	AUSTRALIA	AUSTRA	349 680	:	:	:	:	:
LONDON HEATHROW airport - SHANGHAI/PUDONG airport	UK0061	CHINA	ASIAEA	316 795	228 246	1 720	860	316 795	456 779
LONDON HEATHROW airport - CAIRO/INTL airport	UK0061	EG0004	AFRICN	299 332	239 153	1 528	765	298 248	462 825
LONDON HEATHROW airport - INCHEON airport	UK0061	SOUTH KOREA	ASIAEA	277 674	200 794	1 123	562	277 674	402 340
LONDON HEATHROW airport - BANDARANAIKE INTERNATIONAL AIRPORT COLOMBO airport	UK0061	SRI LANKA	ASIASO	273 163	135 828	1 018	418	236 220	330 083
LONDON HEATHROW airport - BEIJING/CAPITAL airport	UK0061	CHINA	ASIAEA	268 189	182 647	1 242	602	261 203	365 281
LONDON HEATHROW airport - ABU DHABI INTERNATIONAL airport	UK0061	UE0002	ASIAWE	250 332	285 200	2 090	1 051	318 239	571 187
LONDON HEATHROW airport - MUSCAT/SEEB INTL. airport	UK0061	OMAN	ASIAWE	249 591	84 897	1 179	604	188 273	171 626
LONDON HEATHROW airport - PHILADELPHIA INTERNATIONAL, PA. airport	UK0061	USA	AMERIN	242 757	152 747	1 441	723	242 984	305 067
LONDON HEATHROW airport - SEATTLE/SEATTLE-TACOMA INTERNATIONAL airport	UK0061	USA	AMERIN	239 826	154 399	907	453	239 826	308 200
LONDON HEATHROW airport - CALGARY INTL, ALTA. airport	UK0061	CANADA	AMERIN	237 927	200 621	1 085	553	234 495	399 950
LONDON HEATHROW airport - SIR SEEWOOSAGUR RAMGOOLAM INTL airport	UK0061	MAURITIUS	AFRICE	232 827	148 461	885	442	232 190	299 084
LONDON HEATHROW airport - KUWAIT/INTL AIRPORT airport	UK0061	KW0001	ASIAWE	221 968	187 571	1 486	745	254 110	375 055
LONDON HEATHROW airport - AUCKLAND INTL airport	UK0061	NEW ZEALAND	AUSTRA	214 786	:	:	:	:	:

ORIGIN_AIRPORT - DESTINATION_AIRPORT	ORIGIN_AIRPORT	DESTINATION_AIRPORT		TRAFFIC_FIGURES_2006					
	CODE	CODE_1	CODE_2	CRD	BRD	CAF	CAF_DEP	SEATS	SEATS_DEP_CAF
LONDON HEATHROW airport - ISLAMABAD/CHAKLALA airport	UK0061	PAKISTAN	ASIASO	207 909	130 044	720	359	198 569	260 759
LONDON HEATHROW airport - SAO PAULO/GUARULHOS airport	UK0061	BRAZIL	AMERIL	194 604	227 443	1 174	546	302 073	454 786
LONDON HEATHROW airport - PHOENIX SKY HARBOR INTERNATIONAL, AZ. airport	UK0061	USA	AMERIN	185 490	108 521	622	311	185 490	217 092
LONDON HEATHROW airport - KANSAI INTL airport	UK0061	JAPAN	ASIAEA	170 035	99 778	730	365	170 035	199 556
LONDON HEATHROW airport - DENVER INTERNATIONAL airport	UK0061	USA	AMERIN	166 003	94 803	717	359	166 003	189 606
LONDON HEATHROW airport - BANGKOK/SUVARNABHUMI INTL AIRPORT airport	UK0061	THAILAND	ASIASE	163 889	635 765	894	447	269 380	1 271 997
LONDON HEATHROW airport - ZIA INTL.AIRPORT,DHAKA airport	UK0061	BANGLADESH	ASIASO	159 683	:	365	210	76 976	:
LONDON HEATHROW airport - AMMAN/QUEEN ALIA airport	UK0061	JO0001	ASIAWE	154 287	124 952	1 212	606	148 767	249 873
LONDON HEATHROW airport - TEHRAN/MEHRABAD INTL airport	UK0061	IR0002	ASIASO	150 949	105 042	984	491	150 406	210 007
LONDON HEATHROW airport - CHENNAI airport	UK0061	INDIA	ASIASO	144 446	67 186	556	278	136 881	134 840
LONDON HEATHROW airport - KINGSTON/NORMAN MANLEY airport	UK0061	JAMAICA	AMERIL	136 360	:	:	:	:	:
LONDON HEATHROW airport - JEDDAH/KING ABDULAZIZ INTL airport	UK0061	SA0001	ASIAWE	134 632	134 107	900	452	132 868	272 611
LONDON HEATHROW airport - NETAJI SUBHASH CHANDRA BOSE INTL airport	UK0061	INDIA	ASIASO	129 232	62 232	604	303	129 068	123 797
LONDON HEATHROW airport - TAIBEI CITY/TAIBEI INTL AP airport	UK0061	TAIWAN	ASIAEA	128 478	:	:	:	:	:
LONDON HEATHROW airport - BANGALORE airport	UK0061	INDIA	ASIASO	128 143	93 497	610	305	128 143	186 564
LONDON HEATHROW airport - OTTAWA/MACDONALD-CARTIER INTL airport	UK0061	CANADA	AMERIN	124 199	77 453	694	347	124 199	155 127
LONDON HEATHROW airport - PIARCO,TRINIDAD airport	UK0061	TRINIDAD/TOBAGO	AMERIL	118 652	:	:	:	:	:
LONDON HEATHROW airport - BALTIMORE-WASHINGTON INTL THURGOOD MARSHALL airport	UK0061	USA	AMERIN	117 723	69 227	723	361	117 723	138 390
LONDON HEATHROW airport - MEXICO airport	UK0061	MEXICO	AMERIL	116 970	66 368	374	187	116 970	132 034
LONDON HEATHROW airport - ACCRA/KOTOKA INTERNATIONAL airport	UK0061	GHANA	AFRICW	116 854	69 624	729	365	116 690	138 991
LONDON HEATHROW airport - CASABLANCA/MOHAMED V airport	UK0061	MR0002	AFRICN	116 495	116 495	1 398	694	142 623	232 956
LONDON HEATHROW airport - HALIFAX INTL, N.S. airport	UK0061	CANADA	AMERIN	116 077	70 349	:	:	:	140 463
LONDON HEATHROW airport - BRUNEI/INTL airport	UK0061	BRUNEI	ASIASE	114 346	:	:	:	:	:
LONDON HEATHROW airport - ABUJA airport	UK0061	NIGERIA	AFRICW	108 738	83 124	723	362	108 594	166 021
LONDON HEATHROW airport - DETROIT METROPOLITAN WAYNE COUNTY airport	UK0061	USA	AMERIN	100 275	69 310	721	361	107 158	138 680
LONDON HEATHROW airport - MARRAKECH/MENARA airport	UK0061	MR0005	AFRICN	98 473	:	:	:	:	:
LONDON HEATHROW airport - BEIRUT/BEIRUT INTL airport	UK0061	LB0001	ASIAWE	96 492	110 641	1 094	546	124 277	222 096
LONDON HEATHROW airport - LAHORE/ALLAMA IQBAL INT'L airport	UK0061	PAKISTAN	ASIASO	94 212	57 299	310	155	94 412	114 142
LONDON HEATHROW airport - RIYADH/KING KHALED INTL airport	UK0061	SA0002	ASIAWE	90 068	90 068	635	314	80 852	178 184
LONDON HEATHROW airport - AHMEDABAD airport	UK0061	INDIA	ASIASO	87 079	87 079	:	:	:	173 145
LONDON HEATHROW airport - MONTEGO BAY/SANGSTER airport	UK0061	JAMAICA	AMERIL	73 010	73 010	550	317	111 693	130 524
LONDON HEATHROW airport - EDMONTON INTL, ALTA. airport	UK0061	CANADA	AMERIN	65 741	65 741	:	:	:	131 927
LONDON HEATHROW airport - NASSAU INTERNATIONAL airport	UK0061	BAHAMAS	AMERIL	49 388	49 388	522	261	86 811	98 695

NB:

(grey)	… figure refers to passengers on board		
CRD	… number of passengers carried	AFRICW	… Western Africa
BRD	… number of passengers on board	AMERIN	… Northern America
CAF	… number of commercial passenger air flights	AMERIL	… Latin America
CAF_DEP	… number of departing commercial passenger air flights	ASIACE	… Central Asia
SEATS	… number of seats	ASIAEA	… Eastern Asia
SEATS_DEP_CAF	… number of seats on departing commercial passenger air flights	ASIASE	… Southeastern Asia
AFRICE	… Eastern Africa	ASIASO	… Southern Asia
AFRICN	… Northern Africa	ASIAWE	… Western Asia
AFRICS	… Southern Africa	AUSTRA	… Australia, New Zealand and Polynesia

Appendix 16: Extra-European routes from/to London Heathrow airport 2006 (Eurostat)

ORIGIN_AIRPORT - DESTINATION_AIRPORT	ORIGIN_AIRPORT	DESTINATION_AIRPORT		TRAFFIC_FIGURES_2006					
	CODE	CODE_1	CODE_2	CRD	BRD	CAF	CAF_DEP	SEATS	SEATS_DEP_CAF
LONDON HEATHROW airport - DUBLIN airport	UK0061	IE0004	EUROPN	1 991 118	1 326 204	13 813	6 904	1 991 118	2 650 720
LONDON HEATHROW airport - PARIS-CHARLES DE GAULLE airport	UK0061	FR0116	EUROPW	1 970 763	1 305 317	18 602	9 319	1 978 419	2 609 613
LONDON HEATHROW airport - AMSTERDAM/SCHIPHOL airport	UK0061	NL0001	EUROPW	1 846 414	1 329 553	16 952	8 472	1 847 072	2 652 696
LONDON HEATHROW airport - FRANKFURT/MAIN airport	UK0061	DE0051	EUROPW	1 513 278	1 115 899	12 275	6 131	1 514 315	2 231 876
LONDON HEATHROW airport - EDINBURGH airport	UK0061	UK0043	EUROPN	1 494 972	968 804	13 005	6 511	1 494 972	1 937 667
LONDON HEATHROW airport - GLASGOW airport	UK0061	UK0053	EUROPN	1 284 470	836 261	11 867	5 940	1 284 470	1 670 541
LONDON HEATHROW airport - MADRID/BARAJAS airport	UK0061	ES0021	EUROPS	1 120 427	800 924	8 596	4 300	1 120 427	1 601 406
LONDON HEATHROW airport - MANCHESTER airport	UK0061	UK0089	EUROPN	1 087 023	747 406	11 247	5 646	1 099 929	1 492 311
LONDON HEATHROW airport - MUNCHEN airport	UK0061	DE0117	EUROPW	1 027 466	734 429	9 483	4 741	1 027 638	1 468 176
LONDON HEATHROW airport - ROMA/FIUMICINO airport	UK0061	IT0061	EUROPS	954 633	660 707	7 386	3 608	971 294	1 320 659
LONDON HEATHROW airport - ZURICH airport	UK0061	CH0013	EUROPW	940 321	681 332	8 545	4 269	940 835	1 362 794
LONDON HEATHROW airport - STOCKHOLM/ARLANDA airport	UK0061	SE0074	EUROPN	893 414	599 386	7 966	3 985	893 414	1 198 805
LONDON HEATHROW airport - KOBENHAVN/KASTRUP airport	UK0061	DK0006	EUROPN	890 586	614 693	8 086	4 040	902 187	1 229 226
LONDON HEATHROW airport - BARCELONA airport	UK0061	ES0009	EUROPS	773 653	518 106	5 745	2 869	773 653	1 036 584
LONDON HEATHROW airport - BRUXELLES/NATIONAL airport	UK0061	BE0004	EUROPW	740 218	658 514	9 441	4 721	745 047	1 317 014
LONDON HEATHROW airport - WIEN-SCHWECHAT airport	UK0061	AT0008	EUROPW	709 836	516 692	6 392	3 195	710 058	1 033 953
LONDON HEATHROW airport - ATHENS INTL (ELEFTHERIOS VENIZELOS) airport	UK0061	GR0059	EUROPS	690 593	471 425	4 157	2 076	690 647	942 789
LONDON HEATHROW airport - ABERDEEN airport	UK0061	UK0001	EUROPN	673 114	503 000	7 661	3 840	673 232	1 004 581
LONDON HEATHROW airport - BELFAST/CITY airport	UK0061	UK0007	EUROPN	665 656	429 600	5 572	2 788	665 656	857 690
LONDON HEATHROW airport - OSLO/GARDERMOEN airport	UK0061	NO0015	EUROPN	616 828	467 894	6 300	3 149	616 828	935 986
LONDON HEATHROW airport - MILANO/LINATE airport	UK0061	IT0038	EUROPS	604 732	454 874	6 162	3 080	604 732	921 949
LONDON HEATHROW airport - DUSSELDORF airport	UK0061	DE0039	EUROPW	599 340	500 721	7 085	3 542	599 340	1 000 692
LONDON HEATHROW airport - MILANO/MALPENSA airport	UK0061	IT0039	EUROPS	596 306	408 252	5 107	2 559	597 356	814 872
LONDON HEATHROW airport - LISBOA airport	UK0061	PT0014	EUROPS	592 441	452 081	5 232	2 593	592 485	901 776
LONDON HEATHROW airport - GENEVE airport	UK0061	CH0005	EUROPW	580 258	435 937	5 861	2 930	580 333	871 155
LONDON HEATHROW airport - NICE-COTE D'AZUR airport	UK0061	FR0109	EUROPW	501 824	360 074	4 024	2 013	501 824	719 751
LONDON HEATHROW airport - NEWCASTLE airport	UK0061	UK0130	EUROPN	478 505	302 367	4 255	2 128	478 505	605 008
LONDON HEATHROW airport - HAMBURG airport	UK0061	DE0068	EUROPW	458 454	328 437	5 003	2 502	458 454	656 590
LONDON HEATHROW airport - HELSINKI-VANTAA airport	UK0061	FI0005	EUROPN	441 555	338 067	4 284	2 141	441 555	676 107
LONDON HEATHROW airport - PRAHA/RUZYNE airport	UK0061	CZ0035	EUROPE	433 046	309 083	4 151	2 076	432 974	617 681
LONDON HEATHROW airport - CORK airport	UK0061	IE0003	EUROPN	425 232	302 432	3 075	1 539	425 232	604 728
LONDON HEATHROW airport - WARSZAWA/OKECIE airport	UK0061	PL0130	EUROPE	388 035	264 384	4 288	2 143	387 790	529 086
LONDON HEATHROW airport - BERLIN-TEGEL airport	UK0061	DE0013	EUROPW	359 783	251 064	3 562	1 781	359 783	502 047
LONDON HEATHROW airport - BUDAPEST/FERIHEGY airport	UK0061	HU0012	EUROPE	347 136	149 890	3 366	1 684	347 136	299 753
LONDON HEATHROW airport - SHANNON airport	UK0061	IE0006	EUROPN	323 004	221 828	2 507	1 254	323 004	443 849
LONDON HEATHROW airport - MOSCOW/DOMODEDOVO airport	UK0061	RU0587	RUSSIA	293 959	333 313	2 012	1 007	293 959	665 356
LONDON HEATHROW airport - MALAGA airport	UK0061	ES0023	EUROPS	256 087	134 973	1 690	845	256 087	269 776
LONDON HEATHROW airport - STUTTGART airport	UK0061	DE0153	EUROPW	252 983	202 147	3 507	1 753	253 092	404 226
LONDON HEATHROW airport - LYON SAINT-EXUPERY airport	UK0061	FR0088	EUROPW	247 649	171 242	2 468	1 233	247 649	342 358
LONDON HEATHROW airport - MOSCOW/SHEREMETYEVO airport	UK0061	RU0589	RUSSIA	236 007	160 957	1 898	950	236 078	321 779
LONDON HEATHROW airport - KEFLAVIK airport	UK0061	IS0002	EUROPN	209 916	143 134	1 416	707	209 916	286 666
LONDON HEATHROW airport - BUCURESTI/OTOPENI airport	UK0061	RO0021	EUROPE	186 200	149 798	1 994	998	186 200	299 461
LONDON HEATHROW airport - MALTA/LUQA airport	UK0061	MT0002	EUROPS	172 020	108 306	1 469	734	172 020	216 756

ORIGIN_AIRPORT - DESTINATION_AIRPORT	ORIGIN_AIRPORT	DESTINATION_AIRPORT		TRAFFIC_FIGURES_2006					
	CODE	CODE_1	CODE_2	CRD	BRD	CAF	CAF_DEP	SEATS	SEATS_DEP_CAF
LONDON HEATHROW airport - KOLN/BONN airport	UK0061	DE0090	EUROPW	156 259	112 274	2 462	1 229	156 259	224 671
LONDON HEATHROW airport - LEEDS BRADFORD airport	UK0061	UK0076	EUROPN	147 785	171 296	2 574	1 290	147 818	341 267
LONDON HEATHROW airport - BALE-MULHOUSE airport	UK0061	FR0017	EUROPW	141 416	137 550	2 130	1 066	141 416	275 100
LONDON HEATHROW airport - GOTEBORG/LANDVETTER airport	UK0061	SE0020	EUROPN	134 608	95 981	1 354	677	134 608	191 957
LONDON HEATHROW airport - PORTO airport	UK0061	PT0020	EUROPS	129 219	:	1 324	685	129 175	:
LONDON HEATHROW airport - BEOGRAD (AD) airport	UK0061	YU0002	EUROPS	119 360	91 249	1 330	664	115 541	182 245
LONDON HEATHROW airport - DURHAM TEES VALLEY airport	UK0061	UK0113	EUROPN	110 722	90 674	2 014	1 008	110 689	181 080
LONDON HEATHROW airport - SOFIA airport	UK0061	BG0025	EUROPE	103 341	93 726	1 016	510	103 286	187 482
LONDON HEATHROW airport - STAVANGER/SOLA airport	UK0061	NO0024	EUROPN	95 805	72 682	1 211	606	95 805	145 480
LONDON HEATHROW airport - SEVILLA airport	UK0061	ES0039	EUROPS	92 812	:	725	362	92 812	:
LONDON HEATHROW airport - SANKT-PETERBURG/PULKOVO airport	UK0061	RU0517	RUSSIA	86 912	61 185	819	409	86 912	122 380
LONDON HEATHROW airport - BILBAO airport	UK0061	ES0010	EUROPS	83 322	55 448	723	361	83 322	110 896
LONDON HEATHROW airport - VALENCIA airport	UK0061	ES0044	EUROPS	82 801	64 178	648	324	82 801	128 446
LONDON HEATHROW airport - PALMA DE MALLORCA airport	UK0061	ES0027	EUROPS	78 831	:	700	350	78 975	:
LONDON HEATHROW airport - GIBRALTAR (NORTH FRONT) airport	UK0061	GI0001	EUROPS	77 941	:	598	298	77 941	:
LONDON HEATHROW airport - LA CORUĐA airport	UK0061	ES0019	EUROPS	77 116	63 925	663	332	77 116	127 866
LONDON HEATHROW airport - JERSEY airport	UK0061	UK0068	EUROPN	73 791	73 791	:	:	:	147 533
LONDON HEATHROW airport - KYIV/BORYSPIL airport	UK0061	UA0145	EUROPE	59 157	59 157	:	:	:	118 314

NB:

(grey shading)	… figure refers to passengers on board
CRD	… number of passengers carried
BRD	… number of passengers on board
CAF	… number of commercial passenger air flights
CAF_DEP	… number of departing commercial passenger air flights
SEATS	… number of seats
SEATS_DEP_CAF	… number of seats on departing commercial passenger air flights
EUROPE	… Eastern Europe
EUROPN	… Northern Europe
EUROPS	… Southern Europe
EUROPW	… Western Europe

Appendix 17: OAG data for London Heathrow airport 2006 (departing scheduled flights)

ORIGIN_AIRPORT			DESTINATION_AIRPORT				AIRLINE		FLIGHT CHARACTERISTICS		
ABBR	NAME	CODE	ABBR	NAME	CODE_1	CODE_2	CODE	NAME	Capacity	Frequency	ASK (000)
LHR	LONDON/HEATHROW	UK0061	EVN	YEREVAN/ZVARTNOTS	AM0014	ASIAWE	BA	British Airways	35 026	261	127 141
LHR	LONDON/HEATHROW	UK0061	LAD	LUANDA/QUATRO DE FEVEREIRO	ANGOLA	AFRICM	BA	British Airways	13 978	52	95 517
LHR	LONDON/HEATHROW	UK0061	LAD	LUANDA/QUATRO DE FEVEREIRO	ANGOLA	AFRICM	DT	TAAG Angola Airlines	14 040	52	95 941
LHR	LONDON/HEATHROW	UK0061	ANU	ANTIGUA (ANTIGUA AND BARBUDA)	ANTIGUA/BARBUDA	AMERIL	BW	Caribbean Airways	28 606	104	187 422
LHR	LONDON/HEATHROW	UK0061	VIE	VIENNA INTERNATIONAL	AT0008	EUROPW	OS	Austrian Airlines	259 439	1 785	330 192
LHR	LONDON/HEATHROW	UK0061	VIE	VIENNA INTERNATIONAL	AT0008	EUROPW	BA	British Airways	225 144	1 453	286 545
LHR	LONDON/HEATHROW	UK0061	GYD	BAKU/BINA	AZ0017	ASIAWE	J2	Azerbaijan Airlines	540	3	2 160
LHR	LONDON/HEATHROW	UK0061	GYD	BAKU/BINA	AZ0017	ASIAWE	BA	British Airways	53 864	361	215 541
LHR	LONDON/HEATHROW	UK0061	NAS	NASSAU	BAHAMAS	AMERIL	BA	British Airways	64 967	261	453 145
LHR	LONDON/HEATHROW	UK0061	BAH	BAHREIN	BAHREIN	ASIAWE	BA	British Airways	98 123	365	499 689
LHR	LONDON/HEATHROW	UK0061	BAH	BAHREIN	BAHREIN	ASIAWE	GF	Gulf Air	176 630	730	899 485
LHR	LONDON/HEATHROW	UK0061	DAC	DHAKA	BANGLADESH	ASIASO	BG	Birman Bangladesh Airlines	31 843	115	255 357
LHR	LONDON/HEATHROW	UK0061	DAC	DHAKA	BANGLADESH	ASIASO	BA	British Airways	42 205	157	338 452
LHR	LONDON/HEATHROW	UK0061	BGI	BRIDGETOWN/GRANTLEY ADAMS	BARBADOS	AMERIL	BW	Caribbean Airways	44 154	156	298 099
LHR	LONDON/HEATHROW	UK0061	BRU	BRUSSELS	BE0004	EUROPW	BD	bmi British Midland	277 550	2 072	97 353
LHR	LONDON/HEATHROW	UK0061	BRU	BRUSSELS	BE0004	EUROPW	BA	British Airways	403 650	2 699	141 585
LHR	LONDON/HEATHROW	UK0061	BRU	BRUSSELS	BE0004	EUROPW	CY	Cyprus Airways	5 154	31	1 807
LHR	LONDON/HEATHROW	UK0061	BRU	BRUSSELS	BE0004	EUROPW	SN	SNBA SN Brussles Airline	4 354	52	1 527
LHR	LONDON/HEATHROW	UK0061	SOF	SOFIA/VRAZHDEBNA	BG0025	EUROPE	BA	British Airways	52 608	364	107 331
LHR	LONDON/HEATHROW	UK0061	SOF	SOFIA/VRAZHDEBNA	BG0025	EUROPE	DU	Hemus Air	20 428	178	41 677
LHR	LONDON/HEATHROW	UK0061	GRU	SAO PAULO/GUARULHOS INTERNATIONAL	BRAZIL	AMERIL	BA	British Airways	148 312	378	1 402 690
LHR	LONDON/HEATHROW	UK0061	GRU	SAO PAULO/GUARULHOS INTERNATIONAL	BRAZIL	AMERIL	JJ	TAM	14 400	64	136 190
LHR	LONDON/HEATHROW	UK0061	GRU	SAO PAULO/GUARULHOS INTERNATIONAL	BRAZIL	AMERIL	RG	Varig	59 015	207	558 146
LHR	LONDON/HEATHROW	UK0061	YEG	EDMONTON	CANADA	AMERIN	AC	Air Canada	5 603	26	38 152
LHR	LONDON/HEATHROW	UK0061	YHZ	HALIFAX	CANADA	AMERIN	AC	Air Canada	22 848	105	104 772
LHR	LONDON/HEATHROW	UK0061	YOW	OTTAWA/MACDONALD-CARTIER	CANADA	AMERIN	AC	Air Canada	76 088	347	406 820
LHR	LONDON/HEATHROW	UK0061	YUL	MONTREAL/PIERRE ELLIOTT TRUDEAU	CANADA	AMERIN	AC	Air Canada	119 990	488	625 913
LHR	LONDON/HEATHROW	UK0061	YUL	MONTREAL/PIERRE ELLIOTT TRUDEAU	CANADA	AMERIN	BA	British Airways	112 380	418	586 216
LHR	LONDON/HEATHROW	UK0061	YVR	VANCOUVER	CANADA	AMERIN	AC	Air Canada	143 779	562	1 089 613
LHR	LONDON/HEATHROW	UK0061	YVR	VANCOUVER	CANADA	AMERIN	BA	British Airways	202 067	507	1 531 342
LHR	LONDON/HEATHROW	UK0061	YYC	CALGARY	CANADA	AMERIN	AC	Air Canada	136 302	533	956 191
LHR	LONDON/HEATHROW	UK0061	YYC	CALGARY	CANADA	AMERIN	BA	British Airways	5 874	22	41 207
LHR	LONDON/HEATHROW	UK0061	YYT	ST JOHN'S	CANADA	AMERIN	AC	Air Canada	52 140	237	193 793
LHR	LONDON/HEATHROW	UK0061	YYZ	TORONTO/PEARSON	CANADA	AMERIN	AC	Air Canada	384 635	1 625	2 195 159
LHR	LONDON/HEATHROW	UK0061	YYZ	TORONTO/PEARSON	CANADA	AMERIN	BA	British Airways	249 523	891	1 424 058
LHR	LONDON/HEATHROW	UK0061	GVA	GENEVA	CH0005	EUROPW	BA	British Airways	435 951	2 936	328 977
LHR	LONDON/HEATHROW	UK0061	GVA	GENEVA	CH0005	EUROPW	LX	Swiss International Airlines	4 283	35	3 232
LHR	LONDON/HEATHROW	UK0061	ZRH	ZURICH/KLOTEN	CH0013	EUROPW	BA	British Airways	327 084	2 132	257 876
LHR	LONDON/HEATHROW	UK0061	ZRH	ZURICH/KLOTEN	CH0013	EUROPW	LX	Swiss International Airlines	387 133	2 187	305 219
LHR	LONDON/HEATHROW	UK0061	PEK	BEIJING CAPITAL INTERNATIONAL	CHINA	ASIAEA	CA	Air China	106 898	322	871 518
LHR	LONDON/HEATHROW	UK0061	PEK	BEIJING CAPITAL INTERNATIONAL	CHINA	ASIAEA	BA	British Airways	86 028	320	701 369
LHR	LONDON/HEATHROW	UK0061	PVG	SHANGHAI/PUDONG INTERNATIONAL	CHINA	ASIAEA	BA	British Airways	70 163	261	648 227
LHR	LONDON/HEATHROW	UK0061	PVG	SHANGHAI/PUDONG INTERNATIONAL	CHINA	ASIAEA	MU	China Eastern Airlines	68 593	239	633 722
LHR	LONDON/HEATHROW	UK0061	PVG	SHANGHAI/PUDONG INTERNATIONAL	CHINA	ASIAEA	VS	Virgin Atlantic Airways	113 054	364	1 044 492
LHR	LONDON/HEATHROW	UK0061	LCA	LARNACA	CY0004	ASIAWE	BA	British Airways	95 256	395	312 204
LHR	LONDON/HEATHROW	UK0061	LCA	LARNACA	CY0004	ASIAWE	CY	Cyprus Airways	203 389	718	666 614
LHR	LONDON/HEATHROW	UK0061	LCA	LARNACA	CY0004	ASIAWE	ZU	Helios Airways	945	5	3 097
LHR	LONDON/HEATHROW	UK0061	PFO	PAPHOS	CY0005	ASIAWE	CY	Cyprus Airways	13 785	48	44 337
LHR	LONDON/HEATHROW	UK0061	PFO	PAPHOS	CY0005	ASIAWE	ZU	Helios Airways	189	1	607
LHR	LONDON/HEATHROW	UK0061	PRG	PRAGUE/RUZYNE	CZ0035	EUROPE	BA	British Airways	162 538	1 093	169 728
LHR	LONDON/HEATHROW	UK0061	PRG	PRAGUE/RUZYNE	CZ0035	EUROPE	OK	CSA Czech Airlines	143 464	1 001	149 810

ORIGIN_AIRPORT			DESTINATION_AIRPORT				AIRLINE		FLIGHT CHARACTERISTICS		
ABBR	NAME	CODE	ABBR	NAME	CODE_1	CODE_2	CODE	NAME	Capacity	Frequency	ASK (000)
LHR	LONDON/HEATHROW	UK0061	TXL	BERLIN/TEGEL	DE0013	EUROPW	BA	British Airways	263 658	1 812	249 868
LHR	LONDON/HEATHROW	UK0061	DUS	DUSSELDORF	DE0039	EUROPW	BA	British Airways	337 091	2 102	168 679
LHR	LONDON/HEATHROW	UK0061	DUS	DUSSELDORF	DE0039	EUROPW	LH	Lufthansa	179 010	1 505	89 576
LHR	LONDON/HEATHROW	UK0061	FRA	FRANKFURT/MAIN	DE0051	EUROPW	BA	British Airways	439 301	2 664	287 681
LHR	LONDON/HEATHROW	UK0061	FRA	FRANKFURT/MAIN	DE0051	EUROPW	LH	Lufthansa	756 150	3 602	495 174
LHR	LONDON/HEATHROW	UK0061	HAM	HAMBURG	DE0068	EUROPW	BA	British Airways	213 808	1 449	159 279
LHR	LONDON/HEATHROW	UK0061	HAM	HAMBURG	DE0068	EUROPW	LH	Lufthansa	141 154	1 081	105 155
LHR	LONDON/HEATHROW	UK0061	HAJ	HANNOVER	DE0071	EUROPW	BD	bmi British Midland	80 450	706	56 567
LHR	LONDON/HEATHROW	UK0061	HAJ	HANNOVER	DE0071	EUROPW	BA	British Airways	636	4	447
LHR	LONDON/HEATHROW	UK0061	CGN	COLOGNE/BONN	DE0090	EUROPW	BA	British Airways	32 442	250	17 330
LHR	LONDON/HEATHROW	UK0061	CGN	COLOGNE/BONN	DE0090	EUROPW	LH	Lufthansa	84 451	996	45 112
LHR	LONDON/HEATHROW	UK0061	MUC	MUNICH/FRANZ JOSEF STRAUSS	DE0117	EUROPW	BA	British Airways	332 134	2 284	312 626
LHR	LONDON/HEATHROW	UK0061	MUC	MUNICH/FRANZ JOSEF STRAUSS	DE0117	EUROPW	LH	Lufthansa	401 082	2 538	377 524
LHR	LONDON/HEATHROW	UK0061	STR	STUTTGART-ECHTERDINGEN	DE0153	EUROPW	BA	British Airways	153 222	1 086	115 624
LHR	LONDON/HEATHROW	UK0061	STR	STUTTGART-ECHTERDINGEN	DE0153	EUROPW	LH	Lufthansa	53 980	693	40 734
LHR	LONDON/HEATHROW	UK0061	CPH	COPENHAGEN	DK0006	EUROPN	BA	British Airways	314 142	2 085	307 821
LHR	LONDON/HEATHROW	UK0061	CPH	COPENHAGEN	DK0006	EUROPN	SK	SAS Scandinavian Airlines	318 855	1 962	312 439
LHR	LONDON/HEATHROW	UK0061	CPH	COPENHAGEN	DK0006	EUROPN	TG	Thaï Airways	3 501	9	3 430
LHR	LONDON/HEATHROW	UK0061	CPH	COPENHAGEN	DK0006	EUROPN	RG	Varig	25 941	91	25 419
LHR	LONDON/HEATHROW	UK0061	ALG	ALGIERS	DZ0001	AFRICN	AH	Air Algérie	37 634	217	62 733
LHR	LONDON/HEATHROW	UK0061	HBE	ALEXANDRIA/BORG EL ARAB	EG0001	AFRICN	BA	British Airways	29 878	208	100 377
LHR	LONDON/HEATHROW	UK0061	CAI	CAIRO INTERNATIONAL	EG0004	AFRICN	BA	British Airways	114 950	365	405 975
LHR	LONDON/HEATHROW	UK0061	CAI	CAIRO INTERNATIONAL	EG0004	AFRICN	MS	Egyptair	119 850	401	423 280
LHR	LONDON/HEATHROW	UK0061	CAI	CAIRO INTERNATIONAL	EG0004	AFRICN	SD	Sudan Airways	1 375	5	4 856
LHR	LONDON/HEATHROW	UK0061	CAI	CAIRO INTERNATIONAL	EG0004	AFRICN	IY	Yemenia	4 416	15	15 596
LHR	LONDON/HEATHROW	UK0061	LXR	LUXOR	EG0006	AFRICN	MS	Egyptair	14 980	52	59 943
LHR	LONDON/HEATHROW	UK0061	SSH	SHARM EL-SHEIKH	EG0008	AFRICN	MS	Egyptair	3 363	21	13 105
LHR	LONDON/HEATHROW	UK0061	ALC	ALICANTE	ES0003	EUROPS	BD	bmi British Midland	45 709	289	67 000
LHR	LONDON/HEATHROW	UK0061	BCN	BARCELONA	ES0009	EUROPS	BA	British Airways	262 216	1 454	300 818
LHR	LONDON/HEATHROW	UK0061	BCN	BARCELONA	ES0009	EUROPS	IB	Iberia	220 939	1 452	253 464
LHR	LONDON/HEATHROW	UK0061	BIO	BILBAO	ES0010	EUROPS	IB	Iberia	54 755	364	50 746
LHR	LONDON/HEATHROW	UK0061	LCG	LA CORUNA	ES0019	EUROPS	IB	Iberia	50 255	334	54 580
LHR	LONDON/HEATHROW	UK0061	MAD	MADRID/BARAJAS	ES0021	EUROPS	BD	bmi British Midland	13 108	81	16 345
LHR	LONDON/HEATHROW	UK0061	MAD	MADRID/BARAJAS	ES0021	EUROPS	BA	British Airways	308 680	1 818	384 916
LHR	LONDON/HEATHROW	UK0061	MAD	MADRID/BARAJAS	ES0021	EUROPS	IB	Iberia	435 512	2 462	543 072
LHR	LONDON/HEATHROW	UK0061	AGP	MALAGA	ES0023	EUROPS	BA	British Airways	119 877	727	200 983
LHR	LONDON/HEATHROW	UK0061	AGP	MALAGA	ES0023	EUROPS	IB	Iberia	22 320	120	37 421
LHR	LONDON/HEATHROW	UK0061	PMI	PALMA DE MALLORCA	ES0027	EUROPS	BD	bmi British Midland	44 702	343	60 273
LHR	LONDON/HEATHROW	UK0061	SCQ	SANTIAGO DE COMPOSTELA	ES0037	EUROPS	IB	Iberia	4 500	30	5 068
LHR	LONDON/HEATHROW	UK0061	SVQ	SEVILLA	ES0039	EUROPS	IB	Iberia	54 360	363	87 990
LHR	LONDON/HEATHROW	UK0061	VLC	VALENCIA	ES0044	EUROPS	IB	Iberia	50 232	334	66 921
LHR	LONDON/HEATHROW	UK0061	ADD	ADDIS ABABA	ETHIOPIA	AFRICE	ET	Ethiopian Airlines	27 650	175	163 629
LHR	LONDON/HEATHROW	UK0061	HEL	HELSINKI/VANTAA	FI0005	EUROPN	BA	British Airways	102 824	727	190 094
LHR	LONDON/HEATHROW	UK0061	HEL	HELSINKI/VANTAA	FI0005	EUROPN	AY	Finnair	226 392	1 426	418 540
LHR	LONDON/HEATHROW	UK0061	BSL	BASEL EUROAIRPORT	FR0017	EUROPW	BA	British Airways	148 818	1 090	107 033
LHR	LONDON/HEATHROW	UK0061	BOD	BORDEAUX/MERIGNAC	FR0025	EUROPW	BA	British Airways	1 350	9	997
LHR	LONDON/HEATHROW	UK0061	LYS	LYON/ST EXUPERY (SATOLAS)	FR0088	EUROPW	AF	Air France	4 200	84	3 176
LHR	LONDON/HEATHROW	UK0061	LYS	LYON/ST EXUPERY (SATOLAS)	FR0088	EUROPW	BD	bmi British Midland	12 376	84	9 359
LHR	LONDON/HEATHROW	UK0061	LYS	LYON/ST EXUPERY (SATOLAS)	FR0088	EUROPW	BA	British Airways	162 657	1 090	123 006
LHR	LONDON/HEATHROW	UK0061	MRS	MARSEILLE	FR0091	EUROPW	BA	British Airways	2 286	17	2 262
LHR	LONDON/HEATHROW	UK0061	NCE	NICE COTE D'AZUR	FR0109	EUROPW	BD	bmi British Midland	39 404	290	40 957

