

Economic Importance of Air Transport and Airport Activities in Belgium



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by Franziska Kupfer and Frédéric Lagneaux

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Abstract

This study is a publication issued by the Microeconomic Analysis service of the National Bank of Belgium, in partnership with the Department of Transport and Regional Economics of the University of Antwerp (UA).

It is the outcome of a first research project on the Belgian airport and air transport sector. The former relates to the economic activities within the airports of Antwerp, Brussels, Charleroi, Kortrijk, Liège and Ostend, while the latter concentrates on the air transport business as a whole. In the past few years, the logistics business has come to play a significant part in income creation in our country, whose economy is to a large extent driven by services¹. Air transport and airports in particular are driving forces in this context, not only in terms of business generated within the air transport cluster, but also in terms of airports' attractiveness.

On world scale an overall growth of cargo and passengers could be observed in the last ten years. However, the air transport sector has undergone a major crisis during the 2001-2003 period, when passenger traffic numbers first fell sharply and then stagnated. Only after 2003 this activity has picked up again and this until the third quarter of 2008. Cargo traffic on its part recovered already in 2002. In Belgium, a similar evolution can be observed. It should be stressed however that between 1997 and 2007 cargo volumes grew much faster than passenger traffic did. The rankings of European airports underline the importance of cargo traffic for Belgium: In 2006 Brussels, Liège and Ostend-Bruges respectively occupy ranks 6, 8, and 20 in the European cargo airport top 20, while for passenger airports, Brussels can only be found at the end of the top 20.

In this study, a sectoral approach has been followed by focusing, for every airport, on two major economic activity components: the air transport cluster on the one hand and other airport-related sectors on the other hand. In that respect, annual accounts data from the Central Balance Sheet Office were used for the calculation of direct effects, the social balance sheet analysis and the study of financial ratios. Due to an inevitable time lag in the data provision, the analysis was limited to 2006. Like in other sectoral studies published by the Bank, indirect effects have also been estimated on the basis of data from the National Accounts Institute.

In 2006, the total activities under review –direct and indirect, inside and outside airports- accounted for roughly 6.2 billion euro, i.e. 2 p.c. of Belgium's GDP and domestic employment. Considering the direct effects only, these percentages both amounted to 0.8 p.c. The three major airports, i.e. Brussels, Charleroi and Liège, alone account for 95.2 p.c. of the direct value added generated by the six airports under review. They represent 0.5 p.c. of Belgian GDP and, taking account of the indirect effects, 1.1 p.c. of the national income. Furthermore, it has to be pointed out that most Belgian airports are specialised. While the airports of Liège and Ostend focus on air cargo,

¹ See Working Paper No.125, Lagneaux (2008)

Charleroi Airport deals mostly with low-cost passenger transport. Moreover, the smaller regional airports like Antwerp and Kortrijk focus on business travel.

The analysis was completed in December 2008.

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FOREWORD

Each year, the Bank² publishes an update of its study on the economic importance of the Flemish sea ports and the Liège and Brussels port complexes³. The findings of this study are keenly awaited by the sector's stakeholders and by the competent authorities, as it provides key information about the economic impact of the main ports in our country. At the beginning of 2008, an initial report, with a wider perspective, was devoted to freight transport logistics activity as a whole⁴, and this study was also a response to growing expectations from the sector itself and from various governments.

In line with the work accomplished so far, this study focuses on one of the main modes of transport on the logistics scene, namely air transport. It is also an extension of the work begun in 1996 by the NBB's Louvain branch⁵. Our country's economy, whose external openness is inversely proportional to its size, is firmly geared towards services, with logistics being one of its pillars. Out of this, comes the development of trade and, along with it, transport. However marginal it may still be in absolute terms, air transport is still one of the driving forces and 40 p.c. in value of goods are transported nowadays via air⁶. The study on transport logistics had highlighted the key role played by air transport in the logistics cluster. Belgium's six airports - Antwerp, Brussels, Charleroi, Kortrijk, Liège and Ostend - also have an undeniable magnet effect, both within and around them, attracting a series of high value added sectors such as logistics, maintenance, wholesale trade, postal services, etc., all of which tend to prefer suburban locations.

The main objective of this working paper is to analyse the impact of the sector in 2006, as well as some of its trends, in terms of employment and value added, both direct and indirect. Activity in the broad aviation sector, that is air transport, including both goods and passenger traffic, as well as some major companies based at airports and outside them, will also be examined in more detail, notably from the point of view of their social situation, investment and their financial health.

Finally we have to mention that the analysis was completed in December 2008. Data published after this date were not taken into account.

INTRODUCTION

Economic and sectoral context

Although the end of 2008 has seen a relative dip in some air traffic figures, it should be pointed out that 2006 and 2007 were excellent years for the sector. This study focuses on 2006⁷, a year of strong economic growth at world level (+5 p.c.). After a slight slowdown in the year 2005, trade flows then started accelerating (+9.4 p.c.)⁸, despite the rise in prices of raw materials. The Asian countries have been and still are the driving force behind the expansion of the world economy, positioning themselves at the heart of trade flows. The new EU Member States also proved to be highly dynamic, while the euro area countries returned to a pace of sustained growth (+2.9 p.c.). Against this backdrop, Belgium was able to take advantage of its privileged location at the heart of the *Blue Banana*⁹, bringing its economic performance up to slightly above the euro area average.

² National Bank of Belgium. In abbreviation, NBB.

³ Vennix S. (2008).

⁴ Lagneaux (2008).

⁵ NBB Louvain (1996).

⁶ Godart (2004).

⁷ At the Central Balance Sheet Office, the main source of micro-economic data used in the framework of the present study, the 2007 accounts will not be officially closed until the beginning of 2009. The same occurs at the National Accounts Institute (NAI). Therefore it was only possible to cover the period up to 2006 in an exhaustive manner.

⁸ BNB (2008), *Annual Report 2007 - Economic and Financial Developments*.

⁹ The notional region covering the major logistical poles and distribution centres of Europe, stretching from the south-east of the UK to north-eastern Spain and down to Madrid, through Benelux, western Germany, eastern France, Switzerland and northern Italy.

This growth also fed through to global air traffic (both EU-domestic and international), which expanded by 5 p.c. altogether between 2005 and 2006, and by as much as 5.9 p.c. if only passenger transport is taken into account, since the aircraft occupancy rate had at the same time reached an all-time high of 76.3 p.