ORIGIN_AIRPORT			DESTINATION_AIRPORT				AIRLINE		FLIGHT CHARACTERISTICS		
ABBR	NAME	CODE	ABBR	NAME	CODE_1	CODE_2	CODE	NAME	Capacity	Frequency	ASK (000)
LHR	LONDON/HEATHROW	UK0061	NCE	NICE COTE D'AZUR	FR0109	EUROPW	BA	British Airways	300 440	1 747	312 281
LHR	LONDON/HEATHROW	UK0061	CDG	PARIS/CHARLES DE GAULLE	FR0116	EUROPW	AF	Air France	681 238	4 162	235 664
LHR	LONDON/HEATHROW	UK0061	CDG	PARIS/CHARLES DE GAULLE	FR0116	EUROPW	BD	bmi British Midland	228 161	1 653	78 928
LHR	LONDON/HEATHROW	UK0061	CDG	PARIS/CHARLES DE GAULLE	FR0116	EUROPW	BA	British Airways	572 793	3 685	198 149
LHR	LONDON/HEATHROW	UK0061	CDG	PARIS/CHARLES DE GAULLE	FR0116	EUROPW	UL	SriLankan Airlines	322	1	111
LHR	LONDON/HEATHROW	UK0061	CDG	PARIS/CHARLES DE GAULLE	FR0116	EUROPW	SD	Sudan Airways	1 375	5	475
LHR	LONDON/HEATHROW	UK0061	TBS	TBILISI/NOVO ALEXEYEVKA	GE0023	ASIAWE	BA	British Airways	13 252	96	47 207
LHR	LONDON/HEATHROW	UK0061	ACC	ACCRA	GHANA	AFRICW	BA	British Airways	90 895	365	463 466
LHR	LONDON/HEATHROW	UK0061	GIB	GIBRALTAR	GI0001	EUROPS	BA	British Airways	46 266	300	80 844
LHR	LONDON/HEATHROW	UK0061	ATH	ATHENS ELEFTHERIOS VENIZELOS INTERNATIONAL	GR0059	EUROPS	BA	British Airways	235 456	1 091	571 303
LHR	LONDON/HEATHROW	UK0061	ATH	ATHENS ELEFTHERIOS VENIZELOS INTERNATIONAL	GR0059	EUROPS	OA	Olympic Airways	232 959	1 007	565 245
LHR	LONDON/HEATHROW	UK0061	HKG	HONG KONG INTERNATIONAL	HONG KONG	ASIAEA	NZ	Air New Zealand	25 251	64	243 123
LHR	LONDON/HEATHROW	UK0061	HKG	HONG KONG INTERNATIONAL	HONG KONG	ASIAEA	BA	British Airways	432 787	1 093	4 166 984
LHR	LONDON/HEATHROW	UK0061	HKG	HONG KONG INTERNATIONAL	HONG KONG	ASIAEA	CX	Cathay Pacific Airways	461 576	1 460	4 444 171
LHR	LONDON/HEATHROW	UK0061	HKG	HONG KONG INTERNATIONAL	HONG KONG	ASIAEA	QF	Qantas Airways	140 454	329	1 352 327
LHR	LONDON/HEATHROW	UK0061	HKG	HONG KONG INTERNATIONAL	HONG KONG	ASIAEA	VS	Virgin Atlantic Airways	113 360	365	1 091 459
LHR	LONDON/HEATHROW	UK0061	DBV	DUBROVNIK	HR0001	EUROPS	OU	Croatia Airlines	1 320	10	2 272
LHR	LONDON/HEATHROW	UK0061	RJK	RIJEKA	HR0006	EUROPS	OU	Croatia Airlines	4 628	29	6 046
LHR	LONDON/HEATHROW	UK0061	SPU	SPLIT	HR0007	EUROPS	OU	Croatia Airlines	8 464	52	12 964
LHR	LONDON/HEATHROW	UK0061	ZAG	ZAGREB/PLESO	HR0011	EUROPS	OU	Croatia Airlines	50 924	363	69 564
LHR	LONDON/HEATHROW	UK0061	BUD	BUDAPEST/FERIHEGY	HU0012	EUROPE	BA	British Airways	166 146	1 089	247 011
LHR	LONDON/HEATHROW	UK0061	BUD	BUDAPEST/FERIHEGY	HU0012	EUROPE	MA	Malev Hungarian Airlines	73 444	602	109 190
LHR	LONDON/HEATHROW	UK0061	ORK	CORK	IE0003	EUROPN	EI	Aer Lingus	250 307	1 544	139 349
LHR	LONDON/HEATHROW	UK0061	DUB	DUBLIN	IE0004	EUROPN	EI	Aer Lingus	848 056	4 709	382 066
LHR	LONDON/HEATHROW	UK0061	DUB	DUBLIN	IE0004	EUROPN	BD	bmi British Midland	468 374	2 286	211 011
LHR	LONDON/HEATHROW	UK0061	SNN	SHANNON	IE0006	EUROPN	EI	Aer Lingus	201 213	1 257	119 788
LHR	LONDON/HEATHROW	UK0061	VDA	OVDA	IL0001	ASIAWE	LY	El Al Israel Airlines	4 253	21	16 005
LHR	LONDON/HEATHROW	UK0061	TLV	TEL-AVIV/BEN GURION	IL0002	ASIAWE	BA	British Airways	186 800	727	669 950
LHR	LONDON/HEATHROW	UK0061	TLV	TEL-AVIV/BEN GURION	IL0002	ASIAWE	LY	El Al Israel Airlines	172 164	580	617 459
LHR	LONDON/HEATHROW	UK0061	AMD	AHMEDABAD	INDIA	ASIASO	AI	Air India	59 559	157	408 908
LHR	LONDON/HEATHROW	UK0061	ATQ	AMRITSAR	INDIA	ASIASO	9W	Jet Airways	23 541	93	148 934
LHR	LONDON/HEATHROW	UK0061	BLR	BANGALORE/BENGALURU	INDIA	ASIASO	BA	British Airways	81 983	305	661 004
LHR	LONDON/HEATHROW	UK0061	BOM	MUMBAI	INDIA	ASIASO	AI	Air India	149 071	417	1 075 031
LHR	LONDON/HEATHROW	UK0061	BOM	MUMBAI	INDIA	ASIASO	BD	bmi British Midland	60 512	248	436 384
LHR	LONDON/HEATHROW	UK0061	BOM	MUMBAI	INDIA	ASIASO	BA	British Airways	247 579	730	1 785 425
LHR	LONDON/HEATHROW	UK0061	BOM	MUMBAI	INDIA	ASIASO	9W	Jet Airways	144 304	540	1 040 653
LHR	LONDON/HEATHROW	UK0061	BOM	MUMBAI	INDIA	ASIASO	VS	Virgin Atlantic Airways	92 827	365	669 425
LHR	LONDON/HEATHROW	UK0061	CCU	CALCUTTA	INDIA	ASIASO	AI	Air India	45 552	156	363 607
LHR	LONDON/HEATHROW	UK0061	CCU	CALCUTTA	INDIA	ASIASO	BA	British Airways	41 938	156	334 759
LHR	LONDON/HEATHROW	UK0061	DEL	NEW DELHI/INDIRA GHANDI INTERNATIONAL	INDIA	ASIASO	AI	Air India	151 737	359	1 021 257
LHR	LONDON/HEATHROW	UK0061	DEL	NEW DELHI/INDIRA GHANDI INTERNATIONAL	INDIA	ASIASO	S2	Air Sahara	42 884	206	288 628
LHR	LONDON/HEATHROW	UK0061	DEL	NEW DELHI/INDIRA GHANDI INTERNATIONAL	INDIA	ASIASO	BA	British Airways	222 046	633	1 494 468
LHR	LONDON/HEATHROW	UK0061	DEL	NEW DELHI/INDIRA GHANDI INTERNATIONAL	INDIA	ASIASO	9W	Jet Airways	97 001	365	652 860
LHR	LONDON/HEATHROW	UK0061	DEL	NEW DELHI/INDIRA GHANDI INTERNATIONAL	INDIA	ASIASO	VS	Virgin Atlantic Airways	96 504	365	649 515
LHR	LONDON/HEATHROW	UK0061	MAA	CHENNAI	INDIA	ASIASO	BA	British Airways	84 816	278	698 311
LHR	LONDON/HEATHROW	UK0061	THR	TEHRAN/MEHRABAD	IR0002	ASIASO	BA	British Airways	48 411	324	213 661
LHR	LONDON/HEATHROW	UK0061	THR	TEHRAN/MEHRABAD	IR0002	ASIASO	IR	Iran Air	68 400	171	301 882
LHR	LONDON/HEATHROW	UK0061	KEF	REYKJAVIK/KEFLAVIK INTERNATIONAL	IS0002	EUROPN	FI	Icelandair	151 440	708	287 039
LHR	LONDON/HEATHROW	UK0061	LIN	MILAN/LINATE	IT0038	EUROPS	AZ	Alitalia	146 593	950	143 643
LHR	LONDON/HEATHROW	UK0061	LIN	MILAN/LINATE	IT0038	EUROPS	XM	Alitalia Express	94 449	630	92 548
LHR	LONDON/HEATHROW	UK0061	LIN	MILAN/LINATE	IT0038	EUROPS	BD	bmi British Midland	11 844	77	11 605

ORIGIN_AIRPORT			DESTINATION_AIRPORT				AIRLINE		FLIGHT CHARACTERISTICS		
ABBR	NAME	CODE	ABBR	NAME	CODE_1	CODE_2	CODE	NAME	Capacity	Frequency	ASK (000)
LHR	LONDON/HEATHROW	UK0061	LIN	MILAN/LINATE	IT0038	EUROPS	BA	British Airways	223 476	1 453	218 979
LHR	LONDON/HEATHROW	UK0061	MXP	MILAN/MALPENSA	IT0039	EUROPS	AZ	Alitalia	202 895	1 093	189 998
LHR	LONDON/HEATHROW	UK0061	MXP	MILAN/MALPENSA	IT0039	EUROPS	BA	British Airways	223 800	1 516	209 574
LHR	LONDON/HEATHROW	UK0061	NAP	NAPLES	IT0041	EUROPS	BD	bmi British Midland	28 522	217	46 442
LHR	LONDON/HEATHROW	UK0061	PSA	PISA/GALILEO GALILEI	IT0052	EUROPS	BA	British Airways	1 254	9	1 487
LHR	LONDON/HEATHROW	UK0061	FCO	ROME/FIUMICINO	IT0061	EUROPS	MK	Air Mauritius	588	2	848
LHR	LONDON/HEATHROW	UK0061	FCO	ROME/FIUMICINO	IT0061	EUROPS	AZ	Alitalia	333 939	1 848	481 965
LHR	LONDON/HEATHROW	UK0061	FCO	ROME/FIUMICINO	IT0061	EUROPS	BA	British Airways	306 552	1 820	442 438
LHR	LONDON/HEATHROW	UK0061	FCO	ROME/FIUMICINO	IT0061	EUROPS	CY	Cyprus Airways	304	1	438
LHR	LONDON/HEATHROW	UK0061	FCO	ROME/FIUMICINO	IT0061	EUROPS	ET	Ethiopian Airlines	3 318	21	4 788
LHR	LONDON/HEATHROW	UK0061	TRN	TURIN	IT0064	EUROPS	BA	British Airways	378	3	347
LHR	LONDON/HEATHROW	UK0061	VCE	VENICE/MARCO POLO	IT0068	EUROPS	BD	bmi British Midland	49 836	360	57 413
LHR	LONDON/HEATHROW	UK0061	KIN	KINGSTON/NORMAN MANLEY	JAMAICA	AMERIL	JM	Air Jamaica	6 604	26	49 643
LHR	LONDON/HEATHROW	UK0061	MBJ	MONTEGO BAY	JAMAICA	AMERIL	JM	Air Jamaica	83 802	327	632 522
LHR	LONDON/HEATHROW	UK0061	KIX	OSAKA/KANSAI INTERNATIONAL	JAPAN	ASIAEA	JL	Japan Airlines	147 025	365	1 401 400
LHR	LONDON/HEATHROW	UK0061	NRT	TOKYO/NARITA INTERNATIONAL	JAPAN	ASIAEA	NH	ANA All Nippon Airways	118 935	365	1 140 543
LHR	LONDON/HEATHROW	UK0061	NRT	TOKYO/NARITA INTERNATIONAL	JAPAN	ASIAEA	BA	British Airways	280 910	702	2 693 825
LHR	LONDON/HEATHROW	UK0061	NRT	TOKYO/NARITA INTERNATIONAL	JAPAN	ASIAEA	JL	Japan Airlines	191 972	421	1 840 942
LHR	LONDON/HEATHROW	UK0061	NRT	TOKYO/NARITA INTERNATIONAL	JAPAN	ASIAEA	VS	Virgin Atlantic Airways	113 054	364	1 084 147
LHR	LONDON/HEATHROW	UK0061	AMM	AMMAN/QUEEN ALIA INTERNATIONAL	JO0001	ASIAWE	BA	British Airways	30 107	202	110 884
LHR	LONDON/HEATHROW	UK0061	AMM	AMMAN/QUEEN ALIA INTERNATIONAL	JO0001	ASIAWE	RJ	Royal Jordanian Airline	79 868	385	294 153
LHR	LONDON/HEATHROW	UK0061	NBO	NAIROBI/KENYATTA INTERNATIONAL	KENYA	AFRICE	BA	British Airways	155 287	522	1 062 141
LHR	LONDON/HEATHROW	UK0061	NBO	NAIROBI/KENYATTA INTERNATIONAL	KENYA	AFRICE	KQ	Kenya Airways	146 776	460	1 003 927
LHR	LONDON/HEATHROW	UK0061	KWI	KUWAIT INTERNATIONAL	KW0001	ASIAWE	BA	British Airways	98 123	365	458 641
LHR	LONDON/HEATHROW	UK0061	KWI	KUWAIT INTERNATIONAL	KW0001	ASIAWE	KU	Kuwait Airways	106 959	380	499 941
LHR	LONDON/HEATHROW	UK0061	ALA	ALMATY INTERNATIONAL	KZ0006	ASIACE	KC	Air Astana	3 595	17	20 210
LHR	LONDON/HEATHROW	UK0061	ALA	ALMATY INTERNATIONAL	KZ0006	ASIACE	4L	Euroline Airlines	16 704	87	93 907
LHR	LONDON/HEATHROW	UK0061	BEY	BEIRUT	LB0001	ASIAWE	BA	British Airways	52 275	367	181 846
LHR	LONDON/HEATHROW	UK0061	BEY	BEIRUT	LB0001	ASIAWE	ME	Middle East Airlines	63 958	293	222 488
LHR	LONDON/HEATHROW	UK0061	LUX	LUXEMBOURG	LU0001	EUROPW	LG	Luxair	44 859	728	23 024
LHR	LONDON/HEATHROW	UK0061	RIX	RIGA INTERNATIONAL	LV0012	EUROPN	BT	Air Baltic	9 360	78	15 813
LHR	LONDON/HEATHROW	UK0061	RIX	RIGA INTERNATIONAL	LV0012	EUROPN	BA	British Airways	15 165	84	25 620
LHR	LONDON/HEATHROW	UK0061	TIP	TRIPOLI	LY0002	AFRICN	BA	British Airways	54 150	361	127 990
LHR	LONDON/HEATHROW	UK0061	TIP	TRIPOLI	LY0002	AFRICN	LN	Lybian Arab Airlines	15 591	104	36 851
LHR	LONDON/HEATHROW	UK0061	KUL	KUALA LUMPUR INTERNATIONAL	MALAYSIA	ASIASO	MH	Malaysian Airlines	370 885	877	3 932 011
LHR	LONDON/HEATHROW	UK0061	LGK	LANGKAWI	MALAYSIA	ASIASO	MH	Malaysian Airlines	11 050	26	112 188
LHR	LONDON/HEATHROW	UK0061	PEN	PENANG INTERNATIONAL	MALAYSIA	ASIASO	MH	Malaysian Airlines	10 625	25	109 223
LHR	LONDON/HEATHROW	UK0061	MLE	MALE INTERNATIONAL	MALDIVES	ASIASO	UL	SriLankan Airlines	55 884	174	477 101
LHR	LONDON/HEATHROW	UK0061	MRU	MAURITIUS/SIR SEEWOOSAGUR RAM INTERNATIONAL	MAURITIUS	AFRICE	MK	Air Mauritius	84 378	287	825 446
LHR	LONDON/HEATHROW	UK0061	MRU	MAURITIUS/SIR SEEWOOSAGUR RAM INTERNATIONAL	MAURITIUS	AFRICE	BA	British Airways	62 093	157	607 438
LHR	LONDON/HEATHROW	UK0061	MEX	MEXICO CITY/JUAREZ INTERNATIONAL	MEXICO	AMERIL	BA	British Airways	74 373	187	662 112
LHR	LONDON/HEATHROW	UK0061	CMN	CASABLANCA/MOHAMMED V	MR0002	AFRICN	BA	British Airways	57 390	349	120 135
LHR	LONDON/HEATHROW	UK0061	CMN	CASABLANCA/MOHAMMED V	MR0002	AFRICN	AT	Royal Air Maroc	53 038	356	111 024
LHR	LONDON/HEATHROW	UK0061	FEZ	FEZ	MR0004	AFRICN	BA	British Airways	2 700	18	5 334
LHR	LONDON/HEATHROW	UK0061	RAK	MARRAKECH/MENARA	MR0005	AFRICN	BA	British Airways	6 750	45	15 476
LHR	LONDON/HEATHROW	UK0061	TNG	TANGIERS/BOUKHALEF	MR0010	AFRICN	BA	British Airways	2 640	15	4 765
LHR	LONDON/HEATHROW	UK0061	TNG	TANGIERS/BOUKHALEF	MR0010	AFRICN	AT	Royal Air Maroc	14 059	116	25 380
LHR	LONDON/HEATHROW	UK0061	MLA	MALTA	MT0002	EUROPS	KM	Air Malta	105 984	735	222 709
LHR	LONDON/HEATHROW	UK0061	ABV	ABUJA	NIGERIA	AFRICW	BA	British Airways	97 322	362	464 605
LHR	LONDON/HEATHROW	UK0061	LOS	LAGOS/MURTALA MUHAMMED	NIGERIA	AFRICW	BA	British Airways	167 961	455	840 204
LHR	LONDON/HEATHROW	UK0061	LOS	LAGOS/MURTALA MUHAMMED	NIGERIA	AFRICW	VS	Virgin Atlantic Airways	94 955	365	475 001

ORIGIN_AIRPORT			DESTINATION_AIRPORT				AIRLINE		FLIGHT CHARACTERISTICS		
ABBR	NAME	CODE	ABBR	NAME	CODE_1	CODE_2	CODE	NAME	Capacity	Frequency	ASK (000)
LHR	LONDON/HEATHROW	UK0061	AMS	AMSTERDAM/SCHIPHOL	NL0001	EUROPW	BD	bmi British Midland	376 275	2 691	139 248
LHR	LONDON/HEATHROW	UK0061	AMS	AMSTERDAM/SCHIPHOL	NL0001	EUROPW	BA	British Airways	394 659	2 655	146 051
LHR	LONDON/HEATHROW	UK0061	AMS	AMSTERDAM/SCHIPHOL	NL0001	EUROPW	KL	KLM	446 446	3 318	165 216
LHR	LONDON/HEATHROW	UK0061	EIN	EINDHOVEN	NL0006	EUROPW	KL	KLM	25 600	512	10 379
LHR	LONDON/HEATHROW	UK0061	RTM	ROTTERDAM	NL0012	EUROPW	KL	KLM	46 050	921	15 708
LHR	LONDON/HEATHROW	UK0061	OSL	OSLO/GARDERMOEN	NO0015	EUROPN	BA	British Airways	213 348	1 451	257 457
LHR	LONDON/HEATHROW	UK0061	OSL	OSLO/GARDERMOEN	NO0015	EUROPN	SK	SAS Scandinavian Airlines	253 938	1 735	306 439
LHR	LONDON/HEATHROW	UK0061	SVG	STAVANGER/SOLA	NO0024	EUROPN	SK	SAS Scandinavian Airlines	75 793	615	69 024
LHR	LONDON/HEATHROW	UK0061	MCT	MUSCAT/SEEB	OMAN	ASIAWE	GF	Gulf Air	133 466	579	778 242
LHR	LONDON/HEATHROW	UK0061	ISB	ISLAMABAD	PAKISTAN	ASIASO	BA	British Airways	56 753	156	344 168
LHR	LONDON/HEATHROW	UK0061	ISB	ISLAMABAD	PAKISTAN	ASIASO	PK	PIA Pakistan International Airlines	87 900	209	533 053
LHR	LONDON/HEATHROW	UK0061	KHI	KARACHI/QUAID-E-AZAM	PAKISTAN	ASIASO	PK	PIA Pakistan International Airlines	49 549	157	313 954
LHR	LONDON/HEATHROW	UK0061	LHE	LAHORE	PAKISTAN	ASIASO	PK	PIA Pakistan International Airlines	60 995	156	385 006
LHR	LONDON/HEATHROW	UK0061	KRK	KRAKOW	PL0049	EUROPE	LO	LOT Polish Airlines	270	2	385
LHR	LONDON/HEATHROW	UK0061	WAW	WARSAW	PL0130	EUROPE	BA	British Airways	154 518	1 092	226 989
LHR	LONDON/HEATHROW	UK0061	WAW	WARSAW	PL0130	EUROPE	LO	LOT Polish Airlines	130 646	1 081	191 921
LHR	LONDON/HEATHROW	UK0061	FAO	FARO	PT0010	EUROPS	TP	TAP Portugal	42 570	265	72 947
LHR	LONDON/HEATHROW	UK0061	FNC	FUNCHAL MADEIRA	PT0012	EUROPS	TP	TAP Portugal	18 907	105	46 727
LHR	LONDON/HEATHROW	UK0061	LIS	LISBON	PT0014	EUROPS	BA	British Airways	211 974	1 454	331 857
LHR	LONDON/HEATHROW	UK0061	LIS	LISBON	PT0014	EUROPS	TP	TAP Portugal	191 985	1 162	300 563
LHR	LONDON/HEATHROW	UK0061	OPO	PORTO	PT0020	EUROPS	TP	TAP Portugal	102 061	691	132 686
LHR	LONDON/HEATHROW	UK0061	DOH	DOHA INTERNATIONAL	QA0001	ASIAWE	BD	bmi British Midland	1 464	6	7 667
LHR	LONDON/HEATHROW	UK0061	DOH	DOHA INTERNATIONAL	QA0001	ASIAWE	QR	Qatar Airways	290 224	1 005	1 519 988
LHR	LONDON/HEATHROW	UK0061	OTP	BUCHAREST/OTOPENI	RO0021	EUROPE	BA	British Airways	88 440	644	186 128
LHR	LONDON/HEATHROW	UK0061	OTP	BUCHAREST/OTOPENI	RO0021	EUROPE	RO	Tarom	45 496	364	95 749
LHR	LONDON/HEATHROW	UK0061	LED	SANKT-PETERSBURG/PULKOVO	RU0517	RU0517	BA	British Airways	54 150	361	114 485
LHR	LONDON/HEATHROW	UK0061	LED	SANKT-PETERSBURG/PULKOVO	RU0517	RU0517	FV	Pulkovo Airlines/Rossiya Airlines	5 855	51	12 378
LHR	LONDON/HEATHROW	UK0061	DME	MOSCOW/DOMODEDOVO	RU0587	RU0587	BD	bmi British Midland	9 705	64	24 687
LHR	LONDON/HEATHROW	UK0061	DME	MOSCOW/DOMODEDOVO	RU0587	RU0587	BA	British Airways	202 872	883	516 071
LHR	LONDON/HEATHROW	UK0061	DME	MOSCOW/DOMODEDOVO	RU0587	RU0587	UN	Transaero Airlines	9 002	64	22 899
LHR	LONDON/HEATHROW	UK0061	SVO	MOSCOW/SHEREMETYEVO	RU0589	RU0589	SU	Aeroflot Russian Airlines	174 046	948	436 582
LHR	LONDON/HEATHROW	UK0061	SVX	EKATERINBURG/KOLTSOVO INTERNATIONAL	RU1115	RU1115	BA	British Airways	20 984	155	81 504
LHR	LONDON/HEATHROW	UK0061	JED	JEDDAH/KING ABDULAZIZ INTERNATIONAL	SA0001	ASIAWE	BD	bmi British Midland	22 560	98	107 082
LHR	LONDON/HEATHROW	UK0061	JED	JEDDAH/KING ABDULAZIZ INTERNATIONAL	SA0001	ASIAWE	SV	Saudi Arabian Airlines	98 664	346	468 313
LHR	LONDON/HEATHROW	UK0061	RUH	RIYAD/KING KHALED INTERNATIONAL	SA0002	ASIAWE	BD	bmi British Midland	36 002	155	177 836
LHR	LONDON/HEATHROW	UK0061	RUH	RIYAD/KING KHALED INTERNATIONAL	SA0002	ASIAWE	SV	Saudi Arabian Airlines	48 195	169	238 065
LHR	LONDON/HEATHROW	UK0061	UVF	SAINT LUCIA/HEWANORRA	SAINT LUCIA	AMERIL	BW	Caribbean Airways	24 932	88	169 247
LHR	LONDON/HEATHROW	UK0061	GOT	GOTHENBURG/LANDVETTER	SE0020	EUROPN	SK	SAS Scandinavian Airlines	104 652	680	111 976
LHR	LONDON/HEATHROW	UK0061	ARN	STOCKHOLM/ARLANDA	SE0074	EUROPN	BA	British Airways	336 411	2 076	492 028
LHR	LONDON/HEATHROW	UK0061	ARN	STOCKHOLM/ARLANDA	SE0074	EUROPN	SK	SAS Scandinavian Airlines	308 732	1 938	451 545
LHR	LONDON/HEATHROW	UK0061	DKR	DAKAR	SEGENAL	AFRICW	BA	British Airways	4 050	27	17 646
LHR	LONDON/HEATHROW	UK0061	SEZ	SEYCHELLES/MAHE ISLAND	SEYCHELLES	AFRICE	HM	Air Seychelles	24 846	101	203 044
LHR	LONDON/HEATHROW	UK0061	FNA	FREETOWN LUNGI	SIERRA LEONE	AFRICW	O3		33 734	162	165 439
LHR	LONDON/HEATHROW	UK0061	SIN	CHANGI	SINGAPORE	ASIASE	BA	British Airways	283 582	729	3 084 932
LHR	LONDON/HEATHROW	UK0061	SIN	CHANGI	SINGAPORE	ASIASE	QF	Qantas Airways	327 564	766	3 563 388
LHR	LONDON/HEATHROW	UK0061	SIN	CHANGI	SINGAPORE	ASIASE	SQ	Singapore Airlines	493 791	1 095	5 371 680
LHR	LONDON/HEATHROW	UK0061	CPT	CAPE TOWN	SOUTH AFRICA	AFRICS	BA	British Airways	191 290	489	1 851 330
LHR	LONDON/HEATHROW	UK0061	CPT	CAPE TOWN	SOUTH AFRICA	AFRICS	SA	South African Airways	124 949	368	1 209 273
LHR	LONDON/HEATHROW	UK0061	CPT	CAPE TOWN	SOUTH AFRICA	AFRICS	VS	Virgin Atlantic Airways	31 572	107	305 558
LHR	LONDON/HEATHROW	UK0061	JNB	JOHANNESBURG INTERNATIONAL	SOUTH AFRICA	AFRICS	BA	British Airways	289 058	730	2 622 201
LHR	LONDON/HEATHROW	UK0061	JNB	JOHANNESBURG INTERNATIONAL	SOUTH AFRICA	AFRICS	SA	South African Airways	220 368	622	1 999 077

ORIGIN_AIRPORT			DESTINATION_AIRPORT				AIRLINE		FLIGHT CHARACTERISTICS		
ABBR	NAME	CODE	ABBR	NAME	CODE_1	CODE_2	CODE	NAME	Capacity	Frequency	ASK (000)
LHR	LONDON/HEATHROW	UK0061	JNB	JOHANNESBURG INTERNATIONAL	SOUTH AFRICA	AFRICS	VS	Virgin Atlantic Airways	116 925	365	1 060 690
LHR	LONDON/HEATHROW	UK0061	ICN	SEOUL/INCHEON	SOUTH KOREA	ASIAEA	OZ	Asiana Airlines	57 439	199	508 953
LHR	LONDON/HEATHROW	UK0061	ICN	SEOUL/INCHEON	SOUTH KOREA	ASIAEA	KE	Korean Airlines	145 814	365	1 292 023
LHR	LONDON/HEATHROW	UK0061	CMB	COLOMBO (SRI LANKA)	SRI LANKA	ASIASO	UL	SriLankan Airlines	137 858	429	1 201 120
LHR	LONDON/HEATHROW	UK0061	ALP	ALEPPO	SY0001	ASIAWE	BA	British Airways	15 900	119	54 287
LHR	LONDON/HEATHROW	UK0061	DAM	DAMASCUS INTERNATIONAL	SY0002	ASIAWE	BA	British Airways	300	2	1 074
LHR	LONDON/HEATHROW	UK0061	DAM	DAMASCUS INTERNATIONAL	SY0002	ASIAWE	ME	Middle East Airlines	447	3	1 600
LHR	LONDON/HEATHROW	UK0061	DAM	DAMASCUS INTERNATIONAL	SY0002	ASIAWE	RB	Syrian Arab Airlines	45 110	119	161 494
LHR	LONDON/HEATHROW	UK0061	DAR	DAR ES SALAAM	TANZANIA	AFRICE	BA	British Airways	38 857	156	291 660
LHR	LONDON/HEATHROW	UK0061	BKK	BANGKOK INTERNATIONAL	THAILAND	ASIASE	BA	British Airways	144 529	365	1 379 702
LHR	LONDON/HEATHROW	UK0061	BKK	BANGKOK INTERNATIONAL	THAILAND	ASIASE	BR	Eva Air	93 462	312	892 206
LHR	LONDON/HEATHROW	UK0061	BKK	BANGKOK INTERNATIONAL	THAILAND	ASIASE	QF	Qantas Airways	149 094	349	1 423 280
LHR	LONDON/HEATHROW	UK0061	BKK	BANGKOK INTERNATIONAL	THAILAND	ASIASE	TG	Thaï Airways	290 805	721	2 776 081
LHR	LONDON/HEATHROW	UK0061	IST	ISTANBUL/ATATURK	TR0003	ASIAWE	BA	British Airways	177 809	946	446 593
LHR	LONDON/HEATHROW	UK0061	IST	ISTANBUL/ATATURK	TR0003	ASIAWE	TK	Turkish Airlines	189 190	1 093	475 178
LHR	LONDON/HEATHROW	UK0061	ESB	ANKARA/ESENBOGA	TR0006	ASIAWE	BA	British Airways	34 886	248	99 465
LHR	LONDON/HEATHROW	UK0061	AYT	ANTALYA	TR0007	ASIAWE	YK	Cyprus Turkish Airlines	3 782	31	11 105
LHR	LONDON/HEATHROW	UK0061	ADB	IZMIR/ADNAN MENDERES	TR0008	ASIAWE	YK	Cyprus Turkish Airlines	16 348	134	42 480
LHR	LONDON/HEATHROW	UK0061	POS	TRINIDAD/PORT OF SPAIN	TRINIDAD/TOBAGO	AMERIL	BW	Caribbean Airways	4 828	17	34 242
LHR	LONDON/HEATHROW	UK0061	TUN	TUNIS/CARTHAGE	TU0006	AFRICN	TU	Tunis Air	35 892	208	65 719
LHR	LONDON/HEATHROW	UK0061	ASB	ASHKHABAD	TURKMENISTAN	ASIACE	T5	Turkmenistan Airlines	19 656	104	93 171
LHR	LONDON/HEATHROW	UK0061	KBP	KIEV/BORISPOL	UA0144	EUROPE	BA	British Airways	54 600	364	119 390
LHR	LONDON/HEATHROW	UK0061	KBP	KIEV/BORISPOL	UA0144	EUROPE	PS	Ukraine International Airlines	2 684	22	5 868
LHR	LONDON/HEATHROW	UK0061	DXB	DUBAI	UE0001	ASIAWE	BG	Birman Bangladesh Airlines	36 465	165	200 424
LHR	LONDON/HEATHROW	UK0061	DXB	DUBAI	UE0001	ASIAWE	BA	British Airways	219 387	757	1 205 826
LHR	LONDON/HEATHROW	UK0061	DXB	DUBAI	UE0001	ASIAWE	EK	Emirates	608 509	1 825	3 344 574
LHR	LONDON/HEATHROW	UK0061	DXB	DUBAI	UE0001	ASIAWE	BI	Royal Brunei	89 708	366	493 066
LHR	LONDON/HEATHROW	UK0061	DXB	DUBAI	UE0001	ASIAWE	VS	Virgin Atlantic Airways	77 221	256	424 433
LHR	LONDON/HEATHROW	UK0061	AUH	ABU DHABI	UE0002	ASIAWE	BA	British Airways	98 123	365	541 212
LHR	LONDON/HEATHROW	UK0061	AUH	ABU DHABI	UE0002	ASIAWE	EY	Etihad Airways	130 437	564	719 445
LHR	LONDON/HEATHROW	UK0061	AUH	ABU DHABI	UE0002	ASIAWE	GF	Gulf Air	29 835	120	164 559
LHR	LONDON/HEATHROW	UK0061	EBB	ENTEBBE	UGANDA	AFRICE	BA	British Airways	39 109	157	253 970
LHR	LONDON/HEATHROW	UK0061	ABZ	ABERDEEN	UK0001	EUROPN	BD	bmi British Midland	194 920	1 600	126 391
LHR	LONDON/HEATHROW	UK0061	ABZ	ABERDEEN	UK0001	EUROPN	BA	British Airways	336 082	2 327	217 924
LHR	LONDON/HEATHROW	UK0061	BHD	BELFAST CITY	UK0007	EUROPN	BD	bmi British Midland	485 809	2 802	244 661
LHR	LONDON/HEATHROW	UK0061	EDI	EDINBURGH	UK0043	EUROPN	BD	bmi British Midland	443 501	2 776	236 912
LHR	LONDON/HEATHROW	UK0061	EDI	EDINBURGH	UK0043	EUROPN	BA	British Airways	573 892	3 833	306 566
LHR	LONDON/HEATHROW	UK0061	EDI	EDINBURGH	UK0043	EUROPN	QR	Qatar Airways	1 701	9	908
LHR	LONDON/HEATHROW	UK0061	GLA	GLASGOW	UK0053	EUROPN	BD	bmi British Midland	407 553	2 659	226 234
LHR	LONDON/HEATHROW	UK0061	GLA	GLASGOW	UK0053	EUROPN	BA	British Airways	503 159	3 394	279 306
LHR	LONDON/HEATHROW	UK0061	INV	INVERSNESS	UK0065	EUROPN	BD	bmi British Midland	43 524	354	31 093
LHR	LONDON/HEATHROW	UK0061	LBA	LEEDS/BRADFORD	UK0076	EUROPN	BD	bmi British Midland	169 347	1 325	47 411
LHR	LONDON/HEATHROW	UK0061	MAN	MANCHESTER	UK0089	EUROPN	BG	Birman Bangladesh Airlines	5 540	20	1 345
LHR	LONDON/HEATHROW	UK0061	MAN	MANCHESTER	UK0089	EUROPN	BD	bmi British Midland	323 602	2 405	78 622
LHR	LONDON/HEATHROW	UK0061	MAN	MANCHESTER	UK0089	EUROPN	BA	British Airways	493 289	3 300	119 849
LHR	LONDON/HEATHROW	UK0061	MAN	MANCHESTER	UK0089	EUROPN	CY	Cyprus Airways	174	1	42
LHR	LONDON/HEATHROW	UK0061	MAN	MANCHESTER	UK0089	EUROPN	RB	Syrian Arab Airlines	14 204	38	3 450
LHR	LONDON/HEATHROW	UK0061	STN	LONDON/STANSTED	UK0109	EUROPN	QF	Qantas Airways	5 184	12	350
LHR	LONDON/HEATHROW	UK0061	MME	DURHAM TEES VALLEY	UK0113	EUROPN	BD	bmi British Midland	128 174	1 031	44 339
LHR	LONDON/HEATHROW	UK0061	NCL	NEWCASTLE	UK0130	EUROPN	BA	British Airways	311 239	2 179	126 197
LHR	LONDON/HEATHROW	UK0061	BOS	BOSTON LOGAN INTERNATIONAL	USA	AMERIN	AA	American Airlines	171 967	704	900 918
LHR	LONDON/HEATHROW	UK0061	BOS	BOSTON LOGAN INTERNATIONAL	USA	AMERIN	BA	British Airways	358 246	1 087	1 876 816
LHR	LONDON/HEATHROW	UK0061	BOS	BOSTON LOGAN INTERNATIONAL	USA	AMERIN	VS	Virgin Atlantic Airways	132 444	364	693 861

ORIGIN_AIRPORT			DESTINATION_AIRPORT				AIRLINE		FLIGHT CHARACTERISTICS		
ABBR	NAME	CODE	ABBR	NAME	CODE_1	CODE_2	CODE	NAME	Capacity	Frequency	ASK (000)
LHR	LONDON/HEATHROW	UK0061	BWI	BALTIMORE/WASHINGTON	USA	AMERIN	BA	British Airways	90 799	363	529 742
LHR	LONDON/HEATHROW	UK0061	DEN	DENVER INTERNATIONAL	USA	AMERIN	BA	British Airways	97 587	363	731 544
LHR	LONDON/HEATHROW	UK0061	DTW	DETROIT/METROPOLITAN WAYNE COUNTY	USA	AMERIN	BA	British Airways	90 242	362	545 368
LHR	LONDON/HEATHROW	UK0061	EWR	NEWARK LIBERTY INTERNATIONAL	USA	AMERIN	BA	British Airways	272 474	1 040	1 515 147
LHR	LONDON/HEATHROW	UK0061	EWR	NEWARK LIBERTY INTERNATIONAL	USA	AMERIN	VS	Virgin Atlantic Airways	243 609	726	1 354 637
LHR	LONDON/HEATHROW	UK0061	IAD	WASHINGTON/DULLES INTERNATIONAL	USA	AMERIN	BA	British Airways	289 258	915	1 707 146
LHR	LONDON/HEATHROW	UK0061	IAD	WASHINGTON/DULLES INTERNATIONAL	USA	AMERIN	UA	United Airlines	388 072	1 304	2 290 327
LHR	LONDON/HEATHROW	UK0061	IAD	WASHINGTON/DULLES INTERNATIONAL	USA	AMERIN	VS	Virgin Atlantic Airways	109 044	364	643 557
LHR	LONDON/HEATHROW	UK0061	JFK	NEW YORK/JOHN F. KENNEDY INTERNATIONAL	USA	AMERIN	AI	Air India	153 425	363	850 188
LHR	LONDON/HEATHROW	UK0061	JFK	NEW YORK/JOHN F. KENNEDY INTERNATIONAL	USA	AMERIN	AA	American Airlines	508 542	2 082	2 818 032
LHR	LONDON/HEATHROW	UK0061	JFK	NEW YORK/JOHN F. KENNEDY INTERNATIONAL	USA	AMERIN	BA	British Airways	920 215	2 527	5 099 275
LHR	LONDON/HEATHROW	UK0061	JFK	NEW YORK/JOHN F. KENNEDY INTERNATIONAL	USA	AMERIN	KU	Kuwait Airways	43 684	156	242 070
LHR	LONDON/HEATHROW	UK0061	JFK	NEW YORK/JOHN F. KENNEDY INTERNATIONAL	USA	AMERIN	UA	United Airlines	102 148	301	566 042
LHR	LONDON/HEATHROW	UK0061	JFK	NEW YORK/JOHN F. KENNEDY INTERNATIONAL	USA	AMERIN	VS	Virgin Atlantic Airways	452 526	1 273	2 507 625
LHR	LONDON/HEATHROW	UK0061	LAX	LOS ANGELES INTERNATIONAL	USA	AMERIN	NZ	Air New Zealand	138 305	365	1 211 468
LHR	LONDON/HEATHROW	UK0061	LAX	LOS ANGELES INTERNATIONAL	USA	AMERIN	AA	American Airlines	139 861	572	1 225 097
LHR	LONDON/HEATHROW	UK0061	LAX	LOS ANGELES INTERNATIONAL	USA	AMERIN	BA	British Airways	376 719	946	3 299 830
LHR	LONDON/HEATHROW	UK0061	LAX	LOS ANGELES INTERNATIONAL	USA	AMERIN	UA	United Airlines	159 157	507	1 394 119
LHR	LONDON/HEATHROW	UK0061	LAX	LOS ANGELES INTERNATIONAL	USA	AMERIN	VS	Virgin Atlantic Airways	251 196	728	2 200 325
LHR	LONDON/HEATHROW	UK0061	MIA	MIAMI INTERNATIONAL	USA	AMERIN	AA	American Airlines	108 375	444	770 216
LHR	LONDON/HEATHROW	UK0061	MIA	MIAMI INTERNATIONAL	USA	AMERIN	BA	British Airways	303 082	764	2 153 989
LHR	LONDON/HEATHROW	UK0061	MIA	MIAMI INTERNATIONAL	USA	AMERIN	VS	Virgin Atlantic Airways	123 565	365	878 170
LHR	LONDON/HEATHROW	UK0061	ORD	CHICAGO/O'HARE INTERNATIONAL	USA	AMERIN	AI	Air India	66 355	157	420 868
LHR	LONDON/HEATHROW	UK0061	ORD	CHICAGO/O'HARE INTERNATIONAL	USA	AMERIN	AA	American Airlines	406 328	1 663	2 577 207
LHR	LONDON/HEATHROW	UK0061	ORD	CHICAGO/O'HARE INTERNATIONAL	USA	AMERIN	BA	British Airways	320 865	1 091	2 035 143
LHR	LONDON/HEATHROW	UK0061	ORD	CHICAGO/O'HARE INTERNATIONAL	USA	AMERIN	UA	United Airlines	373 260	1 094	2 367 467
LHR	LONDON/HEATHROW	UK0061	PHL	PHILADELPHIA INTERNATIONAL	USA	AMERIN	BA	British Airways	189 500	728	1 078 145
LHR	LONDON/HEATHROW	UK0061	PHX	PHOENIX/SKY HARBOR INTERNATIONAL	USA	AMERIN	BA	British Airways	123 604	312	1 045 903
LHR	LONDON/HEATHROW	UK0061	SEA	SEATTLE/TACOMA	USA	AMERIN	BA	British Airways	172 533	456	1 328 620
LHR	LONDON/HEATHROW	UK0061	SFO	SAN FRANCISCO INTERNATIONAL	USA	AMERIN	BA	British Airways	287 385	725	2 476 165
LHR	LONDON/HEATHROW	UK0061	SFO	SAN FRANCISCO INTERNATIONAL	USA	AMERIN	UA	United Airlines	248 839	730	2 144 045
LHR	LONDON/HEATHROW	UK0061	SFO	SAN FRANCISCO INTERNATIONAL	USA	AMERIN	VS	Virgin Atlantic Airways	159 256	364	1 372 180
LHR	LONDON/HEATHROW	UK0061	TAS	TASHKENT/VOSTOCHNY	UZBEKISTAN	ASIACE	HY	Uzbekistan Airlines	38 917	190	204 696
LHR	LONDON/HEATHROW	UK0061	ADE	ADEN	YEMEN	ASIAWE	IY	Yemenia	3 952	13	23 355
LHR	LONDON/HEATHROW	UK0061	SAH	SANA'A	YEMEN	ASIAWE	IY	Yemenia	21 844	76	122 698
LHR	LONDON/HEATHROW	UK0061	BEG	BELGRAD/BEOGRAD	YU0002	EUROPS	BA	British Airways	42 276	310	71 967
LHR	LONDON/HEATHROW	UK0061	BEG	BELGRAD/BEOGRAD	YU0002	EUROPS	JU	JAT Airways	55 949	363	95 243
LHR	LONDON/HEATHROW	UK0061	TIV	TIVAT	YU0012	EUROPS	JU	JAT Airways	3 120	20	5 502
LHR	LONDON/HEATHROW	UK0061	LUN	LUSAKA	ZAMBIA	AFRICE	BA	British Airways	38 857	156	308 415
LHR	LONDON/HEATHROW	UK0061	HRE	HARARE	ZIMBABWE	AFRICE	BA	British Airways	41 938	156	348 187
	Total								48 480 401	237 102	190 575 166

NB:

ABBR … abbreviation (IATA airport code)
Capacity … number of seats available on departing flights (only scheduled flights)
Frequency … number of departing flights (only scheduled flights)
ASK (000) … number of available seat kilometers (multiplied by 1000, only scheduled flights)

AFRICE … Eastern Africa
AFRICN … Northern Africa
AFRICS … Southern Africa
AFRICW … Western Africa
AMERIL … Latin America
AMERIN … Northern America
ASIACE … Central Asia
ASIAEA … Eastern Asia
ASIASE … Southeastern Asia
ASIASO … Southern Asia
ASIAWE … Western Asia
AUSTRA … Australia, New Zealand and Polynesia
EUROPE … Eastern Europe
EUROPN … Northern Europe
EUROPS … Southern Europe
EUROPW … Western Europe

Appendix 18: Frankfurt airport – access time by public transport (15 March 2007)

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER			
		1	2	3	4	1	2	3	Σ
AACHEN HBF	92	R							0
AALEN	151	R	R			STUTTGART HBF			1
AARAU	231	R	R			OLTEN			1
AARSCHOT	243	R	R			LIEGE-GUILLEMINS			1
AHAUS	248	R	R	R		COLOGNE HBF	DORTMUND HBF		2
AHRWEILER	146	R	R			BONN HBF			1
AICHACH	206	R	R	R		MANNHEIM HBF	AUGSBURG HBF		2
ALTENBURG	287	R	R			LEIPZIG HBF			1
ALTENKIRCHEN	123	R	R	R		SIEGBURG/BONN	AU (SIEG)		2
AMBERG	207	R	R			PLATTLING			1
AMPSIN	156	R	R			LIEGE-GUILLEMINS			1
AMSTERDAM CENTRAAL	220	R							0
ANDENNE	204	R	R	R		COLOGNE HBF	LIEGE-GUILLEMINS		2
ANDERNACH	87	R	R			KOBLENZ HBF			1
ANNABERG BUCHHOLZ	414	R	R	B		WEIMAR	CHEMNITZ HBF		2
ANSBACH	160	R	R			WUERZBURG HBF			1
ANTWERPEN-CENTRAAL	239	R	R			BRUSSELS NORD			1
APOLDA	200	R	R			WEIMAR			1
ARLON	244	R	R	R		KOBLENZ HBF	LUXEMBOURG		2
ARNHEM	158	R							0
ARNSBERG	164	R	R			HAGEN HBF			1
ARNSTADT HBF	174	R	R			ERFURT HBF			1
ARRAS	312	R	R	R		BRUSSELS MIDI	LILLE EUROPE		2
ARTERN	227	R	R			ERFURT HBF			1
ASCHAFFENBURG HBF	47	R							0
ATTENDORN	197	R	R	R		HAGEN HBF	FINNENTROP		2
AUGSBURG HBF	176	R							0
BACKNANG	105	R	R			STUTTGART HBF			1
BAD BERLEBURG	208	R	R	B		FRANKFURT/MAIN HBF	SIEGEN		2
BAD DUERKHEIM	93	R	R			MANNHEIM HBF			1
BAD HARZBURG	231	R	R	R		GOETTINGEN	KREIENSEN		2
BAD HERSFELD	86	R							0
BAD HOMBURG	48	S	S			FRANKFURT/MAIN HBF			1
BAD HONNEF	109	R	R			SIEGBURG/BONN			1
BAD KISSINGEN	178	R	R			WUERZBURG HBF			1
BAD KREUZNACH	47	R							0
BAD LANGENSALZA	162	R	R			GOTHA			1
BAD LIEBENWERDA	311	R	R			LEIPZIG HBF			1
BAD NEUENAHR	144	R	R			BONN HBF			1
BAD NEUSTADT AN DER SAALE	176	R	R			WUERZBURG HBF			1
BAD SALZUNGEN	150	R	R			EISENACH			1
BADEN-BADEN	81	R							0
BALINGEN	156	R	R			STUTTGART HBF			1
BAMBERG	167	R	R			WUERZBURG HBF			1
BASEL BADISCHER BAHNHOF	163	R							0
BASEL SBB	173	R							0
BASTOGNE	331	R	R	R	R	LIEGE-GUILLEMINS	MARLOIE	LIBRAMONT	3
BAUNATAL	137	R	T			KASSEL-WILHELMSHOEHE			1
BAYREUTH	203	R	R			NUERNBERG HBF			1
BELFORT	253	R	R	R		MANNHEIM HBF	BASEL SBB		2
BELZIG	318	S	R	R		FRANKFURT/MAIN HBF	BERLIN HBF		2
BENSHEIM	48	B	R			DARMSTADT HBF			1
BERGHEIM	113	R	R			COLOGNE HBF			1
BERGISCH GLADBACH	98	R	S			COLOGNE HBF			1
BERLIN HBF	266	R	R			HANNOVER HBF			1
BERLIN OSTBAHNHOF	277	R	R			HANNOVER HBF			1
BERLIN SPANDAU	251	R	R			HANNOVER HBF			1
BERN	241	R							0
BEUTELSBACH	108	R	S			STUTTGART HBF			1
BIBERACH AN DER RISS	161	R	R			ULM HBF			1
BIELEFELD HBF	183	R	R			COLOGNE HBF			1
BIETIGHEIM-BISSINGEN	101	R	R			STUTTGART HBF			1
BILZEN	199	R	R			LIEGE-GUILLEMINS			1
BINGEN	48	R							0
BISCHWILLER	159	R	R	R	R	MANNHEIM HBF	KARLSRUHE HBF	STRASBOURG	3
BITBURG-EHRDORF	201	R	R			COLOGNE HBF			1
BITTERFELD	246	R							0
BOCHOLT	180	R	R	R		OBERHAUSEN HBF	WESEL		2
BOCHUM HBF	120	R							0
BOEBLINGEN	104	R	R			STUTTGART HBF			1
BONN HBF	70	R	T			SIEGBURG/BONN			1
BORNA	278	R	R			LEIPZIG HBF			1
BORNHEIM	91	R	T	T		SIEGBURG/BONN	BONN HBF		2
BRAKE	305	S	R	R		FRANKFURT/MAIN HBF	BREMEN HBF		2
BRAUNSCHWEIG	187	R	R			FRANKFURT/MAIN HBF			1
BREDA	245	R	R			ARNHEM			1
BREMEN HBF	241	R	R			HANNOVER HBF			1
BREYELL	156	R	R			DUESSELDORF HBF			1
BRILON	209	R	R	R		COLOGNE HBF	HAGEN HBFWeinheim (Bergstr)		2
BRUCHSAL	80	R	S			MANNHEIM HBF			1
BRUEHL	87	R	R			COLOGNE HBF			1
BRUGG	244	R	R			BASEL SBB			1
BRUSSELS MIDI	197	R							0
BRUSSELS NORTH	190	R							0
BUCHHOLZ	252	R	R			HAMBURG-HARBURG			1
BUXTEHUDE	256	R	R			HAMBURG-HARBURG			1
CALW	142	R	R	R		KARLSRUHE HBF	PFORZHEIM HBF		2
CAMBRAI	421	R	R	R	R	COLOGNE HBF	PARIS NORTH	DOUAI	3
CELLE	203	R	R			HANNOVER HBF			1

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER			
		1	2	3	4	1	2	3	∑
CHAM	278	R	R			NUERNBERG HBF			1
CHARLEROI	248	R	R			BRUSSELS MIDI			1
CHARLEVILLE-MEZIERES	340	R	R	R		MANNHEIM HBF	METZ VILLE		2
CHAUMONT	362	R	R	R		MANNHEIM HBF	BASEL SBB		2
CHEB	293	R	R			NUERNBERG HBF			1
CHEMNITZ	331	R	R			LEIPZIG HBF			1
CHUR	349	R	R			BASEL SBB			1
CLOPPENBURG	286	R	R	R		DORTMUND HBF	OSNABRUECK HBF		2
COBURG	233	R	R	R		WUERZBURG HBF	LICHTENFELS		2
COCHUM (MOSEL)	118	R							0
COLMAR	248	R	R			BASEL SBB			1
COLOGNE HBF	55	R							0
COSWIG	307	R	R			RIESA			1
COULOMMIERS	375	R	R	R		BRUSSELS MIDI	PARIS EAST		2
CRAILSHEIM	177	R	R			STUTTGART HBF			1
CREIL	329	R	R	R		BRUSSELS MIDI	PARIS NORTH		2
CREPY-EN-VALOIS	342	R	R	R		BRUSSELS MIDI	PARIS NORTH		2
DACHAU	227	R	S			MUNICH HBF			1
DARMSTADT HBF	28	B							0
DAUN	213	R	R	B		COLOGNE HBF	GEROLSTEIN		2
DEINZE	257	R	R			BRUSSELS MIDI			1
DELITZSCH	243	R	R			LEIPZIG			1
DENDERMONDE	242	R	R			BRUSSELS NORTH			1
DESSAU HBF	276	R	R			LEIPZIG HBF			1
DETMOLD	216	R	R	R		COLOGNE HBF	BIELEFELD HBF		2
DIEPHOLZ	217	R	R			DORTMUND HBF			1
DIEST-WEBBEKOM	231	R	R			LIEGE-GUILLEMINS			1
DILLENBURG	94	S	R	R		FRANKFURT/MAIN HBF	GIESSEN		2
DILLINGEN	167	R	R			MANNHEIM HBF			1
DILLINGEN/SAAR	177	R	R			SAARBRUECKEN HBF			1
DINANT	277	R	R	R		LIEGE-GUILLEMINS	NAMUR		2
DINGOLFING	267	R	R			PLATTLING			1
DINSLAKEN	129	R	R			DUISBURG HBF			1
DIPPOLDISWALDE	330	R	B			DRESDEN HBF			1
DITZINGEN	102	R	S			STUTTGART HBF			1
DONAUWOERTH	207	R	R			WUERZBURG HBF			1
DORDRECHT	256	R	R	R		UTRECHT CENTRAAL	ROTTERDAM CENTRAAL		2
DORSTEN	156	R	R			ESSEN HBF			1
DORTMUND HBF	132	R							0
DRESDEN HBF	290	R							0
DRESDEN NEUSTADT	284	R							0
DUELMEN	169	R	R			DUISBUEG HBF			1
DUEREN	91	R	R			COLOGNE HBF			1
DUESSELDORF HBF	84	R							0
DUISBURG HBF	97	R							0
EBERBACH	79	R	R			MANNHEIM HBF			1
EBERSBERG	273	R	R			MUNICH HBF			1
EHINGEN	175	R	R			ULM HBF			1
EICHSTAETT	237	R	R			NUERNBERG HBF			1
EINDHOVEN	215	R	R	R		COLOGNE HBF	VENLO		2
EISENACH	114	R							0
EISENBERG	245	R	R	B		WEIMAR	HERMSDORF-KLOSTERLAUSNITZ		2
EISLEBEN	271	R	R			HALLE HBF			1
ELLWANGEN	170	R	R	R		STUTTGART HBF	AALEN		2
EMMEN	300	R	R	R		ARNHEM	ZWOLLE		2
EMMENDINGEN	139	R	R	R		MANNEHIM HBF	OFFENBURG		2
ENSCHEDE	251	R	R	R		COLOGNE HBF	MUENSTER HBF		2
EPERNAY	346	R	R	R	R	MANNHEIM HBF	KARLSRUHE HBF	NANCY VILLE	3
EPINAL	304	R	R	R	R	MANNHEIM HBF	KARLSRUHE HBF	NANCY VILLE	3
ERBACH	92	R	R			DARMSTADT HBF			1
ERFTSTADT	92	R	R			COLOGNE HBF			1
ERFURT HBF	145	R							0
ERKELENZ	155	R	R			DUESSELDORF HBF			1
ERKRATH	102	R	S			DUESSELDORF HBF			1
ERLANGEN	174	R	R			NUERNBERG HBF			1
ESCHWEGE	184	R	R			GOETTINGEN			1
ESCHWEILER	105	R	R			COLOGNE HBF			1
ESSEN HBF	109	R							0
ESSLINGEN	100	R	R			STUTTGART HBF			1
ETTLINGEN STADT	87	R	S			KARLSRUHE HBF			1
EUSKIRCHEN	107	R	R			COLOGNE HBF			1
FORBACH	148	R	R			MANNHEIM HBF			1
FORCHHEIM	183	R	R			NUERNBERG HBF			1
FRANKFURT/MAIN HBF	11	R							0
FRANKFURT/MAIN SOUTH	9	R							0
FRAUENFELD	292	R	R	R		BASEL SBB	ZURICH		2
FREIBERG	338	R	R			DRESDEN HBF			1
FREIBURG IM BREISGAU HBF	126	R							0
FREISING	251	R	R			MUNICH HBF			1
FREUDENSTADT	163	R	R	R		MANNHEIM HBF	KARLSRUHE HBF		2
FRIBOURG	270	R	R			BERN			1
FRIEDBERG	42	S	R			FRANKFURT/MAIN HBF			1
FRIEDRICHSDORF	43	S	S			FRANKFURT/MAIN HBF			1
FRIEDRICHSHAFEN	210	R	R			ULM HBF			1
FUERTH	156	R	R			NUERNBERG HBF			1
FULDA	62	R							0
GAGGENAU	116	R	S			KARLSRUHE HBF			1
GARMISCH-PARTENKIRCHEN	303	R	R			MUNICH PASING			1
GEISLINGEN AN DER STEIGE	131	R	R			STUTTGART HBF			1
GEITHAIN	288	R	R			LEIPZIG HBF			1
GELDERMALSEN	215	R	R			UTRECHT CENTRAAL			1
GELDERN	155	R	R			DUESSELDORF HBF			1

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER			
		1	2	3	4	1	2	3	∑
GENK	242	R	R	R		LIEGE-GUILLEMINS	HASSELT		2
GENTHIN	292	R	R	R		HANNOVER HBF	MAGDEBURG HBF		2
GENT-ST-PIETERS	229	R	R			BRUSSELS MIDI			1
GERA HBF	225	R	R			WEIMAR			1
GERMERSHEIM	74	R	S			MANNHEIM HBF			1
GEVELSBERG HBF	136	R	S			WUPPERTAL HBF			1
GIESSEN	61	R	R			FRANKFURT/MAIN HBF			1
GIFHORN	225	R	R			HANNOVER			1
GLADBECK WEST	161	R	R	R		COLOGNE HBF	ESSEN HBF		2
GLINDE	292	R	S	B		HAMBURG HBF	HAMBURG BERGEDORF		2
GOCH	174	R	R			DUESSELDORF HBF			1
GOEPPINGEN	118	R	R			STUTTGART HBF			1
GOETTINGEN	119	R							0
GORINCHEN	257	R	R	R		UTRECHT CENTRAAL	GELDERMALSEN		2
GOTHA	135	R							0
GREIZ	267	R	R	R		WEIMAR	GERA HBF		2
GREVENBROICH	104	R	R			COLOGNE HBF			1
GRIMMA	276	R	R			LEIPZIG HBF			1
GROSSENHAIN	312	R	R	R		RIESA	PRIESTEWITZ		2
GUENZBURG	156	R	R			ULM HBF			1
GUETERSLOH HBF	174	R	R			COLOGNE HBF			1
GUMMERSBACH	146	R	R			COLOGNE HBF			1
HAAN	98	R	R			COLOGNE HBF			1
HAGEN HBF	110	R	R			COLOGNE HBF			1
HAGENOW	314	R	R	R		HAMBURG HBF	LUDWIGSLUST		2
HAGONDANGE	307	R	R	R		MANNHEIM HBF	METZ VILLE		2
HAGUENAU	167	R	R	R	R	MANNHEIM HBF	KARLSRUHE HBF	STRASBOURG	3
HALBERSTADT	315	R	R	R		HANNOVER HBF	MAGDEBURG HBF		2
HALLE HBF	220	R							0
HAMBURG ALTONA	248	R							0
HAMBURG DAMMTOR	239	R							0
HAMBURG HBF	233	R							0
HAMELN	208	R	R			HANNOVER HBF			1
HAMM HBF	150	R	R			COLOGNE HBF			1
HANNOVER HBF	155	R							0
HASSELT	212	R	R			LIEGE-GUILLEMINS			1
HASSFURT	141	R	R			WUERZBURG HBF			1
HATTINGEN	143	R	S			ESSEN HBF			1
HEERLEN	138	R	R			AACHEN HBF			1
HEIDELBERG HBF	50	R	S			MANNHEIM HBF			1
HEIDENHEIM	183	R	R			ULM HBF			1
HEILBRONN HBF	117	R	R			MANNHEIM HBF			1
HEILIGENSTADT	167	R	R			GOETTINGEN			1
HELMOND	204	R	R	R		COLOGNE HBF	VENLO		2
HELMSTEDT	229	R	R			HANNOVER HBF			1
HERBORN	104	R	R			FRANKFURT/MAIN HBF			1
HERDECKE	155	R	R			HAGEN HBF			1
HERENTALS	268	R	R			BRUSSELS NORTH			1
HERRENBERG	114	R	R			STUTTGART HBF			1
HILDEN	112	R	R			DUESSELDORF HBF			1
HILDENBURGHAUSEN	225	R	R			EISENACH			1
HILDESHEIM HBF	161	R	R			FRANKFURT/MAIN HBF			1
HIRSON	387	R	R	R	R	MANNHEIM HBF	METZ VILLE	CHARLEVILLE-MEZIERES	3
HOF HBF	244	R	R			NUERNBERG HBF			1
HOHENMOELSEN	303	R	R	B		NAUMBURG HBF	WEISSENFELS		2
HOLZMINDEN	210	R	R	R		GOETTINGEN	KREIENSEN		2
HOMBERG	137	R	R	B		FRANKFURT/MAIN HBF	KIRCHHAIN BAHNHOF		2
HOMBURG HBF	109	R	R			MANNHEIM HBF			1
HORB AM NECKAR	139	R	R			STUTTGART HBF			1
HUERTH-KAHLSCHEUREN	83	R	R			COLOGNE HBF			1
HUY	200	R	R			LIEGE-GUILLEMINS			1
IDAR-OBERSTEIN	86	R							0
ILMENAU	208	R	R			ERFURT HBF			1
INGELHEIM	32	R							0
INGOLSTADT	174	R							0
INNSBRUCK HBF	344	R	R			MUNICH HBF			1
INTERLAKEN	308	R							0
JENA WEST	190	R	R			WEIMAR			1
JESSEN	303	R	R			WITTENBERG			1
JUECHEN	110	R	R			COLOGNE HBF			1
JUELICH	117	R	R	R		COLOGNE HBF	DUEREN		2
JUETERBOG	315	S	R	R		FRANKFURT/MAIN HBF	BERLIN HBF		2
KAISERSLAUTERN HBF	87	R	R			MANNHEIM HBF			1
KARLOVY VARY	392	R	R	R	R	NUERNBERG HBF	MARKTREDWITZ	CHEB	3
KARLSRUHE HBF	65	R							0
KARLSTADT	108	R	R			WUERZBURG HBF			1
KASSEL-WILHELMSHOEHE	97	R							0
KEHL	115	R	R	R		MANNHEIM HBF	KARLSRUHE HBF		2
KELHEIM-SAAL	253	R	R			REGENSBURG HBF			1
KEVELAER	162	R	R			DUESSELDORF HBF			1
KIRCHHEIM	115	R	R			STUTTGART HBF			1
KLEVE	189	R	R			DUESSELDORF HBF			1
KLINGENTHAL	331	R	R	R		WEIMAR	ZWICKAU HBF		2
KOBLENZ HBF	72	R							0
KOENIGSWINTER	114	R	R			SIEGBURG/BONN			1
KOETHEN	288	R	R			HANNOVER HBF			1
KORBACH	194	R	R			KASSEL-WILHELMSHOEHE			1
KORTRIJK	269	R	R			BRUSSELS MIDI			1
KREFELD HBF	120	R	R			COLOGNE HBF			1
KREUZTAL	134	R	R	R		FRANKFURT/MAIN HBF	SIEGEN		2
KUFSTEIN	296	R	R			MUNICH HBF			1
KULMBACH	234	R	R			WUERZBURG HBF			1

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER			
		1	2	3	4	1	2	3	∑
LA CHAUX DE FONDS	303	R	R	R		BASEL SBB	LA-CHAUX-DE-FONDS		2
LAATZEN	158	R	B			HANNOVER MESSE/LAATZEN			1
LAHR	111	R	R	R		MANNHEIM HBF	OFFENBURG		2
LANDAU (PFALZ) HBF	88	R	R	R		MANNHEIM HBF	NEUSTADT (WEINSTRASSE) HBF		2
LANDSBERG AM LECH	256	R	R	R		MUNICH PASING	KAUFERING		2
LANDSHUT	264	R	R			REGENSBURG HBF			1
LANGENFELD	96	R	R			COLOGNE HBF			1
LANGENHAUSEN-MITTE	184	R	S			HANNOVER HBF			1
LAON	399	R	R	R		BRUSSELS MIDI	PARIS NORTH		2
LAUF	171	R	R			NUERNBERG HBF			1
LAUTERBACH NORD	97	R	R			FULDA			1
LEBACH	165	R	R			SANKT-WENDEL			1
LEHRTE	191	R	R			HANNOVER HBF			1
LEICHLINGEN	92	R	R			SOLINGEN HBF			1
LEIPZIG HBF	221	R							0
LELYSTAD	269	R	R			AMSTERDAM CENTRAAL			1
LENZBURG	249	R	R			BASEL SBB			1
LEONBERG	109	R	S			STUTTGART HBF			1
LEUVEN	214	R	R			BRUSSELS NORTH			1
LEVERKUSEN MITTE	87	R	R			COLOGNE HBF			1
LICHTENFELS	204	R	R			WUERZBURG HBF			1
LIEGE-GUILLEMINS	144	R							0
LIER	253	R	R			BRUSSELS NORTH			1
LIESTAL	202	R	R			BASEL SBB			1
LILLE	259	R	R			BRUSSELS MIDI			1
LIMBURG SUED	17	R							0
LOBENSTEIN	293	R	R	R	R	EISENACH	NEUDIETENDORF	SAALFELD	3
LOERRACH	183	R	R			BASEL BAD BF			1
LOKEREN	272	R	R			BRUSSELS NORTH			1
LUCKAU	359	R	R	R	B	FRANKFURT/MAIN HBF	BERLIN OSTBAHNHOF	LUEBBEN	3
LUCKENWALDE	307	S	R	R		FRANKFURT/MAIN HBF	BERLIN HBF		2
LUDWIGSBURG	93	R	R			STUTTGART HBF			1
LUDWIGSFELDE	289	R	R	R		HANNOVER HBF	BERLIN HBF		2
LUDWIGSHAFEN (RHEIN) HBF	42	R	S			MANNHEIM HBF			1
LUDWIGSLUST	289	R	R			HAMBURG HBF			1
LUEDENSCHEID	166	R	R	R		COLOGNE HBF	HAGEN HBF		2
LUENEBURG	208	R							0
LUNEVILLE	241	R	R	R	R	MANNHEIM HBF	OFFENBURG	STRASBOURG	3
LURE	276	R	R	R		MANNHEIM HBF	BASEL SBB		2
LUXEMBOURG	221	R	R			KOBLENZ HBF			1
LUZERN	259	R	R			OLTEN			1
MAASTRICHT	165	R	R	R		AACHEN HBF	HERLEN		2
MAGDEBURG	256	R	R			HANNOVER HBF			1
MAINZ HBF	17	R							0
MANNHEIM HBF	30	R							0
MARBURG	77	R	R			FRANKFURT/MAIN HBF			1
MARCHE-EN-FAMENNE	222	R	R			LIEGE-GUILLEMINS			1
MARSBERG	196	R	R	R		KASSEL-WILHELMSHOEHE	WARBURG		2
MAYEN OST	123	R	R	R		KOBLENZ HBF	ANDERNACH		2
MEAUX	348	R	R	R		COLOGNE HBF	PARIS EAST		2
MECHELEN	218	R	R			BRUSSELS NORTH			1
MECHERNICH	119	R	R			COLOGNE HBF			1
MEININGEN	182	R	R			EISENACH			1
MEISSEN	342	R	R			DRESDEN-NEUSTADT			1
MEMMINGEN	204	R	R			ULM HBF			1
MEPPEL	260	R	R	R		ARNHEM	ZWOLLE		2
MEPPEN	235	R	R			COLOGNE HBF			1
MERSEBURG	224	R	R			NAUMBURG HBF			1
MERZIG	176	R	R			MANNHEIM HBF			1
MESCHEDE	185	R	R			HAGEN HBF			1
METZ VILLE	190	R	R			MANNHEIM HBF			1
MILTENBERG	95	R	R			ASCHAFFENBURG HBF			1
MINDELHEIM	245	R	R	R		AUGSBURG HBF	MANNHEIM HBF		2
MOENCHENGLADBACH HBF	130	R	R			COLOGNE HBF			1
MOL	305	R	R	R		LIEGE-GUILLEMINS	HASSELT		2
MOLSHEIM	215	R	R	R		KARLSRUHE HBF	STRASBOURG		2
MONTABUR	28	R							0
MOSBACH-NECKAREIZ	93	R	R			MANNHEIM HBF			1
MOST	432	R	R	R		DRESDEN HBF	USTI NAD LABEM		2
MOUSCRON	280	R	R			BRUSSELS MIDI			1
MUEHLACKER	101	R	R			KARLSRUHE HBF			1
MUEHLHAUSEN	177	R	R			GOTHA			1
MUENDEN	171	R	R			KASSEL-WILHELMSHOEHE			1
MUENSTER (WESTF) HBF	165	R	R			COLOGNE HBF			1
MULHOUSE	226	R	R			BASEL SBB			1
MUNICH HBF	208	R							0
MUNICH PASING	207	R							0
NAGOLD	169	R	R	R		KARLSRUHE HBF	PFORZHEIM HBF		2
NAMUR	217	R	R			LIEGE-GUILLEMINS			1
NANCY-VILLE	210	R	R	R		MANNHEIM HBF	KARLSRUHE HBF		2
NAUMBURG HBF	182	R							0
NEBRA	233	R	R			NAUMBURG HBF			1
NECKARSULM	112	R	R			MANNHEIM HBF			1
NETPHEN	174	R	R	R		SIEGBURG/BONN	SIEGEN		2
NEUCHATEL	277	R	R			OLTEN			1
NEUFCHATEAU-LONGLIER	342	R	R	R		SAARBUECKEN HBF	METZ-VILLE		2
NEUMARKT	171								0
NEUNKIRCHEN (SAAR) HBF	132	R							0
NEURUPPIN	343	S	R	R		FRANKFURT/MAIN HBF	BERLIN SPANDAU		2
NEUSS HBF	100	R	R			COLOGNE HBF			1
NEUSTADT (WEINSTRASSE) HBF	63	R	R			MANNHEIM HBF			1
NEUSTADT AN DER AISCH	143	R	R			WUERZBURG HBF			1

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER			
		1	2	3	4	1	2	3	∑
NEUWIED	93	R	R			KOBLENZ HBF			1
NIEDERKASSEL	76	R	S	B		SIEGBURG/BONN	SPICH		2
NIENBURG	212	R	R			HANNOVER HBF			1
NIJLEN	266	R	R	R		BRUSSELS NORTH	LIER		2
NORDHAUSEN	213	R	R	R		GOETTINGEN	NORTHEIM		2
NORTHEIM	139	R	R			GOETTINGEN			1
NUERNBURG HBF	143	R							0
NURTINGEN	120	R	R			STUTTGART HBF			1
OBERHAUSEN HBF	107	R							0
OBERNAI	230	R	R	R		KARLSRUHE HBF	STRASBOURG		2
OFFENBURG	93	R	R			MANNHEIM HBF			1
OLTEN	209	R							0
OSCHATZ	267	R	R			LEIPZIG HBF			1
OSNABRUECK HBF	192	R	R			COLOGNE HBF			1
OSS	199	R	R			ARNHEM			1
OTTIGNIES	235	R	R			BRUSSELS NORTH			1
OVERATH	103	R	R			COLOGNE HBF			1
PAPENBURG	262	R	R			COLOGNE HBF			1
PARIS NORTH	291	R	R			BRUSSELS MIDI			1
PEINE	194	R	R			HANNOVER HBF			1
PETERSHAGEN	274	R	R	B	F	COLOGNE HBF	MINDEN BAHNHOF	MINDEN ZOB	3
PFAEFFIKON SZ	285	R	R			BASEL SBB			1
PFARRKIRCHEN	359	R	R			PASSU HBF			1
PFORZHEIM	90	R	R			KARLSRUHE HBF			1
PLAUEN	288	R	R			NUERNBERG HBF			1
POESSNECK	237	R	R	R		WEIMAR	GOESCHWITZ		2
PONT-A-MOUSSON	229	R	R	R		MANNHEIM HBF	METZ-VILLE		2
PRITZWALK	401	S	R	R		FRANKFURT/MAIN HBF	BERLIN-SPANDAU		2
PULHEIM	85	R	R			COLOGNE HBF			1
PURMEREND	255	R	R			AMSTERDAM CENTRAAL			1
QUERFURT	297	R	R	R		HALLE HBF	ROEBLINGEN AM SEE		2
RADEBEUL-OST	304	R	R			DRESDEN-NEUSTADT			1
RASTATT	88	R	R			KARLSRUHE HBF			1
RATHENOW	298	S	R	R		FRANKFURT/MAIN HBF	BERLIN SPANDAU		2
REGEN	286	R	R			NUERNBERG HBF			1
REGENSBURG	207	R							0
REIMS	410	R	R	R		MANNHEIM HBF	CHALONS-EN-CHAMPAGNE		2
REMSCHEID	115	R	R	R		COLOGNE HBF	SOLINGEN HBF		2
REUTLINGEN	114	R	R			STUTTGART HBF			1
RHEINBACH	107	R	T	R		SIEGBURG/BONN	BONN HBF		2
RHEINFELDEN	210	R	R			BASEL SBB			1
RIESA	225	R							0
ROERMOND	198	R	R	R		DUESSELDORF HBF	VENLO		2
ROMILLY-SUR-SEINE	530	R	R	R		BASEL SBB	MULHOUSE-VILLE TROYES		2
ROOSENDAAL	246	R	R			ARNHEM			1
ROSENHEIM	264	R	R			MUNICH HBF			1
ROSERATH	94	R	R			COLOGNE HBF			1
ROTENBURG	284	R	R			HAMBURG HBF			1
ROTH	166	R	R			NUERNBERG HBF			1
ROTTENBURG	139	R	R			STUTTGART HBF			1
ROTTERDAM CENTRAAL	238	R	R			UTRECHT CENTRAAL			1
ROTTWEIL	172	R	R			STUTTGART HBF			1
RUDOLSTADT	235	R	R	R		WEIMAR	GOESCHWITZ		2
RUESSELSHEIM	8	R							0
SAALFELD	209	R	R	R		EISENACH	NEUDIETENDORF		2
SAARBRUECKEN HBF	135	R	R			MANNHEIM HBF			1
SAARLOUIS	173	R	R			SAARBRUECKEN HBF			1
SAINT DIZIER	425	R	R	R		MANNHEIM HBF	CHALONS-EN-CHAMPAGNE		2
SALZBURG HBF	327	R	R			MUNICH HBF			1
SALZGITTER BAD	212	S	R	R		FRANKFURT/MAIN HBF	BRAUNSCHWEIG HBF		2
SANGERSHAUSEN	254	R	R	R		FRANKFURT/MAIN HBF	ERFURT HBF		2
SANKT-WENDEL	120	R							0
SARNEN	308	R	R	S		BASEL SBB	LUZERN		2
SARREBOURG	186	R	R	R	R	MANNHEIM HBF	OFFENBURG	STRASBOURG	3
SAVERNE	168	R	R	R	R	MANNHEIM HBF	OFFENBURG	STRASBOURG	3
SCHLEIZ	279	R	R	R		WEILMAR	STADTRODA		2
SCHMALKALDEN	180	R	R	R		EISENACH	WERNSHAUSEN		2
SCHORNDORF	110	R	R			STUTTGART HBF			1
SCHWABACH	159	R	R			NUERNBERG HBF			1
SCHWAEBISCH-GMUEND	130	R	R			STUTTGART HBF			1
SCHWANDORF	225	R	R			NUERNBERG HBF			1
SCHWEINFURT HBF	125	R	R			WUERZBURG HBF			1
SCHWYZ	307	R	R			BASEL SBB			1
SEESEN	199	R	R	R		GOETTINGEN	KREIENSEN		2
SELB	295	R	R	R		NUERNBERG HBF	HOF HBF		2
SELESTAT	174	R	R	R	R	MANNHEIM HBF	KARLSRUHE HBF	STRASBOURG	3
SIEGBURG/BONN	38	R							0
SIEGEN	118	S	R	R		FRANKFURT/MAIN HBF	GIESSEN		2
SIGMARINGEN	185	R	R			STUTTGART HBF			1
SINDELFINGEN	119	R	S	B		STUTTGART HBF	GOLDBERG		2
SOEMMERDA	198	R	R			ERFURT HBF			1
SOLINGEN HBF	78	R							0
SONDERSHAUSEN	239	R	R			ERFURT HBF			1
SONNEBERG HBF	255	R	R	R		WUERZBURG HBF	BAMBERG		2
SONTHOFEN	297	R	R			AUGSBURG HBF			1
SPEYER HBF	61	R	S			MANNHEIM HBF			1
SPICH	57	R	S			SIEGBURG/BONN			1
ST AVOLD	163	R	R			MANNHEIM HBF			1
ST GALLEN	287	R	R	R		COLOGNE HBF	LINDAU HBF		2
STADTALLENDORF	95	R	R			FRANKFURT/MAIN HBF			1
STADTRODA	204	R	R			WEIMAR			1
STANS	308	R	R	R		OLTEN	LUZERN		2

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER			
		1	2	3	4	1	2	3	∑
STARNBERG	250	R	R			MUNICH HBF			1
STASSFURT	302	R	R			ERFURT HBF			1
STENDAL	288	R	R	R		FRANKFURT/MAIN HBF	HANNOVER HBF		2
STRASBOURG	125	R	R	R		MANNEHIM HBF	KARSLRUHE HBF		2
STRAUBING	231	R							0
STUTTGART HBF	74	R							0
SUHL	220	R	R			ERFURT HBF			1
SULZBACH	157	R	R			NEUNKIRCHEN (SAAR) HBF			1
TAUBERBISCHOFSHEIM	153	R	B			WUERZBURG HBF			1
TERGNIER	408	R	R	R		BRUSSELS MIDI	PARIS NORTH		2
TGV HAUTE PICARDIE	318	R	R	R		BRUSSELS MIDI	LILLE EUROPE		2
THIONVILLE	217	R	R	R		MANNHEIM HBF	METZ VILLE		2
THUN	272	R							0
TIENEN	228	R	R			BRUSSELS NORTH			1
TONGEREN	188	R	R			LIEGE-GUILLEMINS			1
TORGAU	278	R	R			LEIPZIG HBF			1
TOUL	251	R	R	R	R	MANNHEIM HBF	KARLSRUHE HBF	NANCY	3
TOURHAI	263	R	R			BRUSSELS MIDI			1
TRAUNSTEIN	300	R	R			MUNICH HBF			1
TRIER HBF	171	R	R			KOBLENZ HBF			1
TROISDORF	53	R	S			SIEGBURG/BONN			1
TUBIZE	225	R	R			BRUSSELS MIDI			1
TUEBINGEN	124	R	R			STUTTGART HBF			1
TURNHOUT	283	R	R			BRUSSELS NORTH			1
TUTTLINGEN	197	R	R			STUTTGART HBF			1
UELZEN	235	R	R			HANNOVER HBF			1
ULM HBF	132	R							0
UTRECHT CENTRAAL	191	R							0
VAIHINGEN	109	R	R			STUTTGART HBF			1
VALENCIENNES	341	R	R	R		BRUSSELS MIDI	LILLE EUROPE		2
VELBERT	153	R	B			WUPPERTAL HBF			1
VENLO	164	R	R			DUESSELDORF HBF			1
VERDUN	317	R	R	R		MANNHEIM HBF	METZ VILLE		2
VERVIERS	138	R	R			AACHEN HBF			1
VESOUL	315	R	R	R		BASEL SBB	MULHOUSE-VILLE		2
VIERSEN	139	R	R			DUISBURG HBF			1
VILLINGEN-SCHWENNINGEN	186	R	R			OFFENBURG			1
VOELKLINGEN	165	R	R			SAARBRUECKEN HBF			1
VOERDE (NIEDERRHEIN)	134	R	R			DUISBURG HBF			1
WAIBLINGEN	90	R	R			STUTTGART HBF			1
WARBURG	170	R	R			KASSEL-WILHELSMSHOEHE			1
WAREMME	214	R	R			LIEGE-GUILLEMINS			1
WEDEL	287	R	S			HAMBURG-ALTONA			1
WEERT	207	R	R	R		AACHEN HBF	HEERLEN		2
WEIL	176	R	R			BASEL BAD BF			1
WEILHEIM	256	R	R			MUNICH PASING			1
WEIMAR	159	R							0
WEINHEIM (BERGSTR)	59	B	R			DARMSTADT HBF			1
WEISSENBURG	188	R	R			NUERNBERG HBF			1
WEISSENFELS	201	R	R			WEIMAR			1
WERDAU	282	R	R			WEIMAR			1
WERNIGERODE	278	R	R	R	R	FRANKFURT/MAIN HBF	BRAUNSCHWEG HBF	VIENENBURG	3
WESEL	143	R	R			DUISBURG HBF			1
WESSELING	95	R	T	R		SIEGBURG/BONN	BONN HBF		2
WETTEREN	257	R	R			BRUSSELS MIDI			1
WETZLAR	82	R	R			FRANKFURT/MAIN HBF			1
WIEHL RATHAUS	159	R	R	B		COLOGNE HBF	GUMMERSBACH		2
WIESBADEN HBF	33	R							0
WIESLOCH-WALLFORF	64	R	S			MANNHEIM HBF			1
WINSEN	236	R	R			LUENEBURG			1
WINTHERTHUR	265	R	R	S		BASEL BAD BF	SCHAFFHAUSEN		2
WITTEN HBF	142	R	R			ESSEN HBF			1
WITTENBERG	243	R							0
WITTENBERGE	308	R	R			HAMBURG HBF			1
WITTLICH	143	R	R			KOBLENZ HBF			1
WITTSTOCK	365	S	R	R		FRANKFURT/MAIN HBF	BERLIN-SPANDAU		2
WOERGL HBF	307	R	R			MUNICH HBF			1
WOLFSBURG	205	S	R			FRANKFURT/MAIN HBF			1
WORMS HBF	66	S	R			MAINZ ROEMISCHES THEATER			1
WUERZBURG HBF	88	R							0
WUNSIEDEL	279	R	R			NUERNBERG HBF			1
WUPPERTAL HBF	92	R	R			COLOGNE HBF			1
WURZEN	247	R	R			LEIPZIG HBF			1
ZEITZ	277	R	R	R		ERFURT BHF	WEISSENFELS		2
ZOFINGEN	224	R	R			OLTEN			1
ZOTTEGEN	235	R	R			BRUSSELS MIDI			1
ZUG	276	R	R	R		BASEL SBB	ZURICH		2
ZURICH HB	244	R	R			BASEL SBB			1
ZWEIBRUECKEN HBF	167	R	R	B		MANNEHIM HBF	HOMBURG HBF		2
ZWICKAU	290	R	R			WEIMAR			1
ZWOLLE	238	R	R			ARNHEM			1

NB:

DESTINATION	… destination (in most case the name of the train station)
TIME	… access time (in minutes)
MODE_TRANSPORT	… mode(s) of transport used for joining the final destination
B	… bus
M	… underground railway/metro
R	… railway
S	… suburban train
T	… tramway
TRANSFER	… station where the passenger has to change
∑	… total number of transfers

Appendix 19: Paris CDG airport – access time by public transport (15 March 2007)

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER				
		1	2	3	4	1	2	3	4	∑
AACHEN HBF	180	R	R			BRUSSELS MIDI				1
AARSCHOT	137	R	R			BRUSSELS MIDI				1
ABBEVILLE	118	R	B	R		TGV HAUTE PICARDIE	AMIENS			2
AGDE	269	R								0
AGEN	325	R								0
AIX-EN-PROVENCE	240	R	B			AIX-EN-PROVENCE TGV				1
AIX-EN-PROVENCE	200	R								0
AIX-LES-BAINS	214	R	R			LYON PART DIEU				1
ALBERTVILLE	271	R	R			LYON PART DIEU				1
ALES	282	R	B			NIMES				1
ALPHEN AN DER RIJN	249	R	R	R	R	BRUSSELS MIDI	THE HAGUE	LEIDEN CENTRAAL		3
ALTENKIRCHEN	352	R	R	R		BRUSSELS MIDI	COLOGNE HBF	AU		3
AMBOISE	133	R	R			ST-PIERRE-DES-CORPS				1
AMERSFOORT	257	R	R	R		BRUSSELS MIDI	ROTTERDAM CENTRAAL			2
AMIENS	72	R	B			TGV HAUTE PICARDIE				1
AMSTERDAM CENTRAAL	248	R	R			BRUSSELS MIDI				1
ANDERNACH	314	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
ANGERS ST LAUD	133	R								0
ANGOULEME	187	R								0
ANNECY	264	R	R			LYON PART DIEU				1
ANNEMASSE	275	R	R			LYON PART DIEU				1
ANNONAY GARE ROUTIERE	216	R	B			LYON PART DIEU				1
ANSE	143	R	R			LYON PART DIEU				1
ANTIBES	365	R								0
ANTWERPEN CENTRAAL	131	R	R			BRUSSELS MIDI				1
APELDOORN	325	R	R	R	R	BRUSSELS MIDI	ROTTERDAM CENTRAAL	AMERSFOORT		3
ARCACHON	300	S	M	R		PARIS CHATELET	PARIS MONTPARNASSE			2
ARGENTAN	174	S	S	R		PARIS CHATELET	PARIS MONTPARNASSE			2
ARLES	250	R	R			AVIGNON TGV				1
ARLON	229	R	R			BRUSSELS MIDI				1
ARNHEM	286	R	R	R		BRUSSELS MIDI	ROOSENDAAL			2
ARRAS	40	R								0
ASHOFRD/KENT	161	R	R			LILLE EUROPE				1
AUBAGNE	241	R	R			MARSEILLE-ST-CHARLES				1
AUBENAS	292	R	B			VALENCE TGV				1
AUBERGENVILLE	100	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
AULNOYE-AYMERIES	133	R	R			LILLE EUROPE				1
AURAY	258	R								0
AURILLAC	403	S	M	R	R	PARIS CHATELET	PARIS AUSTERLITZ	BRIVE-LA-GAILLARD		3
AUXERRE-ST-GERVAIS	160	S	S	R	R	PARIS CHATELET	PARIS LYON	LAROCHE-MIGENNES		3
AVIGNON CENTRE	212	R	B			AVIGNON TGV				1
AVIGNON TGV	182	R								0
BAD HONNEF	322	R	R	T		BRUSSELS MIDI	SIEGBURG/BONN			2
BAD KREUZNACH	390	R	R	R		PARIS EAST	SAARBRUECKEN HBF			2
BADEN-BADEN	352	S	R			PARIS EAST				1
BALLANCOURT-SUR-ESSONNE	96	S	S			PARIS NORTH				1
BAR-LE-DUC	173	S	R			PARIS EAST				1
BASEL SBB	358	S	R			PARIS EAST				1
BASTOGNE-SUD	261	R	R	R		BRUSSELS MIDI	LIBRAMONT			2
BAYEUX	186	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
BAYONNE	357	R	R			BORDEAUX-ST-JEAN				1
BEAUCAIRE	287	R	R			NIMES				1
BEAUNE	192	S	S	R		PARIS CHATELET	PARIS LYON	DIJON-VILLE		3
BEAUVAIS	112	S	R			PARIS NORTH				1
BELFORT	285	S	R			PARIS EAST				1
BERGERAC	334	R	R			LIBOURNE				1
BERN	376	R	R	R		LYON PART DIEU	GENEVA			2
BERNAY	144	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
BESANCON	165	R								0
BETHUNE	80	R	R			ARRAS				1
BEZIERS	283	R								0
BIEL	355	S	S	R	R	PARIS CHATELET	PARIS LYON	NEUCHATEL		3
BISCHWILLER	337	S	R	B		PARIS EAST	STRASBOURG			2
BITBURG	374	R	R	R	B	BRUSSELS MIDI	LUXEMBOURG	TRIER HBF		3
BLOIS	156	R	R			ST-PIERRE-DES-CORPS				1
BOBIGNY	58	S	M			PARIS NORTH				1
BOCHOLT	387	R	R	R	R	BRUSSELS MIDI	COLOGNE HBF	WESEL		3
BOCHUM HBF	311	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
BOLLENE	254	R	R			LYON PART DIEU				1
BONN HBF	254	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
BONNEVILLE	305	R	R			LYON PART DIEU				1
BORDEAUX	248	R								0
BOREHAMWOOD	276	R	R	M	R	LILLE EUROPE	LONDON WATERLOO INT.	LONDON BLACKFRIARS		3
BOUAYE	239	R	R			NANTES				1
BOULOGNE-SUR-MER	121	R	R			LILLE EUROPE				1
BOURG-EN-BRESSE	191	R	R			LYON PART DIEU				1
BOURGES	169	S	M	R		PARIS ST-MICHEL	PARIS AUSTERLITZ			2
BOURGOIGN-JALLIEU	160	R	R			LYON PART DIEU				1
BRAINE-LE-COMTE	103	R	R			BRUXELLES-MIDI				1
BREAUTE-BEUZEVILLE	171	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
BREDA	200	R	R	R		BRUSSELS MIDI	ROOSENDAAL			2
BRESSUIRE	249	S	M	R	R	PARIS CHATELET	PARIS MONTPARNASSE	SAMUR RIVE DROITE		3
BREST	303	S	M	R		PARIS CHATELET	PARIS MONTPARNASSE			2
BRIANCON	424	R	R			VALENCE TGV				1
BRIG	410	R	R	R		LYON PART DIEU	GENEVA			2
BRIVE-LA-GAILLARD	304	S	M	R		PARIS CHATELET	PARIS AUSTERLITZ			2
BRUGG	420	S	R	R	R	PARIS EAST	MULHOUSE VILLE	BASEL SBB		3
BRUGGE	132	R	R			BRUSSELS MIDI				1

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER				
		1	2	3	4	1	2	3	4	∑
BRUSSELS MIDI	73	R								0
BURGDORF	387	S	S	R	R	PARIS CHATELET	PARIS LYON	BERN		3
CAEN	165	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
CAHORS	373	S	M	R		PARIS CHATELET	PARIS AUSTERLITZ			2
CALAIS-FRETHUN	92	R	R			LILLE EUROPE				1
CANNES	351	R								0
CANTERBURY	249	R	R	R	R	LILLE EUROPE	ASHFORD/KENT	DOVER		3
CARCASSAONNE	349	R								0
CARMAUX	480	R	R			TOULOUSE-MATABIAU				1
CASTELNAUDARY	378	R	R			CARCASSONNE				1
CASTRES	478	S	M	R	R	PARIS CHATELET	PARIS MONTPARNASSE	TOULOUSE-MATABIAU		3
CAVAILLON	286	R	B	R		AVIGNON TGV	AVIGNON CENTRE			2
CERGY-PONTOISE	78	S	R			PARIS CHATELET				1
CHALLANS	283	R	R			NANTES				1
CHALONS-EN-CHAMPAGNE	135	S	R			PARIS EAST				1
CHALON-SUR-SAONE	177	R	R			DIJON-VILLE				1
CHAMBERY	213	R	R			LYON PART DIEU				1
CHAMPAGNOLE	261	S	S	R	R	PARIS CHATELET	PARIS LYON	DOLE-VILLE		3
CHANTILLY	66	S	R			PARIS NORTH				1
CHARLEROI-SUD	126	R	R			BRUSSELS MIDI				1
CHARLEVILLE-MEZIERS	208	S	R			PARIS EAST				1
CHARTRES	110	S	M	R		PARIS CHATELET	PARIS MONTPARNASSE			2
CHATEAUBRIANT	258	R	R			RENNES				1
CHATEAUDUN	150	S	S	R		PARIS ST-MICHEL	PARIS AUSTERLITZ			2
CHATEAUROUX	175	S	M	R		PARIS ST-MICHEL	PARIS AUSTERLITZ			2
CHATELLERAULT	175	R	R			POITIERS				1
CHAUMONT	187	S	R			PARIS EAST				1
CHAUNY	117	S	R			PARIS NORTH				1
CHERBOURG	232	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
CHOLET	186	R	R			ANGERS ST LAUD				1
CLERMONT-DE-L'OISE	78	S	R			PARIS NORTH				1
CLERMONT-FERRAND	250	S	S	R		PARIS CHATELET	PARIS LYON			2
CLISSON	219	R	R			NANTES				1
CLUSES	320	R	R			LYON PART DIEU				1
COBHAM	271	R	R	R		LILLE EUROPE	LONDON WATERLOO INT.			2
COCHEM	358	R	R	R	R	BRUSSELS MIDI	COLOGNE HBF	KOBLENZ HBF		3
COGNAC	232	R	R			ANGOULEME				1
COLMAR	343	S	R	R		PARIS EAST	MULHOUSE			2
COLOGNE HBF	227	R	R			BRUSSELS MIDI				1
COMPIEGNE	80	S	R			PARIS NORTH				1
CONCARNEAU	348	S	M	R	B	PARIS CHATELET	PARIS MONTPARNASSE	ROSPORDEN		3
CONFLANS SAINTE HONORINE	80	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
CORBEIL-ESSONNES	82	S	S			PARIS NORTH				1
COSNE-COURS-SUR-LOIRE	162	S	S	R		PARIS CHATELET	PARIS LYON			2
COULOMMIERS	113	S	R			PARIS EAST				1
CREIL	70	S	R			PARIS NORTH				1
CREPY-EN-VALOIS	63	S	R			AULNAY-SOUS-BOIS				1
CRETEIL	57	S	S			PARIS CHATELET				1
DAX	320	S	M	R		PARIS CHATELET	PARIS MONTPARNASSE			2
DEAL	229	R	R	R		LILLE EUROPE	ASHFORD/KENT			2
DEINZE	137	R	R			BRUSSELS MIDI				1
DELEMONT	400	S	R	R		PARIS EAST	BASEL SBB			2
DELFT	206	R	R	R		BRUSSELS MIDI	ROTTERDAM CENTRAAL			2
DENAIN	113	R	R			DOUAI				1
DENDERMONDE	111	R	R			BRUSSELS MIDI				1
DIEPPE	179	S	S	R	R	PARIS NORTH	PARIS ST LAZARE	ROUEN RIVE DROITE		3
DIEST-WEBBEKOM	162	R	R			BRUSSELS MIDI				1
DIFFERDANGE	312	R	R	R		BRUSSELS MIDI	LUXEMBOURG			2
DIGOIN	280	S	S	R	B	PARIS CHATELET	PARIS LYON	MOULINS-SUR-ALLIER		3
DIJON	115	R								0
DINANT	180	R	R			BRUSSELS MIDI				1
DOETINCHEM	337	R	R	R	R	BRUSSELS MIDI	ROTTERDAM CENTRAAL	UTRECHT CENTRAAL	ARNHEM	4
DOLE	141	R								0
DORDRECHT	185	R	R			BRUSSELS MIDI				1
DORTMUND HBF	337	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
DOUAI	56	R								0
DOVER	200	R	R	R		MARNE-LA-VALLEE CHESSY	ASHFORD/KENT			2
DRAGUIGNON	309	R								0
DREUX	115	S	S	R		PARIS CHATELET	PARIS MONTPARNASSE			2
DUEREN	225	R	R	R		BRUSSELS MIDI	AACHEN HBF			2
DUESSELDORF HBF	278	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
DUISBURG HBF	288	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
DUNKERQUE	118	R	R			LILLE EUROPE				1
ECHIROLLES	241	R	R	R		LYON PART DIEU	GRENOBLE			2
EDE	321	R	R	R	R	BRUSSELS MIDI	ROTTERDAM CENTRAAL	AMERSFOORT		3
EMMENDINGEN	378	S	R	R	R	PARIS EAST	STRASBOURG	OFFENBURG HBF		3
EMMERICH	378	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
EPERNAY	118	S	R			PARIS EAST				1
EPINAL	278	S	R	R		PARIS EAST	NANCY-VILLE			2
ESSEN HBF	315	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
ETAMPES	102	S								0
ETAPLES	141	R	R			ARRAS				1
EVREUX	113	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
FECAMP	191	S	S	R	R	PARIS NORTH	PARIS ST LAZARE	BREAUTE-BEUZEVILLE		3
FIRMINY	201	R	R			LYON PART DIEU				1
FLERS	199	S	S	R		PARIS CHATELET	PARIS MONTPARNASSE			2
FOIX	455	S	M	R	R	PARIS CHATELET	PARIS MONTPARNASSE	TOULOUSE-MATABIAU		3
FOLKESTONE	186	R	R	R		MARNE-LA-VALLEE CHESSY	ASHFORD/KENT			2
FORBACH	278	S	R			PARIS EAST				1
FOS-SUR-MER	282	R	R			MARSEILLE-ST-CHARLES				1

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER				
		1	2	3	4	1	2	3	4	∑
FREIBURG IM BREISGAU HBF	380	S	R	R		PARIS EAST	STRASBOURG	OFFENBURG		3
FREJUS	345	R	R			MARSEILLE-ST-CHARLES				1
GAILLON-AUBERVOYE	110	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
GAP	343	R	R			VALENCE TGV				1
GENEVA	249	R	R			LYON PART DIEU				1
GENT ST PIETERS	107	R	R			BRUSSELS MIDI				1
GIEN	137	S	S	R		PARIS CHATELET	PARIS LYON			2
GISORS	126	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
GIVORS VILLE	148	R	R			LYON PART DIEU				1
GLADBECK	348	R	R	R	R	BRUSSELS MIDI	COLOGNE HBF	ESSEN HBF		3
GORINCHEN	220	R	R	R		BRUSSELS MIDI	DORDRECHT			2
GOUSSAINVILLE	59	S	R			PARIS NORTH				1
GRANVILLE	249	S	S	R		PARIS CHATELET	PARIS MONTPARNASSE			2
GRASSE	399	R	R			CANNES				1
GRENOBLE	214	R								0
GUERET	269	S	M	R	B	PARIS CHATELET	PARIS AUSTERLITZ	LA SOUTERRAINE		3
GUINGAMP	250	S	M	R		PARIS CHATELET	PARIS MONTPARNASSE			2
GUMMERSBACH	336	R	R	R	B	BRUSSELS MIDI	COLOGNE HBF	DIERINGHAUSEN		3
HAGEN	301	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
HAGONDANGE	240	S	R	R		PARIS EAST	METZ VILLE			2
HAGUENAU	336	S	R	R		PARIS EAST	STRASBOURG			2
HAZEBROUCK	106	R	R			ARRAS				1
HELMOND	264	R	R	R		BRUSSELS MIDI	DORDRECHT			2
HHARLEM	248	R	R	R		BRUSSELS MIDI	THE HAGUE			2
HILDEN	300	R	R	R	S	BRUSSELS MIDI	AACHEN HBF	DUESSELDORF HBF		3
HILVERSUM	279	R	R	R		BRUSSELS MIDI	AMSTERDAM CENTRAAL			2
HIRSON	172	R	R			LILLE EUROPE				1
HOMBURG HBF	314	S	R			PARIS EAST				1
HOORN	302	R	R	R		BRUSSELS MIDI	AMSTERDAM CENTRAAL			2
HYERES	320	R	R			MARSEILLE-ST-CHARLES				1
IDAR-OBERSTEIN	354	S	R	R		PARIS EAST	METZ VILLE	SAARBRUECKEN HBF		3
INTERLAKEN	440	S	S	R	R	PARIS CHATELET	PARIS LYON	BERN		3
ISBERGUES	95	R	R			ARRAS				1
ISSODUN	176	S	M	R		PARIS ST-MICHEL	PARIS AUSTERLITZ			2
ISSOIRE	297	S	S	R	R	PARIS CHATELET	PARIS LYON	CLERMONT-FERRAND		3
ISTRES	295	R	R			MARSEILLE-ST-CHARLES				1
KAISERSLAUTERN HBF	330	S	R			PARIS EAST				1
KARLSRUHE HBF	358	S	R			PARIS EAST				1
KEHL	311	S	R			PARIS EAST				1
KEMPEN	332	R	R	R	R	BRUSSELS MIDI	AACHEN HBF	KREFELD HBF		3
KEVELAER	355	R	R	R	R	BRUSSELS MIDI	AACHEN HBF	KREFELD HBF		3
KINGSTON UPON THAMES	256	R	R	R		LILLE EUROPE	LONDON WATERLOO INT.			2
KLEVE	359	R	R	R	B	BRUSSELS MIDI	ROOSENDAAL	NIJMEGEN		3
KOBLENZ HBF	288	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
LA BROQUE	357	S	R	R		PARIS EAST	STRASBOURG			2
LA CIOTAT	257	R	R			MARSEILLE-ST-CHARLES				1
LA FERTE-BERNARD	152	R	R			LE MANS				1
LA GRAND-COMBE	279	R	B			NIMES				1
LA ROCHELLE	240	R	R			POITIERS				1
LA ROCHE-SUR-YON	259	R	R			NANTES				1
LA TOUR DU PIN	175	R	R			LYON PART DIEU				1
LA VERPILLIERE	156	R	R			LYON PART DIEU				1
LAHR	360	S	R	R		PARIS EAST	STRASBOURG			2
L'AIGLE	145	S	S	R		PARIS CHATELET	PARIS MONTPARNASSE			2
LANDAU HBF	387	S	R	R		PARIS EAST	NEUSTADT			2
LANDERNEAU	323	S	M	R		PARIS CHATELET	PARIS MONTPARNASSE			2
LANGRES	210	S	R			PARIS EAST				1
LANNION	298	S	M	R	R	PARIS CHATELET	PARIS MONTPARNASSE	GUINGAMP		3
LAON	134	S	R			PARIS NORTH				1
L'ARBRESLE	156	R	R			LYON PART DIEU				1
LAROCHE-MIGENNES	141	S	S	R		PARIS CHATELET	PARIS LYON			2
LAUSANNE	305	R	R			LYON PART DIEU				1
LAVAL	142	R								0
LE CREUSOT	230	S	S	R	R	PARIS CHATELET	PARIS LYON	DIJON-VILLE		3
LE CREUSOT TGV	85	R								0
LE HAVRE	165	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
LE MANS	98	R								0
LE PUY	269	R	R	R		LYON PART DIEU	SAINT-ETIENNE-CHATEAUCREUX			2
LEIDEN	226	R	R	R		BRUSSELS MIDI	THE HAGUE			2
LELYSTAD	300	R	R	R		BRUSSELS MIDI	SCHIPOL AIRPORT			2
LENS	67	R	R			ARRAS				1
LES MUREAUX	90	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
LES SABLES-D'OLONNE	305	R	R			NANTES				1
LEUVEN	110	R	R			BRUSSELS MIDI				1
LEVERKUSEN	258	R	R	S		BRUSSELS MIDI	COLOGNE HBF			2
LIBOURNE	231	R								0
LIEGE-GUILLEMINS	130	R	R			BRUSSELS MIDI				1
LIESIEUX	162	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
LIEUSANT-MOISSY	78	S	S			PARIS NORTH				1
LILLE EUROPE	50	R								0
LIMBURG	319	R	R			BRUSSELS MIDI				1
LIMOGES	231	S	M	R		PARIS CHATELET	PARIS AUSTERLITZ			2
LOCHES	202	R	R	B		ST-PIERRE-DES-CORPS	TOURS			2
LOKEREN	138	R	R			BRUSSELS MIDI				1
LONDON WATERLOO INT.	199	R	R			MARNE-LA-VALLEE CHESSY				1
LONGWY	280	R	R	R		PARIS EAST	CHARLEVILLE-MEZIERES			2
LONS-LE-SAUNIER	232	R	R			LYON PART DIEU				1
LORIENT	278	R								0
LOUHANS	253	R	R	R		LYON PART DIEU	BOURG-EN-BRESSE			2
LUC-ET-LE-CANNET	328	R	R			TOULON				1

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER				
		1	2	3	4	1	2	3	4	∑
LUNEL	228	R	R			NIMES				1
LUNEVILLE	231	S	R			PARIS EAST				1
LURE	276	S	R			PARIS EAST				1
LUXEMBOURG	248	R	R			BRUSSELS MIDI				1
LYON PART DIEU	120	R								0
MAASLUIS	214	R	R	R		BRUSSELS MIDI	ROTTERDAM CENTRAAL			2
MAASTRICHT	188	R	R			BRUSSELS MIDI				1
MACON TGV	153	S	S	R		PARIS CHATELET	PARIS LYON			2
MACON-VILLE	182	R	R			LYON PART DIEU				1
MAIDSTONE	199	R	R	R		LILLE EUROPE	ASHFORD/KENT			2
MAINZ	313	R	R	R	R	BRUSSELS MIDI	COLOGNE HBF	FRANKFURT AIRPORT		3
MANNHEIM HBF	326	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
MANOSQUE	319	R	B	R		AIX-EN-PROVENCE TGV	AIX-EN-PROVENCE VILLE			2
MANTES-LA-JOLIE	90	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
MARCHE-EN-FAMENNE	308	R	R	R		BRUSSELS MIDI	LIEGE-GUILLEMINS			2
MARMANDE	323	R	R			BORDEAUX-ST-JEAN				1
MARNE-LA-VALLEE CHESSY	9	R								0
MARSEILLE-ST-MARSEILLE	216	R								0
MARTIGNY-VILLE	360	S	S	R	R	PARIS CHATELET	PARIS LYON	LAUSANNE		3
MARTIGUES	273	R	R			MARSEILLE-ST-CHARLES				1
MASSY	40	R								0
MAYEN	386	R	R	R	R	BRUSSELS MIDI	COLOGNE HBF	ANDERNACH		3
MEAUX	81	S	R			PARIS NORTH				1
MECHELEN	108	R	R			BRUSSELS MIDI				1
MECHERNICH	309	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
MELUN	91	S	S			PARIS NORTH				1
MENEN	133	R	R	R		LILLE EUROPE	KORTRIJK			2
METZ VILLE	221	S	R			PARIS EAST				1
MIRAMAS	270	R	R			MARSEILLE-ST-CHARLES				1
MOL	186	R	R	R		BRUSSELS MIDI	ANTWERPEN-BERCHEM			2
MOLSHEIM	324	S	R	R		PARIS EAST	STRASBOURG			2
MONTABAUR	293	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
MONTARGIS	118	S	S	R		PARIS CHATELET	PARIS LYON			2
MONTAUBAN	362	R								0
MONTBELIARD	322	S	R	R		PARIS EAST	BELFORT			2
MONTBRISON	232	R	R	R		LYON PART DIEU	SAINT-ETIENNE-CHATEAUCREUX			2
MONTCALIERI	450	S	S	R	R	PARIS CHATELET	PARIS LYON	TORINO PORTA SUSA		3
MONTCEAU-LES-MINES	243	S	S	R	R	PARIS CHATELET	PARIS LYON	DIJON-VILLE		3
MONTELIMAR	220	R	B			VALENCE TGV				1
MONTLUCON	279	S	M	R		PARIS ST-MICHEL	PARIS AUSTERLITZ			2
MONTPELLIER SAINT-ROCH	235	R								0
MORLAIX	280	S	M	R		PARIS CHATELET	PARIS MONTPARNASSE			2
MOULINS-SUR-ALLIER	205	S	S	R		PARIS CHATELET	PARIS LYON			2
MOUSCRON	109	R	R			LILLE EUROPE				1
MULHOUSE	326	S	R			PARIS EAST				1
NAMUR	140	R	R			BRUSSELS MIDI				1
NANCY-VILLE	211	S	R			PARIS EAST				1
NANTERRE PREFECTURE	51	S	S			PARIS CHATELET				1
NANTES	173	R								0
NARBONNE	299	R								0
NEMOURS ST PIERRE	110	S	S	R		PARIS CHATELET	PARIS LYON			2
NEUCHATEL	305	S	S	R		PARIS CHATELET	PARIS LYON			2
NEUFCHATEAU-LONGLIER	228	R	R	R		BRUSSELS MIDI	LIBOURNE			2
NEUSS HBF	279	R	R	R		BRUSSELS MIDI	AACHEN HBF			2
NEUSTADT HBF	363	S	R			PARIS EAST				1
NEVERS	172	S	S	R		PARIS CHATELET	PARIS LYON			2
NICE	386	R								0
NICHELINO	480	S	S	R	R	PARIS CHATELET	PARIS LYON	TORINO PORTA SUSA	TORINO LINGOTO	4
NIMES	208	R								0
NIORT	198	R	R			POITIERS				1
NOGENT-LE-ROTROU	129	S	M	R		PARIS CHATELET	PARIS MONTPARNASSE			2
NOYON	100	S	R			PARIS NORTH				1
OBERHAUSEN HBF	312	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
OBERNAI	349	S	R	R		PARIS EAST	STRASBOURG			2
OFFENBURG	342	S	R	R		PARIS EAST	STRASBOURG			2
OLTEN	390	S	R	R	R	PARIS EAST	MULHOUSE VILLE	BASEL SBB		3
ORANGE	261	R	R			LYON PART DIEU				1
ORLEANS	125	S	M	R		PARIS ST-MICHEL	PARIS AUSTERLITZ			2
OSS	248	R	R	R		BRUSSELS MIDI	ROOSENDAAL			2
OTTIGNIES	115	R	R			BRUSSELS MIDI				1
OXTED	264	R	R	R	R	MARNE-LA-VALLEE CHESSY	LONDON WATERLOO INT.	CLAPHAM JUNCTION		3
OYONNAX	240	S	S	R	R	PARIS CHATELET	PARIS LYON	BOURG-EN-BRESSE		3
PAMIERS	454	R	R			TOULOUSE-MATABIAU				1
PARIS AUSTERLITZ	60	S	S			PARIS ST-MICHEL				1
PARIS EAST	50	S								0
PARIS MONTPARNASSE	60	S	M			PARIS CHATELET				1
PARIS ST LAZARE	60	S				PARIS NORTH				1
PAU	384	R	R			BORDEAUX-ST-JEAN				1
PEAGE-DE-ROUSSILLON	169	R	R			LYON PART DIEU				1
PERIGUEUX	328	R	R			LIBOURNE				1
PERPIGNAN	334	R								0
PERRONNE	182	R	B	R	B	TGV HAUTE PICARDIE	AMIENS	CHAULNES		3
PHILIPPEVILLE	168	R	R	R		BRUSSELS MIDI	CHARLEROI-SUD			2
PINEROLO	480	S	S	R	R	PARIS CHATELET	PARIS LYON	TORINO PORTA SUSA		3
PLOUARET	280	S	M	R		PARIS CHATELET	PARIS MONTPARNASSE			2
POISSY	79	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
POITIERS	140	R								0
PONT-A-MOUSSON	243	S	R	R		PARIS EAST	NANCY-VILLE			2
PONTIVY	308	R	R	B		RENNES	VANNES			2

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER				
		1	2	3	4	1	2	3	4	∑
PONTPARLIER	260	S	S	R		PARIS CHATELET	PARIS LYON			2
PORT-DE-BOUC	278	R	R			MARSEILLE-ST-CHARLES				1
PRIVAS	247	R	B			VALENCE TGV				1
PROVINS	133	S	R			PARIS EAST				1
PURMEREND	302	R	R	R		BRUSSELS MIDI	AMSTERDAM CENTRAAL			2
QUIMPER	316	R	R			RENNES				1
QUIMPERLE	306	R	R			LORIENT				1
RAMBOUILLET	90	S	M	R		PARIS CHATELET	PARIS MONTPARNASSE			2
RECKLINGHAUSEN	337	R	R	R	R	BRUSSELS MIDI	AACHEN HBF	MOENCHENGLADBACH		3
REDON	218	R								0
REIMS	141	S	R			PARIS EAST				1
RENNES	174	R								0
RIOM	282	R	R			LYON PART DIEU				1
RIVES	232	R	R	R		LYON PART DIEU	VOIRON			2
ROANNE	214	R	R			LYON PART DIEU				1
ROCHEFORT	260	S	M	R	B	PARIS CHATELET	PARIS MONTPARNASSE	SURGERES		3
ROMANS-BOURG-DE-PEAGE	178	R	R			VALENCE TGV				1
ROMILLY-SUR-SEINE	130	S	R			PARIS EAST				1
ROMORANTIN	199	R	R	B		ST-PIERRE-DES-CORPS	VILLEFRANCHE-SUR-CHE			2
ROSNY-SUR-SEINE	98	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
ROSPORDEN	322	R	R			LORIENT				1
ROTTERDAM CENTRAAL	188	R	R			BRUSSELS MIDI				1
ROUEN RIVE DROITE	128	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
RUMILLY	249	R	R			LYON PART DIEU				1
SAARBRUECKEN HBF	289	S	R			PARIS EAST				1
SAINR-CHAMOND	164	R	R			LYON PART DIEU				1
SAINT LO	224	S	S	R	B	PARIS NORTH	PARIS ST LAZARE	LISON		3
SAINT-AMAND	242	S	M	R		PARIS ST-MICHEL	PARIS AUSTERLITZ			2
SAINTE-FOYE-LA-GRANDE	313	R	R			LIBOURNE				1
SAINTES	263	R	R			ANGOULEME				1
SAINT-ETIENNE-CHATEAUCREUX	175	R	R			LYON PART DIEU				1
SAINT-JUNIEN	278	R	R			ANGOULEME				1
SAINT-MARCELLIN	198	R	R			VALENCE TGV				1
SAINT-NAZARE	229	R	R			NANTES				1
SAINT-OMER	117	R	R			ARRAS				1
SAINT-PRIEST	161	R	R	R		LYON PART DIEU	LYON-PERRACHE			2
SAINT-QUENTIN	86	S	S			PARIS ST-MICHEL				1
SAINT-RAPHAEL	325	R								0
SALON-DE-PROVENCE	287	R	R	R		MARSEILLE-ST-CHARLES	MIRAMAS			2
SANKT WENDEL	356	S	R	R		PARIS EAST	SAARBURECKEN HBF			2
SARREBOURG	255	S	R			PARIS EAST				1
SAUMUR RIVE DROITE	157	S	R			MASSY				1
SAVERNE	262	S	R			PARIS EAST				1
SAVIGLIANO	480	S	S	R	R	PARIS CHATELET	PARIS LYON	TORINO PORTA SUSA	TORINO LINGOTO	4
SCHIEDAM	198	R	R	R		BRUSSELS MIDI	ROTTERDAM CENTRAAL			2
SCHWERTE	332	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
SEDAN	220	S	R	R		PARIS EAST	CHARLEVILLE-MEZIERS			2
SELESTAT	340	S	R	R		PARIS EAST	STRASBOURG			2
SELM	399	R	R	R	R	BRUSSELS MIDI	COLOGNE HBF	DORTMUND HBF		3
SENS	115	S	S	R		PARIS CHATELET	PARIS LYON			2
SETE	254	R								0
SEVENOAKS	207	R	R	R		LILLE EUROPE	ASHFORD/KENT			2
SIEGBURG/BONN	251	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
SIEGEN	354	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
SIERRE	370	S	S	R	R	PARIS CHATELET	PARIS LYON	LAUSANNE		3
SIMMERN	438	R	R	R	B	BURSSELS MIDI	COLOGNE HBF	KOBLENZ HBF		3
SION	372	R	R	R		LYON PART DIEU	GENEVA			2
SITTINGBOURNE	277	R	R	R	R	LILLE EUROPE	ASHFORD/KENT	DOVER		3
SIX-FOURS-LES-PLAGES	280	R	R			MARSEILLE-ST-CHARLES				1
SLOUGH	267	R	R	R	R	LILLE EUROPE	LONDON WATERLOO INT.	LONDON PADDINGTON		3
SOLINGEN	270	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
SOLOTHURN	380	S	S	R	R	PARIS CHATELET	PARIS LYON	GENEVA		3
SPEYER	367	R	R	R	R	BRUSSELS MIDI	COLOGNE HBF	MANNHEIM HBF		3
ST AVOLD	263	S	R			PARIS EAST				1
ST BRIEUC	231	S	M	R		PARIS CHATELET	PARIS MONTPARNASSE			2
ST-DIZIER	180	S	R			PARIS EAST				1
ST-GILLES-CROIX-DE-VIE	303	R	R			NANTES				1
ST-JEAN-DE-MAURIENNE	271	S	S	R		PARIS CHATELET	PARIS LYON			2
ST-PIERRE-DES-CORPS	97	R								0
STRASBOURG	288	S	R			PARIS EAST				1
SWANLEY	236	R	R	R		LILLE EUROPE	ASHFPRD/KENT			2
TARARE	169	R	R			LYON PART DIEU				1
TARBES	435	R	R			BORDEAUX-ST-JEAN				1
TERGNIER	94	R	B	R		TGV HAUTE PICARDIE	ST-QUENTIN			2
TGV HAUTE PICARDIE	27	R								0
THIONVILLE	247	S	R			PARIS EAST				1
THONON-LES-BAINS	305	R	R			LYON PART DIEU				1
THOUARS	221	R	R			ST-PIERRE-DES-CORPS				1
TIENEN	125	R	R			BRUSSELS MIDI				1
TILBURG	215	R	R	R		BRUSSELS MIDI	ROOSENDAAL			2
TONBRIDGE	197	R	R	R		LILLE EUROPE	ASHFORD/KENT			2
TONNEINS	321	S	M	R	R	PARIS CHATELET	PARIS MONTPARNASSE	BORDEAUX-ST-JEAN		3
TORINO	382	S	S	R		PARIS CHATELET	PARIS LYON			2
TOUL	220	S	R			PARIS EAST				1
TOULON	286	R								0
TOULOUSE-MATABIAU	389	R								0
TOURNAI	101	R	R			LILLE EUROPE				1
TRAPPES	99	S	S	R		PARIS ST-MICHEL	SAINT-QUENTIN			2
TRIER HBF	320	R	R	R		BRUSSELS MIDI	LUXEMBOURG			2

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER				
		1	2	3	4	1	2	3	4	∑
TROYES	134	S	R			PARIS EAST				1
TUBIZE	91	R	R			BRUSSELS MIDI				1
TULLE	334	S	M	R	R	PARIS CHATELET	PARIS AUSTERLITZ	UZERCHE		3
USSEL	351	S	M	R	R	PARIS CHATELET	PARIS AUSTERLITZ	LIMOGES		3
UTRECHT CENTRAAL	253	R	R	R		BRUSSELS MIDI	ROTTERDAM			2
VALENCE TGV	148	R								0
VALENCE-VILLE	190	R	B			VALENCE TGV				1
VALENCIENNES	98	R	R			DOUAI				1
VANNES	245	R								0
VAUVERT	291	R	R			NIMES				1
VENDOME	190	S	S	R		PARIS ST-MICHEL	PARIS AUSTERLITZ			2
VERDUN-SUR-MEUSE	242	S	R	R		PARIS EAST	CHALONS-EN-CHAMPAGNE			2
VERNON	101	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
VERSAILLES CHANTIERS	73	S	M	R		PARIS CHATELET	PARIS MONTPARNASSE			2
VERVIERS	187	R	R			BRUSSELS MIDI				1
VESOUL	250	S	R			PARIS EAST				1
VEVEY	325	R	R	R		LYON PART DIEU	GENEVA			2
VICHY	230	S	S	R		PARIS CHATELET	PARIS LYON			2
VIENNE	154	R	R			LYON PART DIEU				1
VIERZON VILLE	200	R	R			ST-PIERRE-DES-CORPS				1
VILLEFRANCE-SUR-SAONE	146	R	R			LYON PART DIEU				1
VILLENEUVE-SUR-LOT	354	S	M	R	R	PARIS CHATELET	PARIS MONTPARNASSE	AGEN		3
VILLEPINTE	10	S								0
VIRE	215	S	S	R		PARIS CHATELET	PARIS MONTPARNASSE			2
VIRTON-SAINT-MARD	273	R	R	R		BRUSSELS MIDI	LIBRAMONT			2
VITRE	179	R	R			LE MANS				1
VITROLLES	277	R	R			MARSEILLE-ST-CHARLES				1
VITRY-LE-FRANCOIS	156	S	R			PARIS EAST				1
VLAARDINGEN	207	R	R	R		BRUSSELS MIDI	ROTTERDAM CENTRAAL			2
VOERDE	346	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
VOIRON	207	R	R			LYON PART DIEU				1
WESEL	355	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
WIESBADEN	360	S	R	R		PARIS NORTH	COLOGNE HBF			2
WITTEN	342	R	R	R		BRUSSELS MIDI	AACHEN HBF			2
WITTLICH	348	R	R	R	R	BRUSSELS MIDI	LUXEMBOURG	TRIER HBF		3
WORMS	371	R	R	R	R	BRUSSELS MIDI	COLOGNE HBF	MANNHEIM HBF		3
WUPPERTAL	283	R	R	R		BRUSSELS MIDI	COLOGNE HBF			2
YVETOT	150	S	S	R		PARIS NORTH	PARIS ST LAZARE			2
ZOFINGEN	404	S	R	R		PARIS EAST	BASEL SBB			2

NB:

DESTINATION	… destination (in most case the name of the train station)
TIME	… access time (in minutes)
MODE_TRANSPORT	… mode(s) of transport used for joining the final destination
B	… bus
M	… underground railway/metro
R	… railway
S	… suburban train
T	… tramway
TRANSFER	… station where the passenger has to change
∑	… total number of transfers

Appendix 20: Amsterdam airport – access time by public transport (15 March 2007)

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER				
		1	2	3	4	1	2	3	4	∑
AACHEN HBF	223	R	R	R		AMSTERDAM CENTRAAL	HEERLEN			2
AARSCHOT	146	R	R			ANTWERPEN-BERCHEM				1
AHAUS	198	R	R	R		AMERSFOORT	ENSCHEDE			2
AHLEN	218	R	R	R		UTRECHT CENTRAAL	DUISBURG HBF			2
ALMELO	112	R								0
ALPHEN AN DER RIJN	36	R								0
ALTENA	256	R	R	R	R	UTRECHT CENTRAAL	DUESSELDORF HBF	HAGEN		3
ALTENKIRCHEN	265	R	R	R	R	UTRECHT CENTRAAL	COLOGNE HBF	AU		3
AMERSFOORT	44	R								0
AMIENS	293	R	R	R		BRUSSELS MIDI	TGV HAUTE PICARDIE			2
AMSTERDAM CENTRAAL	15	R								0
ANDERNACH	222	R	R	R		UTRECHT CENTRAAL	COLOGNE HBF			2
ANTWERPEN BERCHEM	102	R								0
APELDOORN	75	R								0
ARLON	293	R	R			BRUSSELS NORTH				1
ARNHEM	77	R	R			UTRECHT CENTRAAL				1
ARNSBERG	252	R	R	R	R	UTRECHT CENTRAAL	OBERHAUSEN HBF	DORTMUND HBF		3
ARRAS	254	R	R	R		BRUSSELS MIDI	LILLE EUROPE			2
ASHFORD/KENT	271	R	R			BRUSSELS MIDI				1
ASSEN	132	R								0
ATTENDORN	311	R	R	R	R	UTRECHT CENTRAAL	OBERHAUSEN HBF	ESSEN HBF	FINNENTROP	4
AULNOYE-AYMERIES	262	R	R	R		BRUSSELS MIDI	QUEVY			2
BAD BERLEBURG	369	R	R	R	R	UTRECHT CENTRAAL	COLOGNE HBF	SIEGEN		3
BAD HONNEF	245	R	R	R	R	UTRECHT CENTRAAL	COLOGNE HBF	BONN HBF		3
BAD KREUZNACH	308	R	R	R		UTRECHT CENTRAAL	FRANKFURT/MAIN AIRPORT			2
BASTOGNE	322	R	R	B		BRUSSELS NORTH	LIBRAMONT			2
BEAUVAIS	320	R	R			PARIS NORTH				1
BETHUNDE	283	R	R	R		BRUSSELS MIDI	LILLE EUROPE			2
BIELEFELD	260	R	R			BUENDE				1
BITBURG	316	R	R	B		UTRECHT CENTRAAL	COLOGNE HBF			2
BOCHOLT	220	R	R	R	R	UTRECHT CENTRAAL	OBERHAUSEN HBF	WESEL		3
BOCHUM	168	R	R	R		UTRECHT CENTRAAL	DUISBURG HBF			2
BONN HBF	210	R	R	R		UTRECHT CENTRAAL	COLOGNE HBF			2
BOREHAMWOOD	388	R	R	M	R	BRUSSELS MIDI	LONDON WATERLOO INT.	MOORGATE		3
BOULOGNE-SUR-MER	272	R	R	R		BRUSSELS MIDI	LILLE EUROPE			2
BRAKE	361	R	R	R		OSNABRUECK HBF	BREMEN HBF			2
BRAMSCHE	232	R	R			OSNABRUECK				1
BREDA	88	R	R			DORDRECHT				1
BREMEN HBF	263	R	R			OSNABRUECK HBF				1
BRUGGE	192	R	R			ANTWERPEN-BERCHEM				1
CALAIS-FRETHUN	244	R	R	R		BRUSSELS MIDI	LILLE EUROPE			2
CANTERBURY	535	R	R	R	R	BRUSSELS MIDI	ASHFORD/KENT	DOVER		3
CAUDRY	314	R	R	R	R	ANTWERPEN-BERCHEM	KORTRIJK	LILLE FANDRES	DOUAI	4
CERGY-PONTOISE	291	R	S	S		PARIS NORTH	PARIS CHATELET			2
CHALONS-EN-CHAMPAGNE	393	R	R	R	R	ANTWERPEN-BERCHEM	BRUSSELS MIDI	PARIS NORTH		3
CHARLEROI	193	R	R			BRUSSELS MIDI				1
CHARLEVILLE-MEZIERES	363	R	R	R	R	ANTWERPEN-BERCHEM	KORTRIJK	LILLE FLANDRES		3
COBHAM	388	R	R	R		BRUSSELS MIDI	LONDON WATERLOO INT.			2
COCHEM	281	R	R	R	R	UTRECHT CENTRAAL	COLOGNE HBF	KOBLENZ HBF		3
COESFELD	217	R	R	R		AMERSFOORT	ENSCHEDE			2
COLOGNE HBF	177	R	R			UTRECHT CENTRAAL				1
COMPIEGNE	304	R	R			PARIS NORTH				1
COULOMMIERS	332	R	R			PARIS NORTH				1
CREIL	280	R	R			PARIS NORTH				1
CREPY-EN-VALOIS	279	R	R			PARIS NORTH				1
CRETEIL	269	R	S	S		PARIS NORTH	PARIS CHATELET			2
DARMSTADT	286	R	R	R		UTRECHT CENTRAAL	FRANKFURT/MAIN HBF			2
DEAL	330	R	R	R		BRUSSELS MIDI	ASHFORD/KENT			2
DEINZE	188	R	R	R		ANTWERPEN-BERCHEM	GENT-ST-PIETERS			2
DELFT	54	R								0
DEVENTER	87	R								0
DIEPHOLZ	255	R	R			OSNABRUECK				1
DIEPPE	428	R	R	R	R	PARIS NORTH	PARIS ST LAZARE	ROUEN-RIVE-DROITE		3
DIEST-WEBBEKOM	162	R	R			ANTWERPEN-BERCHEM				1
DILLENBURG	302	R	R	R		UTRECHT CENTRAAL	COLOGNE HBF			2
DILLINGEN	379	R	R	R	R	UTRECHT CENTRAAL	COLOGNE HBF	KOBLENZ HBF		3
DINANT	244	R	R	R		BRUSSELS NORTH	NAMUR			2
DINSLAKEN	153	R	R	R		UTRECHT CENTRAAL	OBERHAUSEN HBF			2
DOETINCHEM	111	R	R	R		UTRECHT CENTRAAL	ARNHEM			2
DORDRECHT	56	R								0
DORSTEN	178	R	R	R		UTRECHT CENTRAAL	OBERHAUSEN			2
DORTMUND HBF	173	R	R	R		UTRECHT CENTRAAL	OBERHAUSEN			2
DOUAI	234	R	R	R		BRUSSELS MIDI	LILLE EUROPE			2
DOVER	302	R	R	R		BRUSSELS MIDI	ASHFORD/KENT			2
DUELMEN	192	R	R	R	R	UTRECHT CENTRAAL	OBERHAUSEN HBF	RECKLINGHAUSEN		3
DUEREN	233	R	R	R		UTRECHT CENTRAAL	COLOGNE HBF			2
DUESSELDORF HBF	149	R	R			UTRECHT CENTRAAL				1
DUISBURG HBF	137	R	R			UTRECHT CENTRAAL				1
DUNKERQUE	266	R	R	R		BRUSSELS MIDI	LILLE EUROPE			2
EDE	88	R	R			AMERSFOORT				1
EINDHOVEN	88	R								0
EMMEN	152	R	R			ZWOLLE				1
EMMERICH	209	R	R	R		UTRECHT CENTRAAL	OBERHAUSEN HBF			2
EMSDETTEN	190	R	R			RHEINE				1
ENSCHEDE	144	R								0
EPERNAY	331	R	R			PARIS NORTH				1
ESSEN HBF	156	R	R	R		UTRECHT CENTRAAL	DUISBURG HBF			2
ETAPLES	341	R	R	R	R	BRUSSELS MIDI	LILLE EUROPE	BOULOGNE-SUR-MER		3

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER				
		1	2	3	4	1	2	3	4	∑
FOLKESTONE	290	R	R	R		BRUSSELS MIDI	ASHFORD/KENT			2
FORBACH	413	R	R	R		BRUSSELS NORTH	METZ-VILLE			2
FRANKFURT/MAIN HBF	255	R	R			UTRECHT CENTRAAL				1
FRIEDRICHSDORF	305	R	R	S		UTRECHT CENTRAAL	FRANKFURT/MAIN HBF			2
GEILENKIRCHEN	242	R	R	R		UTRECHT CENTRAAL	DUESSELDORF HBF			2
GELSENKIRCHEN	148	R	R	R		UTRECHT CENTRAAL	OBERHAUSEN HBF			2
GENT ST PIETERS	162	R	R			ANTWERPEN BERCHEM				1
GIESSEN	320	R	R	R		UTRECHT CENTRAAL	FRANKFURT/MAIN HBF			2
GISORS	354	R	S	R		PARIS NORTH	PARIS ST LAZARE			2
GORINCHEM	103	R	R			DORDRECHT				1
GOUSSAINVILLE	279	R	R			PARIS NORTH				1
GREVEBROICH	186	R	R	R		UTRECHT CENTRAAL	DUESSELDORF HBF			2
GRONINGEN	151	R								0
GUMMERSBACH	260	R	R	R		UTRECHT CENTRAAL	COLOGNE HBF			2
HAAN	196	R	R	R	R	UTRECHT CENTRAAL	DUESSELDORF HBF	GRUITEN		3
HAARLEM	26	R								0
HAGEN	220	R	R	R		UTRECHT CENTRAAL	DUESSELDORF HBF			2
HAGONDANGE	365	R	R	R		BRUSSELS NORTH	THIONVILLE			2
HALTERN	213	R	R	R		UTRECHT CENTRAAL	DUISBURG			2
HAMM	210	R	R	R		UTRECHT CENTRAAL	DUISBURG HBF			2
HASSELT	176	R	R			ANTWERPEN-BERCHEM				1
HATTINGEN MITTE	180	R	R	R		UTRECHT CENTRAAL	OBERHAUSEN HBF			2
HAZEBROUCK	257	R	R	R		BRUSSELS MIDI	LILLE EUROPE			2
HELMOND	104	R	R			EINDHOVEN				1
HIRSON	308	R	R	R	R	BRUSSELS MIDI	QUEVY	AULNOYE-AYMERIES		3
HOMBURG	368	R	R	R		UTRECHT CENTRAAL	MANNHEIM HBF			2
HOORN	44	R								0
HUY-WANZE	232	R	R	R		MAASTRICHT	LIEGE-GUILLEMINS			2
IDAR-OBERSTEIN	344	R	R	R		UTRECHT CENTRAAL	FRANKFURT/MAIN AIRPORT			2
IEPER	247	R	R			BRUSSELS MIDI				1
ISBERGUES	312	R	R	R	R	ANTWERPEN-BERCHEM	LILLE FLANDRES	HAZEBROUCK		3
KAISERSLAUTERN	366	R	R	R		UTRECHT CENTRAAL	FRANKFURT/MAIN HBF			2
KARLSRUHE HBF	344	R	R	R		UTRECHT CENTRAAL	FRANKFURT/MAIN HBF			2
KEMPEN	210	R	R	R		UTRECHT CENTRAAL	DUESSELDORF HBF			2
KEVELAER	233	R	R	R		UTRECHT CENTRAAL	DUESSELDORF HBF			2
KINGSTON UPON THAMES	357	R	R	R		BRUSSELS MIDI	LONDON WATERLOO INT.			2
KLEVE	148	R	R	B		UTRECHT CENTRAAL	NIJMEGEN			2
KOBLENZ HBF	240	R	R	R		UTRECHT CENTRAAL	COLOGNE HBF			2
KORTRIJK	184	R	R			ANTWERPEN-BERCHEM				1
KREFELD	182	R	R	R		UTRECHT CENTRAAL	DUISBURG HBF			2
KREUZTAL	293	R	R	R	R	UTRECHT CENTRAAL	COLOGNE HBF	SIEG		3
LA LOUVIERE	193	R	R			BRUSSELS MIDI				1
LAON	348	R	R			PARIS NORTH				1
LEER	221	R	R	R		AMERSFOORT	GRONINGEN			2
LEEUWARDEN	142	R	R			AMERSFOORT				1
LEICHLINGEN	212	R	R	R		UTRECHT CENTRAAL	COLOGNE HBF			2
LEIDEN	17	R								0
LENS	269	R	R	R		BRUSSELS MIDI	LILLE EUROPE			2
LEOPOLDSBURG	190	R	R			ANTWERPEN-BERCHEM				1
LEUVEN	135	R	R			ANTWERPEN-BERCHEM				1
LEVERKUSEN	178	R	R	R		UTRECHT CENTRAAL	DUESSELDORF HBF			2
LIEGEGUILLEMINS	199	R	R			MAASTRICHT				1
LILLE EUROPE	192	R	R			BRUSSELS MIDI				1
LIMBURG	231	R	R			UTRECHT CENTRAAL				1
LONDON WATERLOO INT.	313	R	R			BRUSSELS MIDI				1
LUEDENSCHEID	280	R	R	R	R	UTRECHT CENTRAAL	DUISBURG HBF	DORTMUND HBF		3
LUNEVILLE	453	R	R			PARIS NORTH				1
LUXEMBOURG	312	R	R			BRUSSELS NORTH				1
MAASLUIS	64	R	R			ROTTERDAM CENTRAAL				1
MAASTRICHT	157	R								0
MAIDSTONE	321	R	R	R		BRUSSELS MIDI	ASHFORD/KENT			2
MAINZ	273	R	R	S		UTRECHT CENTRAAL	FRANKFURT/MAIN AIRPORT			2
MANNHEIM HBF	279	R	R			UTRECHT CENTRAAL				1
MANTES-LA-JOLIE	304	R	S	R		PARIS NORTH	PARIS ST LAZARE			2
MARCHE-EN-FAMENNE	292	R	R	R		BRUSSELS NORTH	MARLOIE			2
MAYEN OST	261	R	R	R	R	UTRECHT CENTRAAL	COLOGNE HBF	ANDERNACH		3
MECHERNICH	234	R	R	R		UTRECHT CENTRAAL	COLOGNE HBF			2
MELUN	298	R	R			PARIS NORTH				1
MENDEN	223	R	R	R		UTRECHT CENTRAAL	COLOGNE HBF			2
MEPPEL	103	R								0
MEPPEN	216	R	R			RHEINE				1
MESCHEDE	269	R	R	R	R	UTRECHT CENTRAAL	OBERHAUSEN HBF	DORTMUND HBF		3
MOERS	168	R	R	R		UTRECHT CENTRAAL	DUISBURG HBF			2
MOL	169	R	R			ANTWERPEN-BERCHEM				1
MONS	213	R	R			BRUSSELS MIDI				1
MONTABAUR	221	R	R			UTRECHT CENTRAAL				1
MOUSCRON	197	R	R			ANTWERPEN-BERCHEM				1
MUEHLHEIM	291	R	R	S		UTRECHT CENTRAAL	FRANKFURT/MAIN HBF			2
MUENSTER	214	R	R			RHEINE				1
NAMUR	211	R	R			BRUSSELS NORTH				1
NANCY	433	R	R			PARIS NORTH				1
NEUFCHATEAU	475	R	R	R	R	PARIS NORTH	PARIS LYON	DIJON-VILLE		3
NIJEN	148	R	R			ANTWERPEN-BERCHEM				1
NIJERK	65	R	R			AMERSFOORT				1
NIJMEGEN	96	R	R			UTRECHT CENTRAAL				1
OBERTSHAUSEN	300	R	R	S		UTRECHT CENTRAAL	FRANKFURT/MAIN HBF			2
OSS	88	R	R			'S-HERTOGENBOSCH				1
OTTIGNIES	202	R	R			BRUSSELS MIDI				1
OVERATH	223	R	R	R		URECHT CENTRAAL	COLOGNE HBF			2
OXTED	367	R	R	R	R	BRUSSELS MIDI	LONDON WATERLOO INT.	CLAPHAM JUNCTION		3

DESTINATION	TIME	MODE_TRANSPORT				TRANSFER				
		1	2	3	4	1	2	3	4	∑
PAPENBURG	243	R	R			RHEINE				1
PARIS CDG TGV	257	R	R			BRUSSELS MIDI				1
PARIS NORTH	332	R								0
PHILIPPEVILLE	264	R	R	R		BRUSSELS MIDI	CHARLEROI-SUD			2
PONT-A-MOUSSON	408	R	R	R		BRUSSELS NORTH	METZ-VILLE			2
PURMEREND	29	R								0
RAMBOUILLET	319	R	M	R		PARIS NORTH	PARIS MONTPARNASSE			2
RATINGEN-MITTE	187	R	R	R	R	UTRECHT CENTRAAL	DUISBURG HBF	DUESSELDOF AIRPORT		3
REIMS	354	R	R			PARIS NORTH				1
RHEDA-WIEDENBRUECK	237	R	R	R		UTRECHT CENTRAAL	DUISBURG HBF			2
ROERMOND	123	R								0
ROMILLY-SUR-SEINE	452	R	R	R		PARIS NORTH	TROYES			2
ROOSENDAAL	79	R								0
ROTTERDAM	41	R								0
ROUEN-RIVE-DROITE	367	R	R	R		PARIS NORTH	PARIS ST LAZARE			2
SAARBRUECKEN	414	R	R	R		UTRECHT CENTRAAL	FRANKFURT/MAIN HBF			2
SAARLOUIS	382	R	R	R	R	UTRECHT CENTRAAL	COLOGNE HBF	KOBLENZ HBF		3
SAINT-OMER	279	R	R	R		BRUSSELS MIDI	LILLE EUROPE			2
SANKT WEDEL	383	R	R	R		UTRECHT CENTRAAL	FRANKFURT/MAIN AIRPORT			2
SARREBOURG	477	R	R			PARIS EAST				1
SAVERNE	447	R	R	R	R	UTRECHT CENTRAAL	FRANKFURT/MAIN HBF	OFFENBURG	STRASBOURG	4
SCHWERTE	207	R	R	R	R	UTRECHT CENTRAAL	DUISBURG HBF	DORTMUND HBF		3
SEDAN	442	R	R	R	R	BRUSSELS NORTH	LUXEMBOURG	LONGWY		3
SELM	254	R	R	R		AMERSFOORT	ENSCHEDE			2
SEVENOAKS	335	R	R	R		BRUSSELS MIDI	ASHFORD/KENT			2
'S-HERTOGENBOSCH	66	R								0
SIEGEN	277	R	R	R		UTRECHT CENTRAAL	COLOGNE HBF			2
SITTARD	140	R								0
SITTINGBOURNE	363	R	R	R	R	BRUSSELS MIDI	ASHFORD/KENT	DOVER		3
SLOUGH	379	R	R	M	R	BRUSSELS MIDI	LONDON WATERLOO INT.	LONDON PADDINGTON		3
SOEST	246	R	R	R		UTRECHT CENTRAAL	DUISBURG HBF			2
SOLINGEN	182	R	R	R		UTRECHT CENTRAAL	DUESSELDORF HBF			2
ST- DIZIER	447	R	R			PARIS EAST				1
ST-AVOLD	399	R	R	R		BRUSSELS NORTH	METZ-VILLE			2
TERGNIER	348	R	R			PARIS NORTH				1
TGV HAUTE PICARDIE	232	R	R			BRUSSELS MIDI				1
THIONVILLE	343	R	R			BRUSSELS NORTH				1
TILBURG	90	R	R			'S-HERTOGENBOSCH				1
TONBRIDGE	311	R	R	R		BRUSSELS MIDI	ASHFORD/KENT			2
TORHOUT	219	R	R	R		ANTWERPEN-BERCHEM	BRUGGE			2
TOURNAI	234	R	R			BRUSSELS MIDI				1
TRIER HBF	332	R	R	R	R	UTRECHT CENTRAAL	COLOGNE HBF	KOBLENZ HBF		3
TROYES	372	R	R			PARIS NORTH				1
TUBIZE	163	R	R			BRUSSELS MIDI				1
UNNA	244	R	R	R		UTRECHT CENTRAAL	DUESSELDORF HBF			2
UTRECHT CENTRAAL	31	R								0
VALENCIENNES	282	R	R	R		BRUSSELS MIDI	LILLE EUROPE			2
VEENENDAAL	59	R	R			UTRECHT CENTRAAL				1
VENLO	148	R	R			EINDHOVEN				1
VERDUN	480	R	R	R		BRUSSELS NORTH	METZ-VILLE			2
VERSAILLES	299	R	M	R		PARIS NORTH	PARIS MONTPARNASSE			2
VERVIERS	222	R	R	R		MECHELEN	LEUVEN			2
VEURNE	252	R	R	R		ANTWERPEN-BERCHEM	GENT-ST-PIETERS			2
VIERSEN	191	R	R	R		EINDHOVEN	VENLO			2
VITRY-LE-FRANCOIS	425	R	R			PARIS EAST				1
WAREMME	197	R	R	R		ANTWERPEN-BERCHEM	LEUVEN			2
WEERT	109	R								0
WESEL	167	R	R	R		UTRECHT CENTRAAL	OBERHAUSEN HBF			2
WIESBADEN	292	R	R	S		UTRECHT CENTRAAL	FRANKFURT/MAIN AIRPORT			2
WINTERSWIJK	141	R	R	R		APELDOORN	ZUTPEN			2
WITTEN	191	R	R	R	R	UTRECHT CENTRAAL	DUISBURG HBF	BOCHUM		3
WITTLICH	303	R	R	R	R	UTRECHT CENTRAAL	COLOGNE HBF	KOBLENZ HBF		3
WORMS	326	R	R	R		UTRECHT CENTRAAL	MANNHEIM HBF			2
WUPPERTAL	195	R	R	S		UTRECHT CENTRAAL	DUESSELDORF HBF			2
ZWOLLE	85	R								0

NB:

DESTINATION	… destination (in most case the name of the train station)
TIME	… access time (in minutes)
MODE_TRANSPORT	… mode(s) of transport used for joining the final destination
B	… bus
M	… underground railway/metro
R	… railway
S	… suburban train
T	… tramway
TRANSFER	… station where the passenger has to change
∑	… total number of transfers

REFERENCES

Abed, S. Y., Ba-Fail, A. O., & Jasimuddin, S. M. (2001). An econometric analysis of international air travel demand in Saudi Arabia. *Journal of Air Transport Management , 7* (3), 143-148.

ACI Europe. (1995). *Environmental Handbook.* Airports Council International Europe.

ACI Europe. (2003). *Airport Charges in Europe.* Airports Council International Europe.

ACI Europe. (2004). *Study on the use of airport capacity.* Airports Council International Europe.

ACNUSA. (2006). *Estimation des populations survolées en 2005 par les aéronefs en provenance ou à destination des aéroports de Paris - Orly et Paris - CDG.* www.acnusa.fr/actualite_docs/comptage_acnusa_2005.pdf, accessed 13/11/2008.

ADV. (1965). *Fluggastaufkommen und Einzugsgebiete der Verkehrsflughäfen in der BRD.* Arbeitsgemeinschaft der Deutschen Verkehrsflughäfen. Stuttgart.

ADV. (1997). *Sicherung und Optimierung des Luftverkehrsstandortes Deutschland: Situationsanalyse und Beiträge zu Problemlösungen.* Arbeitsgemeinschaft der Deutschen Verkehrsflughäfen. Stuttgart.

Advani, A., & Borins, S. (2001). Managing airports: a test of new public management. *International Public Management Journal , 4* (1), 91-107.

Aéroport International de Genève. (2007). *Rapport annuel 2006.* Genève.

Aéroport Toulouse-Blagnac. (2007). Création de la Société Aéroportuaire AEROPORT TOULOUSE-BLAGNAC. *Communiqué de Presse du 23 mars 2007* . Toulouse.

Aéroports de la Côte d'Azur. (2007). *Rapport d'acitivités 2006.* Nice: CCI Nice Côte d'Azur.

Aéroports de Lyon. (2007). Aéroports de Lyon : Lancement de la première société anonyme aéroportuaire régionale française. *Communiqué de Presse du 9 mars 2007* . Lyon.

Aéroports de Paris. (2006). *Document de base 2005.* Paris.

Aéroports de Paris. (2007). *Document de référence 2006.* Paris.

Aéroports de Paris. (2008). *Document de référence 2007.* Paris.

Aéroports de Paris. (2009). *Document de référence 2008.* Paris.

Agarwal, A., & Narain, S. (1991). *Global warming in an unequal world.* New Delhi: Centre for Science and Environment.

Air France-KLM. (2005). *The hub model.* Prestention by Pierre-Henri Gourgeon, available on the website: www.airfranceklm-finance.com, accessed 20/04/2008.

Air Transport Action Group. (2008). *The economic and social benefits of air transport 2008.* Geneva.

Airbus. (2007). *Flying by nature: Global Market Forecast 2007-2026.*

Airola, J., & Craig, S. (2001). Institutional efficiency in airport governance. *Unpublished manuscript, Department of Economics, University of Houston* . Houston, Texas.

Alamdari, F. E., & Brewer, D. (1994). Taxation policy for aircraft emissions. *Transport Policy , 1* (3), 149-159.

Alamdari, F. (2002). Regional development in airlines and travel agents relationship. *Journal of Air Transport Management , 8*, 339-348.

Alamdari, F., & Mason, K. (2006). The future of airline distribution. *Journal of Air Transport Management , 12* (3), 122-134.

Albers, S., Bühne, J.-A., & Peters, H. (2009). Will the EU-ETS instigate airline network configurations? *Journal of Air Transport Management , 15* (1), 1-6.

Allaz, C. (2003). Transport aérien. *Techniques de l'Ingénieur* . AG8140.

Allaz, C. (2006). Transport aérien. *Techniques de l'Ingénieur* . AG8140.

Allix, A. (1914). La foire de Goncelin. *Annales de l'Université de Grenoble , 26*, 359-394.

Allix, A. (1922). The Geography of Fairs. *Geographical Review , 12*, 532-569.

ANA Aeroportos de Portugal. (2007). *Annual report and accounts 2006.* Lisbon.

ARIC. (2003). *A good practice guide to the assessment and management of aircraft noise disturbance around Northern Ireland airports.* Manchester: Center for Aviation Transport and the Environment, Manchester Metropolitan University.

Arndt, A. (2002). *Zur Qualität von Luftverkehrsstatistiken für das innereuropäische Luftverkehrsgebiet.* Bremen: IWIM - Institut für Weltwirtschaft und Internationales Management.

Arnold, K. (1992). *Wirtschaftsgeographie in Stichworten.* Berlin, Stuttgart: Ferdinand Hirt in der Gebrüder Borntraeger Verlagsbuchhandlung.

Association Ville et Aéroport. (s.a.). *Le troisième aéroport: 15 ans d'atermoiements de la puissance publique.* http://www.villaeroport.org/up/docpdf331.pdf, accessed 16/08/2008.

Association Ville et Aéroport. (2003). *Les retombées économiques et fiscales des grands sites aéroportuaires.* 2ème Rencontres parlementaires, Agora Europe Ed.

Awada, F. (2004). Gouvernance métropolitaine, gouvernance aéroportuaire: acteurs et enjeux en Ile-de-France. *Cahiers de l'Institut d'Aménagement et d'Urbanisme de la Région Ile-de-France* , 262-270.

BAA. (2005). *Annual report 2004/05: Success through innovation.* London.

BAA. (2007). *Leading airlines 2006.* www.baa.com, accessed 10/07/2007.

BAA. (2008). *Annual report 2007.* London.

Bailey, E. E. (1981). Contestability and the Design of Regulatory and Antitrust Policy. *American Economic Review , 71*, 178-183.

Bailey, E. E., Graham, D. R., & Kaplan, D. P. (1985). *Deregulating the Airlines.* Cambridge, Mass: The MIT Press.

Bamberger, G. E., & Carlton, D. W. (2006). Predation and the Entry and Exit of Low-Fare Carriers. In D. Lee (Ed.), *Advances in Airline Economics: Competition Policy and Antitust* (Vol. 2, pp. 1-23). Amsterdam et al: Elsevier.

Bania, N., Bauer, P. W., & Zlatoper, T. J. (1998). U.S. Air Passenger Service: A taxonomy of route networks, hub locations, and competition. *Transport Research Part E: Logistics and Transportation Review , 34* (1), 53-74.

Barnett, A., Curtis, T., Goranson, J., & Patrick, A. (1992). Better than ever: nonstop jet service in era of hubs and spokes. *Sloan Management Review , 33* (2), 49-54.

Barraqué, B. (2002). Quels indicateurs de gêne et quelle démarche participative pour quelle politique territoriale d'aéroports ? *Annales des mines* , 23-33.

Barrett, S. D. (1987). *Flying High: Airline Prices and European Regulation* . Avebury, Aldershot.

Barrett, S. D. (2000). Airport competition in the deregulated European aviation market. *Journal of Air Transport Management , 6* (1), 13-27.

Barrett, S. D. (2004a). *Airports and Communities in a deregulated market.* Presentation to the 7th Hamburg Aviation Conference, Hamburg.

Barrett, S. D. (2004b). How do the demands for airport services differ between full-service and low-cost carriers? *Journal of Air Transport Management , 10* (1), 33-39.

Barrett, S. D. (2004c). The sustainability of the Ryanair model. *International Journal of Transport Management , 2* (2), 89-98.

Barrett, S. D. (2005). The role of airports in the transport chain. In ECMT (Ed.), *Airports as multimodal interchange nodes* (pp. 41-66). Report of the Round Table N°126 on transport economics, held in Paris on 20th-21st March 2003. Paris.

Bass, T. (2003). The role of market forces in the allocation of airport slots. In K. Boyfield (Ed.), D. Starkie, T. Bass, & B. Humphreys, *A Market in Airport Slots* (pp. 80-93). iea The Istitute od Economic Affaires. London.

Bastakis, C., Buhalis, D., & Butler, R. (2004). The perception of small and medium sized tourism accomadation providers ont he impacts of the tour operators' power in Eastern Mediterranean. *Tourism Management , 25* (3), 151-170.

Bateman, I. J., Jones, A. P., Lovett, A. A., Lake, I. R., & Day, B. H. (2002). Applying Geographical Information Systems (GIS) to Environmental and Resource Economics. *Environmental and Resource Economics , 22* (1-2), 219-269.

Bauchet, P. (1998). *Les transports mondiaux, instruments de domination.* Paris: Economica.

Baudouin, T. (2000). De l'aéroport à la plate-forme de commerce mondial, le nouveau rôle des villes de la métropole. In M. Collin, & C. Drouet (Eds.), *Aéroports et dynamique des territoires* (pp. 27-33). Comité scientifique sous la responsabilité d'Alain Bourdin et de Michel Savy, coordonné par Michèle Collin et Eric Charmes. DRAST 99 MT 45. Rapport pour le PREDIT. Champs-sur-Marne: ARDU.

Bauer, P. W. (1987). Airline Hubs: A Study of Determining Factors and Effects. *Economic Review (Federal Reserve Bank of Cleveland) , 23* (4), 13-19.

Baum, H., & Weingarten, F. (1992). *Kooperation zwischen Schienen- und Luftverkehr, Studie für das Deutsche Verkehrsforum.* Köln.

Baum, H., Esser, K., & Kurte, J. (2004). *Standortfaktor Flughafen Frankfurt Main – Bedeutung für die für die Struktur, Entwicklung und Wettbewerbsfähigkeit der Wirtschaft der Region Frankfurt/Rhein-Main (G 19.2).* Gutachten zum Ausbau des Flughafens Frankfurt Main, Unterlagen für das Planfeststellungsverfahren. Köln: Institut für Verkehrswissenschaft der Universität Köln, KE-CONSULT.

Baumol, W. J., & Willig, R. D. (1986). Contestability: Developments since the book. *Oxford Economic Papers , 38,* 9-36.

Baumol, W. J., Panzar, J. C., & Willig, R. D. (1982). *Contestable markets and the theory of industry structure.* New York: Harcourt Brace Jovanovich.

Baumol, W. J., Panzar, J. C., & Willig, R. D. (1988). *Contestable markets and the theory of industry structure* (Revised ed.). New York: Harcourt Brace Jovanovich.

Becker, S. (1999). *Reorganisation der Luftfrachtkonsolidierung: Eine Analyse strategischer Allianzen von Luftfrachtspeditionen.* Beiträge aus dem Institut für Verkehrswissenschaft an der Universität Münster, Heft 147. Göttingen: Vandenhoeck & Ruprecht.

Beckers, T., Fritz, J.-S., von Hirschhausen, C., & Müller, S. (2003). *Privatisierung und Re-Regulierung der deutschen Flughäfen unter Berücksichtigung internationaler Erfahrungen.* Berlin: TU Berlin, Fachgebiet Wirtschafts- und Infrastrukturpolitik.

Beer, T., & Paesler, R. (1997). Der Flughafen München II: Abgrenzung des Passagiereinzugsgebietes in Abhängigkeit von luftverkehrsspezifischen Rahmenbedingungen. In H.-D. Haas (Ed.), *Zur Raumwirksamkeit von Grossflughäfen: Wirtschaftsgeographische Studien zum Flughafen München II* (pp. 21-96). Regensburg: Verlag Michael Lassleben Kallmünz.

Berghof, R., Schmitt, A., Eyers, C., Haag, K., Middel, J., Hepting, M., et al. (2005). *CONSAVE 2050 - Constrained Scenarios on Aviation and Emissions: Executive Summary.* Project funded by the European Commission, Contract number G4MA-CT-2002-04013.

Bernadet, M. (2006). Les professions du transport. *Techniques de l'Ingénieur* . AG8020.

Berthon, E. (2004a). La difficile gestion du développement aéroportuaire en Europe. *Cahiers de l'Institut d'Aménagement et d'Urbanisme de la Région Ile-de-France* (139-140), 242-250.

Berthon, E. (2004b). Le projet COFAR. *Cahiers de l'Institut d'Aménagement et d'Urbanisme de la Région Ile-de-France* (139-140), 241.

Berthon, E. (2004c). L'impact économique des aéroports franciliens. *Cahiers de l'Institut d'Aménagement et d'Urbanisme de la Région Ile-de-France* (139-140), 146-157.

Berthon, E., Bringand, F., & Prins, M. (2001). *L'Airport city et son intégration régionale.* Rapport final pour la Commission Européenne dans le cadre du projet INTERREG IIC COFAR, Thème 2.3. Paris: IAURIF, ADP.

Betancor, O., & Campos, J. (2000). The first decade of the European air transport deregulation: an empirical note. *Public works management & policy , 5* (2), 135-146.

Bickenbach, F., Kumkar, L., Sichelschmidt, H., Soltwedel, R., & Wolf, H. (2005). *Ausbau der Flughafeninfrastruktur: Konflikte und institutionelle Lösungsansätze.* Berlin, Heidelberg: Springer.

Bitner, M. J., & Booms, B. H. (1982). Trends in Travel and Tourism Marketing: The Changing Structure of Distribution Channels. *Journal of Travel Research , 20* (4), 39-44.

Blazy, J.-P. (1999). *Rapport d'information de M. Jean-Pierre Blazy déposé en application de l'article 145 du Règlement par la Commission de la Production et des Echanges sur la politique aéroportuaire.* N° 1671, Assemblée Nationale.

Boeing. (2007). *Current Market Outlook.*

Boeing. (2008). *Calculation of the tax on air noise pollution.* www.boeing.com/commercial/noise/FranceNoiseTax2008.pdf, accessed 12/01/2009.

Boiteux, M. (2001). *Transports: choix des investissements et coût des nuisances.* La documentation française.

Bonnassies, O. (1997). Outsourcing the Ground Handling Activity? *Avmark Aviation Economist , 14* (6), 4-8.

Boon, B., Davidson, M., Faber, J., & van Velzen, A. (2007). *Allocation of allowances for aviation in the EU ETS: The impact on the profitability of the aviation sector under high levels of auctioning* . Final report. Commissioned by WWF UK. Delft: CE Delft.

Borrmann, J., & Finsinger, J. (1999). *Markt und Regulierung.* München: Vahlen.

Boston Consulting Group. (2004). *Airports - Dawn of a new era.* Munich.

Bourdin, A. (2000). Gouvernance et grandes infrastructures de transport: Y a-t-il une spécificité des aéroports ? In M. Collin (Ed.), *Aéroports et dynamique des territoires* (pp. 35-44). Comité scientifique sous la responsabilité d'Alain Bourdin et de Michel Savy, coordonné par Michèle Collin et Eric Charmes. DRAST 99 MT 45. Rapport pour le PREDIT. Champs-sur-Marne: ARDU.

Bourqui, D. P. (2006). *L'accès au marché unique du transport aérien dans l'Union européenne.* Bâle: Helbing Lichtenhain Verlag.

Branch, A. (2000). *Export Practice and Management* (4th ed.). London: Thomson Learning.

Brueckner, J. K., & Zhang, Y. (2001). A model of scheduling in airline networks: How a hub-and-spoke system affects flight frequency, fares and welfare. *Journal of Transport Economics and Policy , 35* (2), 195-222.

Brunet, R., Ferras, R., & Théry, H. (1993). *Les mots de la géographie : dictionnaire critique.* Montpellier: Reclus, Paris: La Documentation française.

Budeanu, A. (2005). Impacts and responsibilities for sustainable tourism: a tour operator's perspective. *Journal of Cleaner Production , 13* (2), 89-97.

Burghouwt, G. (2007). *Airline Network Devlopment in Europe and its Implications for Airport Planning.* Aldershot: Ashgate.

Burghouwt, G., & De Wit, J. (2005). The temporal configurations of airline networks. *Journal of Air Transport Management , 11* (3), 185-198.

Burghouwt, G., & Hakfoort, J. (2001). The evolution of the European aviation network, 1990-1998. *Journal of Air Transport Management , 7* (5), 311-318.

Burghouwt, G., Hakfoort, J., & Van Eck, J. R. (2003). The spatial configuration of airline networks in Europe. *Journal of Air Transport Management , 9* (5), 309-323.

Burmeister, A., & Colletis-Wahl, K. (1997). Proximity in Production Networks: The Circulatory Dimension. *European Urban and Regional Studies , 4* (3), 231-241.

Busquets, J. (2000). L'aéroport comme morphologie urbaine: Evolution récente et tendances en Europe. In *Aéroports et dynamiques des territoires* (pp. 45-62). Comité scientifique sous la responsabilité d'Alain Bourdin et de Michel Savy, coordonné par Michèle Collin et Eric Charmes. DRAST 99 MT 45. Rapport pour le PREDIT. Champs-sur-Marne: ARDU.

Butler, R. V., & Huston, J. H. (1990). Airline service to non-hub airport ten years after deregulation. *Logistics and Transportation Review , 26*, 3-16.

Butler, R. V., & Huston, J. H. (1991). The Location of Airline Hubs. *Southern Economic Journal , 57* (4), 976-981.

Butler, R. V., & Huston, J. H. (1993). Airline Hubs in the Single European Market: A Benchmark Analysis. *Review of Industrial Organization , 8* (4), 407-417.

Button, K. J. (1993a). *Transport Economics* (2nd ed.). Cheltenham: Edward Elgar.

Button, K. J. (1993b). *Transport, the Environment and Economic Policy.* Cheltenham: Edward Elgar.

Button, K. J. (1994). *Chapter 1: Overview of Internalising the Social Costs of Transport.* OECD/ECMT Seminar 1993 'Internalising the Social Costs of Transport'. Paris.

Button, K. J. (1999). The Usefulness of Current International Air Transport Statistics. *Journal of Transportation and Statistics , 2* (1), 71-92.

Button, K. J. (2002). Debunking some common myth about airport hubs. *Journal of Air Transport Management , 8* (3), 177-188.

Button, K. J. (2005). Market and government failures in transportation. In K. J. Button, & D. A. Hensher (Eds.), *Handbook of transport strategy, policy and institutions* (Vol. 6, pp. 11-28). Amsterdam: Elsevier.

Button, K. J. (2004). *Wings across Europe: towards an efficient European air transport system.* Aldershot: Ashgate.

Button, K. J., & Stough, R. (2000). *Air Transport Networks: Theory and Policy Implications.* Cheltenham (UK), Northampton (MA, USA): Edward Elgar.

Button, K. J., Haynes, K., & Stough, R. (1998). *Flying into the future.* Cheltenham: Edward Elgar.

Calais, C. (2006). UPS aggrandit son hub européen à Cologne. *Supply Chain Magazine* (3), 38.

Calder, S. (2003). *No Frills - The Truth Behind the Low-Cost Revolution in the Skies* (2nd ed.). London: Virgin.

Carey, S., Gountas, Y., & Gilbert, D. (1997). Tour operators and destination sustainability. *Tourism Management , 18* (7), 425-431.

Carlsson, F., & Hammar, H. (2002). Incentive-based regulation of CO2 emissions from international aviation. *Journal of Air Transport Management , 8* (6), 365-372.

Carney, M., & Mew, K. (2003). Airport governance reform: a strategic management perspective. *Journal of Air Transport Management , 9* (4), 221-232.

Carré, A.-D. (2000a). *Aéroports et stratégie d'entreprise: Les aéroports, des entreprises à part entière* (Vol. 1). Paris: Les Presses de l'Institut du Transport Aérien.

Carré, A.-D. (2000b). *Aérports et stratégie d'entreprise: La libéralisation de la gestion des aéroports* (Vol. 2). Paris: Les Presses de l'Institut du Transport Aérien.

Cattan, N., Pumain, D., Rozenblatt, C., & Saint-Julien, T. (1999). *Le Système des Villes européennes* (2nd ed.). Paris: Anthropos.

Cavlek, N. (2002). Tour operators and destination safety. *Annals of Tourism Research , 29* (2), 478-496.

Charmes, E. (2000). Synthèse des travaux du comité scientifique. In M. Collin, & C. Drouet (Eds.), *Aéroports et dynamique des territoires* (pp. 11-20). Comité scientifique sous la responsabilité d'Alain Bourdin et de Michel Savy, coordonné par Michèle Collin et Eric Charmes. DRAST 99 MT 45. Rapport pour le PREDIT. Champs-sur-Marne: ARDU.

Chauvel, J.-P. (2004). La fiscalité locale générée par les activités aéroportuaires. *Cahiers de l'Institut d'Aménagement et d'Urbanisme de la Région Ile-de-France* (139-140), 158-162.

Cherradi, N. (2004). Emploi et formation dans le secteur de Roissy : un partenariat actif au service de tous. *Cahiers de l'Institut d'Aménagement et d'Urbanisme de la Région Ile-de-France* (139-140), 170-177.

Christiansen, U. (1977). *Verkehrsflughäfen im Wettbewerb: Das Beispiel der Bundesrepublik Deutschland.* Verkehrswissenschaftliche Studien aus dem Institut für Verkehrswissenschaft der Universität Hamburg Nr. 31. Göttingen: Vandenhoeck & Ruprecht.

Church, J., & Ware, R. (2000). *Industrial Organization: A Strategic Approach.* Boston: McGraw-Hill.

Cidell, J. L., & Adams, J. S. (2001). *The groundside effects of air transportation.* Center for Transportation Studies, Department of Geography, University of Minnesota.

Coase, R. H. (1960). The Problem of Social Cost. *Journal of Law and Economics* (3), 1-44.

Cohas, F. J., Belobaba, P. P., & Simpson, R. W. (1995). Competitive fare and frequency effects in airport market share modeling. *Journal of Air Transport Management , 2* (1), 33-45.

Colletis-Wahl, K. (2000). Le lien entre aéroports et dynamiques territoriales, quelques questions. In *Aéroports et dynamique des territoires* (pp. 63-80). Comité scientifique sous la responsabilité d'Alain Bourdin et de Michel Savy, coordonné par Michèle Collin et Eric Charmes. DRAST 99 MT 45. Rapport pour le PREDIT. Champs-sur-Marne: ARDU.

Collin, M. (2000). Note de synthèse - Compte rendu de la réunion du Comité scientifique du jeudi 27 mars 2000. In *Aéroports et dynamique des territoires* (pp. 143-145). Comité scientifique sous la responsabilité d'Alain Bourdin et de Michel Savy, coordonné par Michèle Collin et Eric Charmes. DRAST 99 MT 45. Rapport pour le PREDIT. Champs-sur-Marne: ARDU.

Collins Essential English Dictionary (2nd ed.). (2006). HarperCollinsPublishers. Retrieved on 14 April 2009 form www.thefreedictionary.com.

Commission of the European Communities. (1981). *Scheduled Passenger Air Fares in the EEC.* COM(81) 398 Final, Brussels.

Commission of the European Communities. (1984). *Civil Aviation Memorandum No. 2: Progress towards the development of a Community air transport policy.* COM(84) 72 final, Brussels.

Commission of the European Communities. (1996a). Council Directive 96/48/EC of 23 July 1996 on the operability of the trans-European hig-speed rail system. *Official Journal , L23, 17 September* , 0006-0024.

Commission of the European Communities. (1996b). *Future Noise Policy: European Commission Green Paper.* COM(96) 540 final. Brussels.

Commission of the European Communities. (1996c). *Impact of the Third Package of Air Transport Liberalization Measures.* Com(96) 514 final. Brussels.

Commission of the European Communities. (1996d). *Interaction between High Speed and Passenger Air Transport.* Interim Report on the Action COST 318. Brussels.

Commission of the European Communities. (2001). *Livre blanc - La politique européenne des transports à l'horizon 2010: L'heure des choix.* Luxembourg.

Commission of the European Communities. (2004a). *International aviation agreements - Opening the market for efficient air travel.* Brussels.

Commission of the European Communities. (2004b). *The Commission's decision on Charleroi airport promotes the activities of low-cost airlines and regional development.* IP/04/157. Brussels.

Commission of the European Communities. (2005). *Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions: Reducing Climate Change Impact of Aviation.* COM(2005) 459 final. Brussels.

Commission of the European Communities. (2007). *Flying together - EU air transport policy.* Luxembourg.

Commission of the European Communities. (2008a). *Development of Integrated Ticketing for Air and Rail Transport.* Public consultation document of the European Commission services Directorate-General "Energy and Transport". Brussels.

Commission of the European Communities. (2008b). *Report from the Commission to the Council and the European Parliament: Noise Operation Restrictions at EU Airports.* Report on the application of Directive 2002/30/EC. COM(2008) 66 final. Brussels.

Compact Oxford English Dictionary of Current English (3rd ed.). (2005). Oxford University Press. Retrieved on 14 April 2009 form www.thefreedictionary.com.

Copenhagen Airports A/S. (2010). *Group annual report 2009.* Kastrup.

Cordeau, E., & Moulinié, C. (2004). Les nuisances aéroportuaires: réalités et perceptions. *Cahiers de l'Institut d'Aménagement et d'Urbanisme de la Région Ile-de-France* (139-140), 182-206.

Cournanel, A. (2001). *Les mutations du transport aérien.* Paris: L'Harmattan.

Cranfield University Air Transport Group. (2002a). *Study on Competition between Airport and the Application of State Aid Rules, Final Report for the European Union, Volume I.* Cranfield: Cranfield University.

Cranfield University Air Transport Group. (2002b). *Study on Competition between Airport and the Application of State Aid Rules, Final Report for the European Union, Volume II: Country Reports.* Cranfield: Cranfield University.

Crawford, G., & Melewar, T. C. (2004). The importance of impulse purchasing behaviour in the international airport environment. *Journal of Consumer Behaviour , 3* (1), 85-98.

Curien, N. (2005). *Economie des réseaux.* Paris: Editions de La Découverte.

Curtin, S., & Busby, G. (1999). Sustainable Destination Development: the Tour Operator Perspective. *International Journal of Tourism Research , 1* (2), 135-147.

D'Amato, A., & D'Amato, J. (1977). The changing role of the foreign freight forwarder. *Journal of the Academy of Management Science* , Vol. 5/Supplement, 143-145.

DAST. (2006). *Le TGV et l'avion: une complémentarité qui se développe.* Les notes thématiques n° 4.

De Neufville, R. (1999). *Airport privatization: issues for the United States.* A draft paper. Massachusetts Institut of Technology. Cambridge, MA.

De Rus, G. (2008). *The Economic Effects of High Speed Rail Investment.* Discussion Paper No. 2008-16. International Transport Forum, OECD, Joint Transport Research Centre.

Dehn, W. H. (1987). *Qualitative Wachstumschancen der See- und Luftfrachtspedition in der interkontinentalen Distributionslogistik der Investitionsgüterindustrie.* Göttingen: Vandenhoeck & Ruprecht (also Doctoral Thesis at Universität Münster 1986).

Delfmann, W., Baum, H., Auerbach, S., & Albers, S. (2005). Moving targets: strategic trends in the aviation sector. In W. Delfmann, H. Baum, S. Auerbach, & S. Albers (Eds.), *Strategic Management in the Aviation Industry.* Aldershot, Cologne: Ashgate/Kölner Wissenschaftsverlag.

Demangeon, E. (2002). Fret express: Concilier croissance and environnement? *Aéroports Magazine* (333), 18-27.

Dennis, N. (2007). End of the free lunch? The responses of traditional European airlines to the low-cost carrier threat. *Journal of Air Transport Management , 13* (5), 311-321.

Department of Transport and Regional Services. (2005). *Restricting Operations by Marginally Compliant Chapter 3 Aircraft: A proposed Airport-by-Airport Approach.* Discussion Paper. Canberra: Australian Government.

Deraëd, P. (2002). *Mercer-Studie zum Airline-Markt der Zukunft: Low Cost Airlines haben sich als Herausforderer etabliert.* Presseinformation zum Erscheinen der Studie. München: Mercer Management Consulting.

Deuber, O. (2008). *Climate externalities of aviation - Particularities, economic evaluation methods and emission trading as internalisation strategy.* Paper presented at the G.A.R.S. Workshop "Aviation and Climate Change", 2 July 2008, Amsterdam.

DGAC. (2006). *Observatoire de l'aviation civile 2005-2006: Tome 1 - Analyses.* Paris.

DGAC. (2007a). *Enquête sur l'importance de l'aviation civile dans l'économie nationale et son image en termes de sûreté, de sécurité et d'environnement.* Etude réalisée par MV2 ETC. Paris: Direction Générale de l'Aviation Civile.

DGAC. (2007b). *Observatoire de l'aviation civile 2006-2007: Tome 1 - Analyses.* Paris.

Dillingwater, D. (1994). *Air freight express.* Department of Transport Technology, Loughborough University.

Dings, J., Wit, R., Leurs, B., Davidson, M., & Fransen, W. (2002). *External Costs of Aviation.* Delft: CE Delft.

Dischinger, A. H., Daigl, W., Dreykorn, W., Hiedl, W., & Rebhan, U. (2005). *Speditionsbetriebslehre* (5th ed.). Darmstadt: Winklers.

DLR, ADV. (2007). *Low Cost Monitor 1/2007: Der aktuelle Low Cost Carrier Markt in Deutschland.* Köln, Berlin.

Dobruszkes, F. (2006). An analysis of European low-cost airlines and their networks. *Journal of Transport Geography , 14* (4), 249-264.

Dobruszkes, F. (2007). *Géographie de la libéralisation du transport aérien passagers en Europe.* Thèse de doctorat. Université Libre de Bruxelles, Faculté des Sciences, Laboratoire de Géographie Humaine. Bruxelles.

Dobruszkes, F. (2008). *Libéralisation et desserte des territoires: le cas du transport aérien européen.* Bruxelles: P.I.E. Peter Lang (also Doctoral Thesis at Université Libre de Bruxelles).

Dodgson, J., Katsoulacous, Y., & Pryke, R. (1991). *Predatory behavious in aviation.* Luxembourg: EC Official Publications.

Doganis, R. (1991). *Flying off Course: The Economics of International Airlines.* London.

Doganis, R. (1992). *The airport business.* London: Routledge.

Doganis, R. (2001). *The Airline Business in the Twenty-first Century.* London: Routledge.

Doganis, R., & Thompson, G. F. (1973). *The Economics of British Airports.* London.

Doganis, R., & Thompson, G. F. (1975). The economics of regional airports. *International Journal of Transport Economics* .

Doganis, R., Lobbenberg, A., & Graham, A. (1995). *The Economic Performance of European Airports.* Research Report 3. Bedford: Department of Air Transport, College of Aeronautics, Cranfiels University.

Dublin Airport Authority plc. (2008). *Annual report and financial statements 2007.* Dublin.

Ducher, D. (1989). Roissy: de l'aéroport à l'aéroville: Introduction. *Urbanisme* (230), 39-40.

DUCSAI. (2001). *Dossier du débat public. Partie A: Dossier pour la nouvelle plate-forme aéroportuaire.* Document available on http://www.debatpublic.fr, accessed 16/08/2008.

Dumazel, R., & Humphreys, I. (1999). Travel agent monitoring and management. *Journal of Air Transport Management , 5* (2), 63-72.

Dupéron, O. (2000). *Transport aérien, aménagement du territoire et service public.* Paris: L'Harmattan.

Duron, P. (2001). *Rapport d'information N° 3401 sur la création d'un nouvel aéroport à vocation internationale.* au nom de la Délégation à l'aménagement et au développement durable du territoire, présenté à l'Assemblée nationale.

DVB. (2001a). *The European charter airline industry.* Industrial Research No. 1/2001. Frankfurt/Main: DVB VerkehrsBank.

DVB. (2001b). *The global air cargo industry.* Industrial Research No. 3/2001. Frankfurt/Main: DVB VerkehrsBank.

Eckel, C., Eckel, D., & Singal, V. (1997). Privatization and efficiency: industry effects of the sale of British Airways. *Journal of Financial Economics , 43* (2), 275-298.

ECMT. (2005). *Airports as multimodal interchange nodes.* Report of the Round Table N°126 on transport economics, held in Paris on 20th-21st March 2003. Paris.

Ehmer, H. (2000). *Der Wettbewerb im Linienluftverkehr mit kleinen Verkehrsflugzeugen.* Beiträge aus dem Institut für Verkehrswissenschaft an der Universität Münster. Heft 146. Göttingen.

Ehmer, H., & Berster, P. (2002). *Globale Allianzen von Fluggesellschaften und ihre Auswirkungen auf die Bundesrepublik Deutschland.* Köln: Deutsches Zentrum für Luft- und Raumfahrt e.V.

Ehmer, H., Berster, P., Basedow, J., & Jung, C. (2000). *Liberalisierung im Luftverkehr Deutschlands - Analyse und wettbewerbspolitische Empfehlungen.* DLR-Forschungsbericht 2000-17. Köln.

ENAC. (2007). *Annuario Statistico 2006.* Ente Nazionale per l'Aviazone Civile. Rome.

Ernst & Young, York Aviation. (2007). *Analysis of the EC Proposal to Include Aviation Activities in the Emissions Trading Scheme.*

Estienne-Henrotte, E. (1988). *L'application des règles générales du Traité de Rome au transport aérien.* Editions de l'Université libre de Bruxelles. Bruxelles.

Eurocontrol. (2007). *Low-Cost Carrier Market Update - December 2006.*

Eurostat. (2004). *Urban Audit: Methodological Handbook.* Luxembourg: Office for Official Publications of the European Communities.

Eurostat. (2007). *Urban audit reference guide: Data 2003-2004.* Luxembourg: Office for Official Publications of the European Communities.

Eurostat. (2009a). *Air passenger transport in Europe in 2007.* Statistics in focus 1/2009. Luxembourg: Office for Official Publications of the European Communities.

Eurostat. (2009b). European Regional and Urban Statistics: Reference Guide. Luxembourg: Office for Official Publications of the European Communities.

Eurostat; ITF; UNECE. (2009). *Illustrated Glossary for Transport Statistics.* Luxembourg: Eurostat, Paris: International Transport Forum, Geneva: United Nations Economic Commission for Europe.

Evans, N. (2001). The UK Air Inclusive-tour Industry: A Reassessment of the Competitive Positioning of the 'Independent' Sector. *International Journal of Tourism Research , 3* (6), 477-491.

FAA. (1999). *Airport business practices and their impact on airline competition.* Federal Aviation Authority.

Faburel, G. (2001). *Le bruit des avions: Evaluation du coût social: Entre aéroport et territoires.* Paris: Ed. Presses de l'Ecole Nationale des Ponts et Chaussées.

Faburel, G. (2003a). Le bruit des avions: Facteur de révélation et de construction des territoires. *L'Espace Géographique , 3*, 205-223.

Faburel, G. (2003b). Lorsque les territoires locaux entrent dans l'arène publique: Retours d'expérience en matière de conflits aéroportuaires. *Espaces et Sociétés* (115), 123-146.

Faburel, G. (2004a). Autour de Roissy CDG et d'Orly : Une géographie singulière ? *Cahiers de l'Institut d'Aménagement et d'Urbanisme de la Région Ile-de-France* (139-140), 98-99.

Faburel, G. (2004b). Développement des infrastructures aéroportuaires: Le débat impossible? *Cahiers de l'Institut d'Aménagement et d'Urbanisme de la Région Ile-de-France* (139-140), 234-239.

Faburel, G. (2004c). *Evaluation of noise effects in the airport conflicts: the necessity of territorial indicators - The case of Orly Airport (France).* Paper presented at inter noise 2004, 22-25 August 2004, Prague.

Faburel, G., & Barraqué, B. (2002). *Les impacts territoriaux du bruit des avions. Le cas de l'urbanisation à proximité de Roissy CDG. Ne pas évaluer pour pouvoir dire tout et son contraire.* Rapport final du CRETEIL, pour l'Agence de l'Environnement et de la Maîtrise de l'Energie, dans le cadre du Programme Concertation, Décision et Environnement du Ministère de l'Aménagement du Territoire et de l'Environnement.

Faburel, G., & coll. Mikiki, F. (2003). *Pour une territorialisation des aéroports: Acceptabilité politique du principe pollueur-payeur: Le cas bruit des avions à Roissy CDG.* Rapport du CRETEIL, Université Paris XII - Institut d'Urbanisme pour la Mission Bruit du Ministère de l'Ecologie et du Développement Durable BC 02000506.

Faburel, G., & Maleyre, I. (2007). Le bruit des avions comme facteur de dépréciations immobilières, de polarisation sociale et d'inégalités environnementales. Le cas d'Orly. *Développement durable et territoire.* Dossier 9: Inégalités écologiques, inégalités sociales, mis en ligne le 15 avril 2007. URL: http://developpementdurable.revues.org/document2775.html. Consulté le 06 février 2009.

Faburel, G., & Mikiki, F. (2004). *Valuation of aircraft noise social costs: policy and science implications.* Paper presented at the WCTR'04 conference, 4-8 July 2004, Istanbul.

Farber, S. (1998). Undesirable facilities and property values: a summary of empirical studies. *Ecological Economics , 24* (1), 1-14.

FAZ. (1998). Der Flughafen expandiert kräftig: Neues Terminal, Bürozentrum und Logistikkomplex geplant. *Frankfurter Allgemeine Zeitung, Sonderbeilage vom 25.09.1998* .

Fenger, J. (2009). Air pollution in the last 50 years - From local to global. *Atmospheric Environment , 43* (1), 13-22.

Fichert, F. (2006). Economic Instruments for Reducing Aircraft Noise: Theoretical Framework and Recent Experience. In M. Pickhardt, & J. S. Pons (Eds.), *Perspectives on Competition in Transportation* (pp. 59-76). INFER Research Perspectives Vol. 1. Berlin et al: Lit Verlag.

Fischer, J. W. (2000). Aircraft Hushkits: Noise and International Trade. *CRS Reports for Congress* (RL30547).

Flughafen München GmbH. (2007). *Statistischer Jahresbericht 2006 - Luftverkehrsstatistik.* München.

Flughafen Wien AG. (2007). *Geschäftsbericht 2006: How to run an airport - Alles, was sie für den erfolgreichen Betrieb eines Flughafens wissen müssen!* Wien.

Flughafen Zürich AG. (2008). *Annual report 2007.* Zurich.

Flughafen Wien AG. (2010). *Annual report 2009.* Zurich.

Forsyth, P. (2006). Airport Competition: Regulatory Issues and Policy Implications. In D. Lee (Ed.), *Advances in Airline Economics: Competition Policy and Antitust* (Vol. 1, pp. 347-368). Amsterdam et al: Elsevier.

Forsyth, P. (2008a). Airport Slots: Perspectives and Policies. In A. I. Czerny, P. Forsyth, D. Gillen, & H.-M. Niemeier (Eds.), *Airport Slots: International Experiences and Options for Reform* (pp. 379-405). Aldershot: Asgate.

Forsyth, P. (2008b). *The Impact of Climate Change on Competition in the Air Transport Industry.* Discussion Paper No. 2008-18. International Transport Forum, OECD, Joint Transport Research Centre.

Forsyth, P., & Niemeier, H.-M. (2008a). Prices and Regulation in Slot Constrained Airports. In A. I. Czerny, P. Forsyth, D. Gillen, & H.-M. Niemeier (Eds.), *Airport Slots: International Experiences and Options for Reform* (pp. 127-148). Aldershot: Ashgate.

Forsyth, P., Gillen, D. W., Mayer, O. G., & Niemeier, H.-M. (Eds.). (2005). *Competition versus Predation in Aviation Markets: A Survey of Experience in North America, Europe and Australia.* Published in Association with the German Aviation Research Society (GARS). Aldershot: Ashgate.

Forsyth, P., Niemeier, H.-M., & Wolf, H. (2009). *Airport Alliances and Multi-Airport Companies - Implications for Competition Policy.* Presentation to the 12th Hamburg Aviation Conference, Hamburg.

Francis, G., Fidato, A., & Humphreys, B. I. (2003). Airport-airline interaction: the impact of low-cost carriers on two European airports. *Journal of Air Transport Management , 9*, 267-273.

Francis, G., Humphreys, I., Ison, S., & Aicken, M. (2006). Where next for low cost airlines? A spatial and comparative study. *Journal of Transport Geography , 14* (2), 83-94.

Franssen, E. A., Van Wiechen, C. M., Nagelkerke, N. J., & Lebret, E. (2004). Aircraft noise around a large international airport and its impact on general health and medication use. *Occupational and Environmental Medecine , 61*, 405-413.

Fraport AG. (2005). *Geschäftsbericht 2004.* Frankfurt/Main.

Fraport AG. (2007a). *Airport Charges and Charges for Central Ground Handling Infrastructure: Frankfurt Airport - effective as of January 1, 2008.* Frankfurt.

Fraport AG. (2007b). *Geschäftsbericht 2006.* Frankfurt/Main.

Fraport AG. (2008). *Geschäftsbericht 2007: Fraport worldwide.* Frankfurt am Main.

Freathy, P. (2004). The commercialisation of European airports: successful strategies in a decade of turbulence? *Journal ofAir Transport Management , 10* (3), 191-197.

Freathy, P., & O'Connell, F. (2000). Strategic reactions to the abolition of duty free: Examples from the European airport sector. *European Management Journal , 18* (6), 638-645.

Fritsch, B. (1999). *La contribution des infrastructures au développement des régions françaises.* Presses de l'Ecole nationale des ponts et chaussées.

Fritsch, M., Wein, T., & Ewers, H.-J. (1996). *Marktversagen und Wirtschaftspolitik: Mikroökonomische Grundlagen staatlichen Handelns* (2 ed.). München: Vahlen.

Garriga, J. C. (2004). *Low-cost. A regional affair.* Research commissioned by ARC's "Transport" and "Business and Employment" Interest Groups: ARC Airport Regions Conference.

Geuens, M., Vantomme, D., & Brengman, M. (2003). Developing a typology of airport shoppers. *Working paper 2003/206* . Gent: Universiteit Gent, Faculteit Economie en Bedrijfskunde.

Giese, D. (1993). *Regionalluftverkehr und Eisenbahn als Wettbewerber im deutschen und grenzüberschreitenden Personenverkehr.* Berlin.

Gillen, D., & Lall, A. (1997). Developing measures of airport productivity and performance: an application of data envelopment analysis. *Transportation Research Part E: Logistics and Transportation Review , 33* (4), 261-274.

Gillen, D., & Lall, A. (2004). Competitive advantage of low-cost carriers: some implications for airports. *Journal of Air Transport Management , 9,* 41-50.

Gillen, D., & Morrison, W. G. (2003). Bundling, integration and the delivered price of air travel: are low cost carriers full service competitors? *Journal of Air Transport Management , 9*, 15-23.

Gilroy, B. M., Lukas, E., & Volpert, T. (2005). The European 'No-Frills'-Aviation Market: Current and Future Developments. In P. Forsyth, D. Gillen, O. Mayer, & H.-M. Niemeier

(Eds.), *Competition versus Predation in Aviation Markets: A Survey of Experience in North America, Europe and Australia* (pp. 203-233). Aldershot: Ashgate.

Girvin, R. (2009). Aircraft noise-abatement and mitigation strategies. *Journal of Aircraft Transport Management , 15* (1), 14-22.

Givoni, M. (2006). Development and Impact of the Modern High-Speed Train: A Review. *Transport Reviews , 26* (5), 593-611.

Gonzalez, R. M. (1997). The value of time: a theoretical review. *Transport Reviews , 17* (3), 245-266.

Gonzalez-Savignat, M. (2004). Competition in Air Transport: The Case of High Speed Train. *Journal of Transport Economics and Policy , 38* (1), 77-108.

Gordijn, H., & Hornis, W. (2007). *Noise-differentiation of airport-tariffs; can they make aviation more noise-sustainable in the future?* Paper to be presented at the 47th congress of the European Regional Science Association and 44th congress of the Association de Science Régionale de Langue Française in Paris. The Hague: Netherlands Institute for Spatial Research.

Graham, A. (2003). *Managing airports: An international perspective* (2nd ed.). Oxford: Butterworth-Heinemann.

Graham, A. (2008). *How important are commercial revenues to today's airports?* Presentation to the 11th Hamburg Aviation Conference, Hamburg.

Graham, B. (1995). *Geography and Air Transport.* Chichester: John Wiley & Sons.

Graham, B. (1998). Liberalization, regional economic development and the geography of demand for air transport in the European Union. *Journal of Transport Geography , 6* (2), 87-104.

Graham, M. (2009). Different models in different spaces or liberalized optimizations? Competitive strategies among low-cost carriers. *Journal of Transport Geography , 17* (4), 306-316.

Grandjot, H.-H., Roessler, I., & Roland, A. (2007). *Air Cargo Guide: An introduction to the air cargo industry* (1st english ed.). München: Huss-Verlag.

Gray, F. (1998). Landside shopping. *Communique Airport Business , June-July, 42 .*

Grimme, W. (2008). *Measuring the long-term sustainability of air transport - an assessment of the global airline fleet and its CO2-emissions up to the year 2050.* Paper presented at the G.A.R.S. Workshop "Aviation and the Environment", 26 November 2008, Bad Honnef.

Grupo Ferrovial. (2006). *Annual report 2005.* Madrid.

Grupo Ferrovial. (2007). *Annual report 2006.* Madrid.

Grupo Ferrovial. (2008). *Annual report 2007.* Madrid.

Grupo Ferrovial. (2009). *Annual report 2008.* Madrid.

Gurrea, S. D. (2006). Evidence on Pricing from the Continental Airlines and Northwest Airlines Code-Share Agreement. In D. Lee (Ed.), *Advances in Airline Economics: Competition Policy and Antitust* (Vol. 1, pp. 109-140). Amsterdam et al: Elsevier.

Guyard, M., Chapulut, J.-N., & Ranfaing, D. (2004). *Multimodalité Avion - TGV.* Ministère de l'équipement, des transports, de l'aménagement du territoire, du tourisme et de la mer. Paris: La Documentation française.

Haites, E. (2008). *Linking Emissions Trading Schemes for International Aviation and Maritime Emissions* . Margaree Consultants.

Halpern, N., & Pagliari, R. (2007a). Direct, moderating and mediating effects of market orientation on the performance of airports in Europe's peripheral areas. *Journal of Travel and Tourism Marketing , 24* (1).

Halpern, N., & Pagliari, R. (2007b). Governance structures and the market orientation of airports in Europe's peripheral areas. *Journal of Air Transport Management , 13* (6), 376-382.

Heimer, O., & Shy, O. (2006). Code-Sharing Agreements, Frequency of Flights, and Profits Under Parallel Operation. In D. Lee (Ed.), *Advances in Airline Economics: Competition Policy and Antitust* (Vol. 1, pp. 163-181). Amsterdam et al: Elsevier.

Hensher, D. A., & Button, K. J. (2003). Introduction. In D. A. Hensher, & K. J. Button (Eds.), *Handbook of Transport and Environment* (pp. 1-6). Amsterdam, Boston et al: Elsevier.

Hess, S., & Polak, J. W. (2005). Mixed logit modelling of airport choice in multi-airport regions. *Journal of Air Transport Management , 11* (2), 59-68.

Hilsinger, H.-H. (1976). *Das Flughafen-Umland: Eine Wirtschaftsgeographische Untersuchung an ausgewählten Beispielen im westlichen Europa.* Bochumer Geographische Arbeiten, Heft 23. Paderborn: Ferdinand Schöningh.

Hochtief AirPort. (2008). *Annual review 07.* Essen.

Hoffmann, L. (1958). *Die gegenseitigen Einwirkungen von Wirtschaftsstruktur eines Flughafeneinzugsgebietes und dessen Luftfrachtverkehr.* Dissertation. Nürnberg.

Holloway, C. J. (1998). *The business of tourism.* Singapore: Addison Wesley Longman Ltd.

Holmén, B. A., & Niemeier, D. A. (2003). Air quality. In D. A. Hensher, & K. J. Button (Eds.), *Handbook of Transport and the Environment* (pp. 61-79). Amsterdam, Boston et al: Elsevier.

Holzschneider, M. (2000). *Flughäfen im Personenluftverkehrsmarkt: Ein Modellansatz zur Beschreibung der Verkehrsmittel- und Flughafenwahl von Reisenden zur Vorausschätzung des Passagieraufkommens von Flughäfen.* Fakultät für Bauingenieurwesen, Dissertationsschrift Lehr- und Forschungsgebiet Flughafenwesen, Rheinisch-Westfälische Technische Hochschule Achen.

Holzschneider, M. (2003). Flughäfen im Wettbewerb: Neue Ansätze zur Prognose des Passagierverhaltens. *Internationales Verkehrswesen , 55* (7+8), 329-333.

Honey, M. (1999). *Ecotourism and sustainable development: Who owns paradise?* Washington: Island Press.

Honey, M. (2008). *Ecotourism and sustainable development: Who owns paradise?* (2nd ed.). Washington: Island Press.

Horan, H. (2002). Is the traditional Big Hub model still viable? *Aviation Strategy Analysis, July/August 2002* .

Horn, C. (2007). *Intermodality and airport competition.* 1st International Scientific Conference: Competitiveness and Complementary of Transport Modes – Perspectives for the Development of Intermodal Transport (Conference Proceedings), University of the Aegean, 10-12 May 2007, Chios.

Horstmann, U. (2003). *Finanzanalysen: Airlines - vor einer Fusionswelle?* München: Bayerische Landesbank.

Horton, G. (2006). *Forecasts of CO2 emissions from civil aircraft for IPCC.* DTI Unique Reference Number 06/2178: QINETIC.

Howard, J. A. (1963). *Marketing Management: analysis and decision* (éd. 2nd). Homewood, Illinois: Irwin Publishing.

Hsu, C.-I., & Chao, C.-C. (2005). Space allocation for commercial activities at international passenger terminals. *Transportation Research Part E: Logistics and Transportation Review , 41*, 29-51.

Hsu, C.-I., & Lin, P.-H. (2005). Performance assessment for airport noise charge policies and airline network adjustment response. *Transportation Research Part D: Transport and Environment , 10* (4), 281-304.

Hujer, R., Kokot, S., Zeiss, C., Rürup, B., & Mehlinger, C. (2004). *Einkommens- und Beschäftigungseffekte des Flughafens Frankfurt Main (G 19.1).* Gutachten zum Ausbau des Flughafens Frankfurt Main, Unterlagen für das Planfeststellungsverfahren. Frankfurt am Main, Darmstadt.

Humphreys, I. M. (1994). Travel agents and regional air services. *Journal of Air Transport Management , 1* (3), 151-160.

Humphreys, I. (1999). Privatisation and commercialisation: Changes in UK airport ownership patterns. *Journal of Transport Geography , 7* (2), 121-134.

Humphreys, I., & Francis, G. (2002). Policy issues and planning of UK regional airports. *Journal of Transport Geography , 10* (4), 249-258.

Huston, J. H., & Butler, R. V. (1988). The effects of fortress hubs on airline fares and service: the early returns. *Logistics and Transportation Review , 24*, 203-215.

IATA Air Transport Consultancy Services. (2003). *Air/ Rail Intermodality Study.* Hounslow, Middlesex (UK).

IATA. (2008). *Building a greener future* (3 ed.). International Air Transport Association, Canada.

IATA. (2009). *Emissions policy options.* http://www.iata.org/whatwedo/environment/emissions_policy.htm, accessed 02/03/2009.

IAURIF; ADP. (2001). *Airport City and Regional Embeddedness.* Final Report, Projet INTERREG IIC COFAR - Theme 2.3, by Etienne Berthon and Flore Bringand, with the cooperation of Marielle Prins - Prins DC - consultant for ADP, Paris: IAURIF.

ICAO. (2001). *ICAO's policies on charges for airports and air navigation services* (6th ed.). Doc 9082/6: International Civil Aviation Organisation.

IEA. (2007a). *CO2 Emissions from Fossil Fuel Combustion 1971-2005.* France: International Energy Agency.

IEA. (2007b). *Energy Statistics of Non-OECD Countries, 2004-2005.* France: International Energy Agency.

IEA. (2007c). *Energy statistics of OECD Countries, 2004-2005.* France: International Energy Agency.

International Civil Aviation Organization. (2004). *Consolidated statement of continuing ICAO policies related to environmental protection. Assembly resolutions in Force (as of 8 October 2004) A35-5, Doc 9848.*

International Civil Aviation Organisation. (2006). *Convention on international civil aviation: Appendix 14* (9th ed.). Montreal.

International Civil Aviation Organisation. (2007). *Outlook for air transport for the year 2025.*

ITA. (1991). *Rail/Air Complementarity in Europe: The Impact of High-Speed Train Services.* An ITA study for the Commission of the European Communities. Paris: Institute of Air Transport.

Ito, H., & Lee, D. (2006). The Impact of Domestic Codesharing Agreements on Market Airfares: Evidence from the U.S. In D. Lee (Ed.), *Advances in Airline Economics: Competition Policy and Antitust* (Vol. 1, pp. 141-161). Amsterdam et al: Elsevier.

Jarach, D. (2001). The evolution of airport management practices: towards a multi-point, multi-service, marketing-driven firm. *Journal of Air Transport Management , 7* (2), 119-125.

Jarup, L., Dudley, M.-L., Babisch, W., Houthuijs, D., Swart, W., Pershagen, G., et al. (2005). Hypertension and exposure to noise near airports (HEYNA): study design and exposure assessment. *Environmental Health Perspectives , 113* (11), 1473-1478.

Jasanoff, S. (1995). *Science at the Bar: Science and Technology in American Law.* Cambridge, MA: Harvard University Press.

Jenner, G. (2008). Mobilised Change. *Airline Business* (July 2008), 48-51.

Johnson, G., Scholes, K., Whittington, R., & Fréry, F. (2005). *Stratégique* (éd. 7th). Paris: Pearson Education France.

Johnson, J. C., & Wood, D. F. (1996). *Contemporary Logistics* (6th ed.). New York: Prentice-Hall.

Johnston, R. J., Gregory, D., Pratt, G., & Watts, M. (Eds.). (2000). *The dictionary of human geography* (4th ed.). Blackwell Publishing.

Jones, I., Viehoff, I., & Marks, P. (1993). The economics of airport slots. *Fiscal studies , 14*, 37-57.

Jones, R. (2004). A la recherche de l'introuvable nouvelle piste pour le Sud-Est anglais. *Cahiers de l'Institut d'Aménagement et d'Urbanisme de la Région Ile-de-France* (139-140), 251-256.

Jünemann, R., coll. Fränkle, A., Frye, H., Quick, A., Rauch, C., et al. (2001). *Verkehrsliche Auswirkungen und mögliche Massnahmen bei Einführung eines Nachtflugverbotes am Flughafen Frankfurt/Main.* Dortmund.

Kahn, A. E. (1988). Surprises of Airline Deregulation. *American Economic Review , 78*, 316-322.

Kanafani, A., & Ghobrial, A. A. (1985). Airline hubbing - some implications for airport economics. *Transportation Research Part A: General , 19* (1), 15-27.

Kapur, A. (1995). Airport infrastructure: the emerging role of the private sector. *World Bank Technical Paper (313)* . Washington, D.C.: The World Bank.

Keeler, M. (1973). Airport cost and congestion. *The American Economist* .

Keeler, T. E. (1990). Airline deregulation and market performance: the economic basis for regulatory reform and lessons from the US experience. In D. Banister, & K. J. Button (Eds.), *Transport in a Free Market.* London: Macmillan.

Kilian, M. (2008). The Development of the Regulatory Regime of Slot Allocation in the EU. In A. I. Czerny, P. Forsyth, D. Gillen, & H.-M. Niemeier (Eds.), *Airport Slots: International Experiences and Options for Reform* (pp. 251-269). Aldershot: Ashgate.

Kim, B., Fleming, G., Balasubramanian, S., Malwitz, A., Lee, J., Waitz, I., et al. (2005). *System for Assessing Aviation's Global Emissions (SAGE), Version 1.5, Global Aviation Emissions Inventories for 2000 through 2004.* United States Federal Aviation Administation.

Kim, H.-B., & Shin, J.-H. (2001). A contextual investigation of the operation and management of airport concessions. *Tourism Management , 22* (2), 149-155.

Kirchner, P. H. (1950). *Die Bedeutung der internationalen Spedition für die österreichische Wirtschaft* . unpublished Doctoral Thesis at Hochschule für Welthandel Wien.

Klemm, M., & Parkinson, L. (2001). UK Tour Operator Strategies: Causes and Consequences. *International Journal of Tourism Research , 3* (5), 367-375.

Klenosky, D. B., & Gitelson, R. E. (1998). Travel agents' destination recommendations. *Annals of Tourism Research , 25* (3), 661-674.

Klophaus, R. (2006). Volkswirtschaftlicher Nutzen flächendeckender Luft-Infrastruktur. *Internationales Verkehrswesen , 58* (10), 480-482.

Knitschky, G., Allemeyer, W., Lehmann, C., Jakubowski, P., & Tegner, H. (1998). *Motive und Ursachen von Personenmobilität verstehen.* Abschlussbericht im Auftrag der Enquête-Kommission "Zukunft der Mobilität" des Landtags Nordrhein-Westfalen. Münster.

Knowles, T., & Curtis, S. (1999). The Market Viability of European Mass Tourist Destinations: A Post-Stagnation Life-cycle Analysis. *International Journal of Tourism Research , 1* (2), 87-96.

Kurth, W. (2007). *Aviation in Transition: The Future of LCC and Charter.* Presentation to the 10th Hamburg Aviation Conference, Hamburg.

La Mond, A. M. (1974). An evaluation of intrastate airline regulation in California. *The Bell Journal of Economics , 7* (2), 641-657.

Laaser, C.-F. (2002). Vor- und Nachteile globaler Allianzen im Luftverkehr. In DVWG (Ed.), *Europäischer Luftverkehr - wem nützen die strategischen Allianzen?* (pp. 70-111). Heft B 246. Bergisch Gladbach.

Laaser, C.-F., Sichelschmidt, H., Soltwedel, R., & Wolf, H. (2000). *Global Strategic Alliances in Scheduled Air Transport - Implications for Competition Policy.* Kieler Diskussionsbeiträge Nr. 370. Kiel.

Laboratoire Communication et Politique, COSTECH. (2005). *Nouveaux dispositifs de concertation et formes de controverses : le choix d'un troisième aéroport pour Paris.* Projet de recherche Concertation, Décision et Environnement - Quelles places et quels impacts pour les NTIC ? Rapport final, sous la direction scientifique de Laurence Monnoyer-Smith.

Lajarge, R., & Roux, E. (2000). Territoires de projet et projets d'auteur: la complexité nécessaire. *Journées d'études ENS Géographie* .

Lartique, S. (2004). La disparité des effets d'entraînement des aéroports sur leurs territoires. *Cahiers de l'Institut d'Aménagement et d'Urbanisme de la Région Ile-de-France , 139-140,* 163-169.

Lascoumes, P. (1994). *L'Eco-pouvoir, environnements et politiques.* La Découverte.

Lee, D. S., Lim, L. L., & Raper, S. C. (2005). *The Role of Aviation Emissions in Climate Stabilization Scenarios.* Paper presented at the Avoiding Dangerous Climate Change Symposium, 1-3 February 2005, Exeter.

Lenzen, M., Dey, C., & Hamilton, C. (2003). Climate Change. In D. A. Hensher, & K. J. Button (Eds.), *Handbook of Transport and the Environment* (pp. 37-60). Amsterdam, Boston et al: Elsevier.

Lévêque, F. (2000). *La réglementation des externalités.* Intervention à "Ecole thématique sur les règles publiques", organisée par l'IEPE Grenoble. Paris: CERNA.

Levine, M. E. (1965). Is regulation necessary? California air transportation and national regulatory policy. *Yale Law Journal , 74*, 1416-1447.

Levine, M. E. (1987). Airline competition in deregulated markets: theory, firm strategy and public policy. *Yale Journal on Regulation , 4*, 393-494.

Liese, H. (1977). *Zur Problematik von Prognosen im Personenluftverkehr unter besonderer Berücksichtigung der Abhängigkeit der Luftverkehrsnachfrage von sozio-ökonomischen Einflussfaktoren.* Berlin: TU Berlin, Fachbereich Verkehrswesen.

Lobbenberg, A. (1995). Strategic responses of charter airlines to single market integration. *Journal of Air Transport Management , 2* (2), 67-80.

London Luton Airport, Luton Borough Council. (2007). *Annual Monitoring Report 2006.* Luton: Planning Division, Department of Environment and Regeneration, Luton Borough Council.

Lopez-Pita, A., & Robusté, F. (2005). Impact of High-Speed Lines in Relation to Very High Frequency Air Services. *Journal of Public Transportation , 8* (2), 17-35.

Lorenz, W. (2005). *Leitfaden für Spediteure und Logistiker in Ausbildung und Beruf (Band 1).* Hamburg: Deutscher Verkehrs-Verlag.

Lowe, S., Faber, J., Mason, A., Veldhuis, J., Leishout, R., & Nelissen, D. (2007). *Implications of EU Emission Trading Scheme for Competition Between EU and Non-EU Airlines.* Final Draft Report for the Directorate General for Transport and Civil Aviation. In Association with SEO Amsterdam: CE Delft, MVA Consultancy.

Lu, C. H.-Y., & Morrell, P. (2001). Evaluation and implications of environmental charges on commercial flights. *Transport Reviews , 21* (3), 377-395.

Lu, C., & Morrell, P. (2006). Determination and applications of environmental costs at different sized airports - aircraft noise and engine emissions. *Transportation , 33* (1), 45-61.

Lucke, H. J., Eisenkopf, A., Lüsch, J., Milczarek, N., Stabenau, H., Woda, A., et al. (2001). Verkehrsunternehmen als Logistikdienstleister. In H. Krampe, & H.-J. Lucke (Eds.), *Grundlagen Logistik: Einführung in Theorie und Praxis logistischer Systeme* (pp. 251-300). Munich: Huss-Verlag.

Lutz, V. (1993). *Horizontale Strategische Allianzen - Ansatzpunkte zu ihrer Institutionalisierung.* Duisburger Betriebswirtschaftliche Schriften. Band 5. Hamburg.

Macintosh, A., & Wallace, L. (2009). International aviation emissions to 2025: Can emissions be stabilised without restricting demand? *Energy Policy , 37* (1), 264-273.

Macquarie Airports. (2008a). *Annual report 2007.* Sydney.

Macquarie Airports. (2008b). *Fact Sheet.* Sydney.

Malina, R. (2006). *Potenziale des Wettbewerbs und staatlicher Regulierungsbedarf von Flughäfen in Deutschland.* Beiträge aus dem Institut für Verkehrswissenschaft an der Universität Münster, Heft 158. Göttingen: Vandenhoeck & Ruprecht.

Mandel, B. (1999a). *Airport Choice and Competition: A Strategic Approach.* Paper presented at the 3rd ATRG Conference in Hong-Kong. Karlsruhe: Mkmetric GmbH.

Mandel, B. (1999b). Measuring competition: approaches for (de-) regulated markets. In W. Pfähler, H.-M. Niemeier, & O. G. Mayer (Eds.), *Airports & Air Traffic: Regulation, Privatisation and Competition* (pp. 71-92). Frankfurt am Main: Peter Lang Press.

MAp. (2010). *Annual report 2009.* Sydney.

Marchetti, N. (2005). *Les confits de localisation: le syndrome NIMBY.* Rapport Bourgogne 2005RB-05. CIRANO.

Marland, G., Andres, R., & Boden, T. (2007). *Global CO2 emissions from fossil-fuel burning, cement manufacture, and gas flaring: 1751-2004.* United States: Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory.

Martinez, M. (2001). *L'impact des nuisances sonores de l'aéroport de Roissy CDG sur le marché foncier et l'immobilier: Approche exploratoire.* Association des Etudes Foncières, Rapport pour l'European Airport Project COFAR, et la Ville de Tremblay-en-France.

Mason, K. J. (2001). Marketing low-cost airline services to business travellers. *Journal of Air Transport Management , 7* (2), 103-109.

Mason, K., Whelan, C., & Williams, G. (2000). *Europe's low cost airlines: An analysis of the economics and operating characteristics of Europe's charter and low cost scheduled airlines.* Air Transport Group Research Report 7. Cranfield University.

Mathieu, G., & Pavaux, J. (2004). Les transferts de trafic possibles de l'avion vers le rail: Le cas des aéroports de Paris. *Transports* (407), 281-299.

Matthäi, J. (1985). *Spedition - Grundlagen - Heft 1.* Schriftenreihe der Zentralstelle für Bildung des Ministeriums für Verkehrswesen. Berlin.

Maurice, L. Q., Hockstad, L., Höhne, N., Hupe, J., Lee, D. S., & Rypdal, K. (2006). Mobile Combustion. In H. S. Egglestone, L. Buendia, K. Miwa, T. Ngara, & K. Tanabe (Eds.), *2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 2 Energy* (pp. 56-74). Prepared by the National Greenhouse Gas Inventories Programme. Hayame, Kanagawa, Japan: IGES.

Mayer, L. (1933). *Speditionsgeschäft oder Speditionsbetrieb.* Berlin: Heymanns or Vienna: Oesterreichischer Wirtschaftsverlag.

McShan, S., & Windle, R. (1989). The implications of of hub-and-spoke routing for airline costs and competitiveness. *Logistics and Transportation Review , 25*, 209-230.

Merenne-Schoumaker, B. (2002). *Analyser les territoires: savoirs et outils* (éd. 2ème). Rennes: Presses Universitaires de Rennes.

Merlin, P. (1992). *Géographie des transports.* Que sais-je? N° 1427. Paris: Presses Universitaires de France.

Metzger, O. (1922). Die internationale Spedition. In E. Esch (Ed.), *Die Spedition - Vorträge gehalten im Sonderlehrgang für Spedition 1922* (pp. 89-99). Cologne: Universitäts-Buchhandlung Oskar Müller.

Meyer, J. R., & Oster, C. V. (1987). *Deregulation and the Future of Intercity Passenger Travel.* Cambridge: MIT Press.

Middecke, R. (2000). *Designing the perfect airport to optimise retail revenue: a retailers point of view.* 9th ACI-Europe Airport Trading Conference, London.

Midgley, D., & Wills, G. (1969). Institutional influence in air passenger routeing decisions. *European Journal of Marketing , 3* (4), 259-266.

Mintzberg, H. (1987). The Strategy Concept I: Five Ps For Strategy. *California Management Review* (30), 11-24.

Mintzberg, H., & Quinn, J. B. (1991). *The Strategy Process: Concepts,concepts, cases* (2nd ed.). Prentice-Hall International.

Mintzberg, H., & Waters, J. A. (1982). Tracking strategy in an entrepreneurial firm. *Academy of management journal* , 465-499.

Mittendorf, H., & Oelfke, W. (1974). *Güterverkehr und Spedition - Verkehrsbetriebslehre.* Bad Homburg, Berlin, Zürich: Gehlen.

Monitor Group. (2004). *Monitor-Studie belegt: Charter Airlines bedroht - Pauschalanbieter kaufen vermehrt Billigflugkapazitäten.* Press release 28 April 2004.

Moore, T. G. (1986). Airline deregulation: its effects on passengers, capital, and labor. *Journal of Law and Economics , 29* (1), 1-28.

Morrell, P., & Lu, C. H.-Y. (2000). Aircraft noise social cost and charge mechanisms - a case study of Amsterdam Airport Schiphol. *Transportation Research Part D: Transport and Environment , 5* (4), 305-320.

Morrison, S. A. (2001). Actual, adjacent, and potential competition: estimating the full effect of Soutwest Airlines. *Journal of Transport Economics and Policy , 35*, 239-256.

Morrison, S. A. (2002). Airline service: the evolution of competition since deregulation. In L. L. Duetsch (Ed.), *Industry studies* (3rd ed.). Armonk, NY: M.E. Sharpe.

Morrison, S. A. (2005). Deregulation of US air transportation. In K. J. Button, & D. A. Hensher (Eds.), *Handbook of transport strategy, policy and institutions* (Vol. 6, pp. 405-420). Amsterdam et al: Elsevier.

Morrison, S. A., & Winston, C. (1986). *The economic effects of airline deregulation.* Washington, D.C.: The Brookings Institution.

Morrison, S. A., & Winston, C. (1987). Empirical implications and tests of the contestability hypothesis. *Journal of Law and Economics , 30* (1), 53-56.

Morrison, S. A., & Winston, C. (1995). *The evolution of the airline industry.* Washington, D.C.: Brookings Institution.

Morrison, S. A., & Winston, C. (2000). The remaining role of government policy in the airline industry. In S. Peltzman, & C. Winston (Eds.), *Deregulation of network industries: what's next?* Washington, D.C.: AEI-Brookings Joint Center for Regulatory Studies.

Müller-Jentsch, D. (2007). *The European Common Aviation Area and the Western Balkans: Domestic Reforms and Regional Integration in Air Transport.* European Commission - World Bank Office For South East Europe.

Murphy, P. R., & Daley, J. M. (1995). International freight forwarders: current activities and operational issues. *International Journal of Purchasing and Materials Management , 31* (3), 22-27.

Murr, A. (1979). *Export/Import Traffic Management and Forwarding* (6th ed.). Centreville: Cornell Maritime Press.

Navrud, S. (2002). *The State-of-Art on Economic Valuation of Noise.* Report to the European Commission DG Environment, Department of Economics and Social Sciences, Agricultural University of Norway.

Nelson, J. P. (1980). Airports and property values. *Journal of Transport Economics and Policy , 14* (1), 37-52.

Nelson, J. P. (2004). Meta-Analysis of Airport Noise and Hedonic Property Values: Problems and Prospects. *Journal of Transport Economics and Policy , 38* (1), 1-28.

NERA. (2004). *Study to assess the effects of different slot allocation schemes.* A Final Report for the European Commission, DG TREN. London.

Nero, G., & Black, J. A. (2000). A critical examination of an airport noise mitigation scheme and an aircraft noise charge: the case of capacity expansion and externalities at Sydney (Kingsford Smith) Airport. *Transportation Research Part D: Transport and Enviornment , 5* (6), 433-461.

Nero, G., & Black, J. A. (1998). Hub-and-spoke networks and the inclusion of environmental costs on airport pricing. *Transportation Research Part D: Transport and Environment , 3* (5), 275-296.

Niejahr, M. (1999). Regulation and Liberalisation of International Air Transport - Prospects for Reform from the Perspective of the European Commission. In W. Pfähler, H.-M. Niemeier, & O. G. Mayer (Eds.), *Airports and air traffic: regulation, privatisation, and competition* (pp. 59-67). Economic forum of the free and hanseatic city of Hamburg. Frankfurt am Main et al: Lang.

O'Connor, K. (2003). Global air travel: toward concentration or dispersal? *Journal of Transport Geography , 11* (2), 83-92.

O'Connor, W. E. (1995). *An introduction to airline economics* (5th ed.). Westport, Connecticut: Praeger.

OECD. (1997). *Environmental taxes and green tax reform.* OP-OE/3667. Paris: Organisation for Economic Cooperation and Development.

OECD. (1991). *Fighting noise in the 1990s.* Paris, Washington D.C.: Organisation for Economic Cooperation and Development, OECD Publications and Information Centre.

Offner, J.-M. (1993). Les "effets structurants" du transport : mythe politique, mystification scientifique. *L'Espace géographique* (3), 233-242.

Offner, J.-M., & Pumain, D. (Éds.). (1996). *Réseaux et territoires: Significations croisées.*

Ohling, H. (1950). *Export - Import - Spedition: Handbuch für die Praxis und Technik des Aussenhandels* (3rd rev. ed.). Hamburg: Hemmerich & Lesser.

Olsthoorn, X. (2001). Carbon dioxide emissions from international aviation: 1950-2050. *Journal of Air Transport Management , 7* (2), 87-93.

OPSTE. (2007). *Dossier n° 8 : Les stratégies aéroportuaires.* Les Dossiers de l'Observatoire Transports/Europe. Paris: Conseil National des Transports.

O'Sullivan, A., & Sheffrin, S. M. (1996). *Economics: Principles in action.* Upper Saddle River, New Jersey: Pearson Prentice Hall.

Oum, T. H., Adler, N., & Yu, C. (2006a). Privatization, Corporatization, Ownership Forms and their Effects on the Performance of the World's Major Airports. *The UBC P3 Project: Working Paper 2006-02* . Vancouver: Sauder School of Business, University of British Columbia.

Oum, T. H., Adler, N., & Yu, C. (2006b). Privatization, corporatization, ownership forms and their effects on the performance of the world's major airports. *Journal of Air Transport Management , 12* (3), 109-121.

Oum, T. H., Zhang, A., & Zhang, Y. (1995). Airline network rivalry. *Canadian Journal of Economics , 28,* 836-857.

Oum, T. H., Zhang, A., & Zhang, Y. (2004). Alternative forms of economic regulation and their efficiency implications for airports. *Journal of Transport Economics and Policy , 38,* 217-246.

Owen, B., & Lee, D. (2006). *Allocation of international aviation emissions from scheduled air traffic - future cases, 2005 to 2050.* Report 3 of 3. Study on the Allocation of Emissions from International Aviation to the UK Inventory - CPEG7. Final Report to DEFRA Global Atmosphere Division: Manchester Metropolitan University.

OXERA. (2003). *Assessment of the financial impact on airlines of integration into the EU ETS.* London.

Oxford Economic Forecasting. (1999). *The contribution of the aviation industry to the UK economy.*

Parker, D. (1999). The performance of BAA before and after privatization. *Journal of Transport Economics and Policy , 38,* 217-246.

Pels, E. (2000). Airport economics and policy: Efficiency, competition, and interaction with airlines. *Tinbergen Institute Research Series n° 222* . Free University Amsterdam.

Pels, E., Nijkamp, P., & Rietveld, P. (2000). Airport and Airline Competition for Passengers Departing from a Large Metropolitan Area. *Journal of Urban Economics , 48* (1), 29-45.

Pels, E., Nijkamp, P., & Rietveld, P. (2001). Relative efficiency of European airports. *Transport Policy , 8,* 183-192.

Pels, E., Nijkamp, P., & Rietveld, P. (2003a). Access to and competition between airports: a case study from the San Francisco Bay area. *Transportation Research Part A , 37* (1), 71-83.

Pels, E., Nijkamp, P., & Rietveld, P. (2003b). Inefficiencies and scale economies of European airport operations. *Transportation Research Part E: Logistics and Transportation Review , 39,* 341-361.

Peltzman, S. (1976). Toward a more general theory of regulation. *Journal of Law and Economics , 19,* 211-240.

Penner, J. E., Lister, D. H., Griggs, D. J., Dokken, D. J., & McFarland, M. (Eds.). (1999). *Aviation and the global atmosphere: Summary for policymakers.* IPCC Special Report. Geneva: International Panel on Climate Change, UNEP, WMO.

Pennington, G., Topham, N., & Ward, R. (1990). Aircraft noise and residential property values adjacent to Manchester International Airport. *Journal of Transport Economics and Policy , 24* (1), 49-59.

Perry, A. (1994). The changing face of flying to the sun. *The Air Transport Management Journal , 1* (4), 251-254.

Peter, J. P., & Olson, J. C. (1993). *Consumer Behavior and Marketing Strategy* (3rd ed.). Homewood, Illinois: Irwin Publishing.

Pfohl, H.-C. (2003). *Logistiksysteme - Betriebswirtschaftliche Grundlagen* (7th ed.). Berlin, Heidelberg: Springer.

Pieper, H. (1986). Luftverkehr und Kurzstrecken im Wettberwerb mit der Höchgeschwindigkeitsbahn. *Internationales Verkehrswesen , 38* (3), 195-199.

Pigou, A. (1920). *The Economics of Welfare.* London: Macmillan.

Pinchemel, G., & Pinchemel, P. (1994). *La face de la Terre: Eléments de géographie* (éd. 3ème). Paris: A. Colin.

Plassard, F. (1989). *Interconnexions et nouvelles parités.* Les actes du colloque "Les couloirs Rhin-Rhône dans l'espace européen". Lyon: LET.

Plassard, F. (1992). Les réseaux de transport et de communication. Dans A. Bailly, R. Ferras, & D. Pumain (Éds.), *Encyclopédie de géographie.* Economica.

Pol, E., Di Masso, A., Castrechini, A., Bonet, M. R., & Vidal, T. (2006). Psychological parameters to understand and manage the NIMBY effect. *Revue européenne de psychologie appliquée , 56* (1), 43-51.

Pompl, W. (1998). *Luftverkehr: Eine ökonomische und politische Einführung.* Berlin.

Posner, R. A. (1971). Taxation by regulation. *The Bell Journal of Economics and Management Science , 2* (1), 22-50.

Poungias, P. (2003). *Should airports specialize in the markets they serve - Low-cost airports for low-cost airlines?* Presentation to the 6th Hamburg Aviation Conference, Hamburg.

Prins, M. (2004). La concertation à la hollandaise, un modèle qui marche? *Cahiers de l'Institut d'Aménagement et d'Urbanisme de la Région Ile-de-France* (139-140), 257-261.

Prompl, W. (1998). *Luftverkehr: Eine ökonomische und politische Einführung.* Berlin.

Quinet, E. (1994). Chapter 2: The Social Costs of Transport: Evaluation and Links with Internalising Policies. In *Internalising the Social Costs of Transpport.* OECD/ECMT Seminar 1993 'Internalising the Social Costs of Transport'. Paris.

Quinet, E. (1998). *Principes d'Economie des transports.* Paris: Economica.

Quinet, E. (1992). *Route, Air, Fer.* Rapport pour le Ministère des Transports, Paris.

Ramberg, J. (1998). Unification of the Law of International Freight Forwarding. *Uniform Law Review , 3* (1), 5-13.

Rawlings, P. (2007). *Commercial law.* London: The University of London Press.

Ray, P. (1989). Roissy, de l'aéroport à l'aéroville: Territoires et urbanisme. *Urbanisme* (230), 39-59.

Reynolds-Feighan, A. J., & Button, K. J. (1999). An assessment of the capacity and congestion levels at European airports. *Journal of Air Transport Management , 5* (3), 113-134.

Rheinhardt-Lehmann, A. (2004). Aktuelle Entwicklungen im deutschen und europäischen Billigflugmarkt. *Internationales Verkehrswesen , 56* (4), 140-143.

Rhein-Main-Institut e.V. (2007). *Dokumentation zum Konsensworkshop zur Evaluation der Gutachten im Planfeststellungsverfahren zum Ausbau des Rhein-Main-Flughafens G 19.1 und G 19.2.* Dreieich.

Rodrigue, J.-P., Comtois, C., & Slack, B. (2006). *The geography of transport systems.* New York: Routledge.

Roger Tym & Partners. (2006). *Bristol International Airport Economic Impact Study.* Study on behalf of Bristol International Airport and the South West Regional Development Agency. Exeter.

Rosenthal, W. S. (1950). *Techniques of International Trade.* New York, Toronto, London: McGraw-Hill.

Saltmarsh, M. (2008, August 20). British competition authorities seek break-up of BAA. *International Herald Tribune* (http://www.iht.com/articles/2008/08/20/business/baa.php).

Sander, C. (2004). *Airport privatization: trends and opportunities, Part 1.* http://www.unisys.com/transportation/insights/insights__compendium/airport__privatization_c0___part__1.htm (Unisys Global Transportation website), accessed 14/02/2004.

Savy, M. (2000). Aéroport et territoire : rôle et enjeu du fret. In *Aéroports et dynamique des territoires* (pp. 105-115). Comité scientifique sous la responsabilité d'Alain Bourdin et de Michel Savy, coordonné par Michèle Collin et Eric Charmes. DRAST 99 MT 45. Rapport pour le PREDIT. Champs-sur-Marne: ARDU.

Savy, M. (2007). *Le transport de marchandises.* Paris: Eyrolles.

Scheelhaase, J. D., & Grimme, W. G. (2007). Emissions trading for international aviation - an estimation of the economic impact on selected European airlines. *Journal of Air Transport Management , 13* (5), 253-263.

Scheers, J. (2001). Attracting investors to European regional airports: what are the prerequisites? *Internatonal Airport Review , 5* (4), 55-63.

Schipper, L. J., & Fulton, L. (2003). Carbon dioxide emissions from transportation: trends, driving factors, and forces for change. In D. A. Hensher, & K. J. Button (Eds.), *Handbook of Transport and the Environment* (pp. 203-225). Amsterdam, Boston et al: Elsevier.

Schipper, Y., Nijkamp, P., & Rietveld, P. (1998). Why do aircraft noise value estimates differ? A meta-analysis. *Journal of Air Transport Management , 4* (2), 117-124.

Schipper, Y., Rietveld, P., & Nijkamp, P. (2001). Environmental externalities in air transport markets. *Journal of Air Transport Management , 7* (3), 169-179.

Schlichting, W. (1931). *Der Seehafenspediteur in der deutschen Verkehrswirtschaft.* Berlin, Vienna: Spaeth & Linde.

Schramm, H.-J. (2010). *Freight Forwarder's Intermediary Role in Multimodal Transport Chains - A Social Network Approach.* Doctoral thesis submitted to the Technische Universität Dresden.

Schumacher, W. (1987). *Die Entwicklung der betriebswirtschaftlichen Logistik und ihr Einfluss auf das zukünftige Leistungsbild eines deutschen Speditions- und Lagereigewerbes.* Cologne: Müller Botermann (also Doctoral Thesis at Universität zu Köln 1986).

Schwarze, D. (s.a.). *Leise wie ein Eulenschlag - Flugzeuge in der Nacht.* www.bundhannover.de/themen/laerm/flugzeuge-in-der-nacht.html (BUND Freunde der Erde website), accessed 12/01/2009.

SH&E Ltd. (2002). *Study on the quality and efficiency of ground handling services at EU airports as a result of the implementation of Council Directicve 96/67/EC.* Final report to the European Commission. London: SH&E Limited International Air Transport Consultancy.

Sharkey, W. W. (1982). *The theory of natural monopoly.* Cambridge, M.A.: Cambridge University Press.

Sherwood, C. S., & Burns, R. (1992). Solving international transportation problems. *Review of Business , 14* (1), 25-31.

Sigala, M. (2008). A supply chain management approach for investigating the role of tour operators on sustainable tourism: the case of TUI. *Journal of Cleaner Production , 16* (15), 1589-1599.

Smith, P. (1974). *Air Freight - Operations, Marketing and Economics.* London: Faber and Faber.

Sobie, B. (2008). Weaving the Web. *Airline Business* (March 2008), 46-49.

Somerville, H. (1993). The airline industry's perspective. In D. Banister, & K. Button (Eds.), *Transport, the environment and sustainable development* (pp. 161-174). London: E. and F. N. Spon.

Somerville, H. (2003). Transport Energy and Emissions: Aviation. In D. A. Hensher, & K. J. Button (Eds.), *Handbook of Transport and the Environment* (pp. 263-278). Amsterdam, Boston et al: Elsevier.

Sorensen, F. (2008). The Slot Allocation Philosophy at the EU. In A. I. Czerny, P. Forsyth, D. Gillen, & H.-M. Niemeier (Eds.), *Airport Slots: International Experiences and Options for Reform* (pp. 345-377). Aldershot: Ashgate.

SQW Ltd. (2002). *Economic and social impact of no frills air services in the Highlands and Islands.*

Starkie, D. (2002). Airport regulation and competition. *Journal of Air Transport Management, 8* (1), 63-72.

Starkie, D. (2008). *The Airport Industry in a Competitive Environment: A United Kingdom Perspective.* Discussion Paper No. 2008-15. International Transport Forum, OECD, Joint Transport Research Centre.

Starkie, D., & Thompson, D. (1985). *Privatising London's Airports.* Institute for Fiscal Studies Report Series 16. London.

Steer Davies Gleave. (2006). *Air and Rail Competition and Complementarity.* Final Report for the European Commission DG TREN. London.

Stern, H. (1938). *Die Grundlagen des Wettbewerbs und der Geschäftspolitik in der internationalen Spedition.* Vienna: Eigenverlag (also Doctoral Thesis at Hochschule für Welthandel Wien).

Sterzenbach, R., Conrady, R., & Fichert, F. (2009). *Luftverkehr: Betriebswirtschaftliches Lehr- und Handbuch.* München: Oldenbourg Wissenschaftsverlag.

Stigler, G. J. (1971). The theory of economic regulation. *The Bell Journal of Economics and Management Sciences , 2* (1), 3-21.

Strang, G. (1998). Major boost for Local Authority airports. *Press Notice N° 476, 11th June 1998* . Department of Transport, Environment and the Regions.

Strohbach, D. (2007). *Wettbewerb im Luftverkehr - Deregulierung und strategische Allianzen.* Schriftenreihe des Instituts für Transportwirtschaft und Logistik Nr. 1 (2007 VER). Wien: Wirtschaftsuniversität Wien.

Subra, P. (2004). Roissy et le troisième aéroport: réalités économiques et manipulation géopolitique. *Hérodote (114)* . La Découverte.

Sull, D. N., Ghoshal, S., & Monteiro, F. (2005). The hub of the world. *Business Strategy Review , 16* (1), 35-40.

Sutton Harbour Holdings plc. (2008). *Annual report and financial statements 2008.* Plymouth.

Téfra, M. (1996). *Economie des transports.* Paris: ellipses.

Thaler, S. P. (1990). *Betriebswirtschaftliche Konsequenzen des EG-Binnenmarktes und der EG-Güterverkehrsliberalisierung für europäische Speditionsunternehmungen.* Basel: Haupt (also Doctoral Thesis at Universität Basel).

The American Heritage Dictonary of the English Language (4th ed.). (2000). Houghton Mifflin Company. Retrieved on 14 April 2009 from www.thefreedictionary.com.

The American Heritage Science Dictionary. (2005). Houghton Mifflin Company. Retrieved on 14 April 2009 from www.thefreedictionary.com.

Thiessen, F. (2005). *Der Nutzen grosser Flughäfen.* Fachbeitrag im Rahmes des Erörterungtermins zum Flughafenausbau (Frankfurt/Main). Chemnitz.

Thiessen, F. (2007). *Zum Ausbau des Flughafen Frankfurt: Wie im Gutachten 19.2 (Baum, Esser, Kurte) der Zusammenhang zwischen Flughafengrösse und Wirtschaftskraft einer Region erfunden wird.* Im Namen des Rhein-Main-Instituts e.V., Dreiech, Chemnitz.

Thomas, C., Hume, K., & Hooper, P. (s.a.). *Airport growth and regional development.* http://www.cate.mmu.ac.uk/documents/Publications/THOMAS%20HOOPER%20HUME%20PSCA.pdf, accessed 22/02/2009.

Toh, R. S., & Higgins, R. G. (1985). The impact of hub and spoke network centralization and route monopoly on domestic air profitability. *Transportation Journal , 24*, 16-27.

Tolofari, Ashford, N., & Caves. (1990). *The cost of air service fragmentation.* Loughborough University.

Torres, E., Dominguez, J. S., Valdés, L., & Aza, R. (2005). Passenger waiting time in an airport and expenditure carried out in the commercial area. *Journal of Air Transport Management , 11*, 363-367.

Tretheway, M. W. (1990). Globalisation of the airline industry and implications for Canada. *Transportation Research Part E: Logistics and Transportation Review , 26*, 357-367.

Tretheway, M. W., & Oum, T. H. (1992). *Airline Economics: Foundations for Strategy and Policy.* Vancouver: University of British Columbia.

Trumpfheller, M. (2006). *Strategisches Flughafenmanagement: Positionierung und Wertschöpfung von Flughafentypen* (1. Ausg.). Wiesbaden: Deutscher Universitäts-Verlag.

Uittenbogaart, P. (1997). Airline competition on the route between Amsterdam and London. *Journal of Air Transport Management , 3* (4), 217-225.

UK Civil Aviation Authority. (1998). *The Single European Aviation Market: The First Five Years*. London: CAA.

Ullmann, E. M. (1950). *Entwicklung und Funktionen der internationalen Spedition*. unpublished Doctoral Thesis at Hochschule für Welthandel Wien.

Ungefug, H.-G. (1998). *Luftverkehrsanalyse 1998: Umstieg vom Flug zum Zug. Innerdeutscher Luftverkehr im Wettbewerb mit der Schnellbahn - Eine detaillierte Bewertung der realen Entwicklung zwischen 1990 und 1996*. Berlin: Redaktionsbüro für Verkehr, Wirtschaft und Tourismus.

Urbatzka, E. (1991). *Ein prognostaugliches Verfahren zur Ermittlung der Start- und Landebahnkapazitäten deutscher Verkehrsflughäfen für Einbahnsysteme*. Köln.

US General Accounting Office. (1990b). *Airline competition: industry operating and marketing practices limit market entry*. GAO/RECD-90-147. Washington, D.C.: US General Accounting Office.

US General Accounting Office. (2000). *Aviation and the Environment: Airport Operations and Future Growth Present Environmental Challanges*. Report to the Ranking Democratic Member, Committee on Transportation and Infrastructures, House of Representatives. Washington, D.C.: US General Accounting Office.

US Government. (1997). Control of air pollution from aircraft and aircraft engines, emission standards and test procedures, final and proposed rule. In *Federal Register, 40 CFR Part 87* (pp. 25355-25367). Washington, D.C.: US Government Printing Office.

Uyeno, D., Hamilton, S. W., & Biggs, A. J. (1993). Density of residential land use and the impact of airport noise. *Journal of Transport Economics and Policy , 27* (1), 3-14.

Van Cleef, E. (1941). Hinterland and Umland. *Geographical Review , 31* (2), 308-311.

Van der Horst, D. (2007). NIMBY or not? Exploring the relevance of location and the politics of voiced opinions in renewable energy siting controversies. *Energy Policy , 35* (5), 2705-2714.

Van Reeven, P. (2005). Transport policy in the European Union. In K. J. Button, & D. A. Hensher (Eds.), *Handbook of transport strategy, policy and institutions* (Vol. 6, pp. 705-724). Amsterdam et al: Elsevier.

Van Wijk, J., & Persoon, W. (2006). A Long-haul Destination: Sustainability Reporting Among Tour Operators. *European Management Journal , 24* (6), 381-395.

Vandermotten, C., & Marissal, P. (2000). Une nouvelle typologie économique des régions européennes. *L'Espace géographique* (4), 289-300.

Varian, H. (1992). *Microeconomic analysis* (3rd ed.). New York: W. W. Norton & Company.

Viscusi, W. K., Vernon, J. M., & Harrington, J. E. (2000). *Economics of Regulation and Antitrust* (3rd ed.). Cambridge, MA: MIT Press.

Walters, A. A. (1978). Airports - An Economic Survey. *Journal of Transport Economics and Policy , 12* (2), 125-160.

Wang, L.-Y. (1999). *Politique d'implantation du commissionnaire de transport*. Mémoire de DEA réalisé sous la direction de Michel Savy. DEA Transport. Université Paris XII - Val-de-Marne et Ecole Nationale des Ponts et Chaussées. Créteil.

Warnock-Smith, D., & Potter, A. (2005). An exploratory study into airport choice factors for European low-cost airlines. *Journal of Air Transport Management , 11*, 388-392.

Weimar, K.-H., & Jansen, P. (2001). *Zukunft der deutschen Verkehrsflughäfen: im Spannungsfeld von Verkehrswachstum, Kapazitätsengpässen und Umweltschutzbelastungen.* Veranstaltung der Friedrich-Ebert-Stiftung, 12. Dezember 2000 in Leipzig. Reihe "Wirtschaftspolitische Diskurse Nr. 140". Bonn: FES Library.

Wester-Herber, M. (2004). Undelying concerns in land-use conflicts - the role of place-identity in risk perception. *Environmental Science & Policy , 7* (2), 109-116.

Williams, G. (2001). Will Europe's charter carriers be replaced by "no-frills" airlines? *Journal of Air Transport Management , 7* (5), 277-286.

Windisch, E. (1996). *Marktabgrenzung von Luftfrachtleistungen: Analysen - Konzepte - Lösungsansätze.* Wiesbaden: Deutscher Universitäts-Verlag, Gabler: Wiesbaden.

Wit, R. C., Boon, B. H., van Velzen, A., Cames, M., Deuber, O., & Lee, D. S. (2005). *Giving wings to emission trading: Inclusion of aviation under the European emission trading system (ETS): design and impacts.* Report for the European Commission, DG Environment, No. ENV.C.2/ETU/2004/0074r. Delft: CE Delft.

Wolf, H. (1997). *Grundsatzfragen einer Flughafenprivatisierung in Deutschland.* Unveröffentlichtes Gutachten im Auftrag des Bundesministeriums für Finanzen. Kiel.

Wolf, H. (2003). *Privatisierung im Flughafensektor: Eine ordnungspolitische Analyse.* Berlin, Heidelberg, New York: Springer-Verlag.

Worthington, J., & Briggs, G. (2000). Airport city interchange, gateway and destination. In *Aéroports et dynamique des territoires* (pp. 129-138). Comité scientifique sous la responsabilité d'Alain Bourdin et de Michel Savy, coordonné par Michèle Collin et Eric Charmes. DRAST 99 MT 45. Rapport pour le PREDIT. Champs-sur-Marne: ARDU.

Yokomi, M. (2005). *Evaluation of technical efficiency at privatized airports: Case of BAA Plc.* Paper presented at the Air Transport Research Society (ATRS) Conference, 3-6 July 2005, Rio de Janeiro.

York Aviation. (2004). *The social and economic impact of airports in Europe.* Study on behalf of Airports Council International Europe.

York Consulting. (1999). *Manchester Airport Long Term Strategy Review – Economic Impact.*

Youssef, W. (1992). *Causes and Effects of International Airline Equity Alliances.* PhD Dissertation Series UCB-ITS-DS-92-1. Institute of Transportation Studies. University of California at Berkeley.

Zagury, F. (2003). *Réflexion sur l'utilité d'un troisième aéroport de Paris d'après l'analyse des mouvements d'avions.* URL: http://pagesperso-orange.fr/mnle/Pages/National/Debats/transports/fzagury.html, consulté le 20/02/2009.

Zémor, P. (2001). *Débat public sur un nouvel aéroport: Observations au gouvernement.* DUCSAI. Document available on http://www.debatpublic.fr, accessed 16/08/2008.

Zhang, A. (1996). An analysis of fortress hubs in airline networks. *Journal of Transport Economics and Policy , 30* (3), 293-307.

Zhang, A., & Zhang, Y. (1997). Concession revenue and optimal airport pricing. *Transportation Research Part E: Logistics and Transportation Review , 33* (4), 287-296.

Zimmer, C. (1995). *Flughäfen im Luftfrachtmarkt: Ein entscheidungsbasierter Systemansatz zur Erklärung und Vorausschätzung des Luftfrachtaufkommens von Flughäfen.* Veröffentlichungen des Verkehrswissenschaftlichen Instituts der Rheinisch-Westfälischen Technischen Hochschule Aachen, Heft 50 (Doctoral Thesis).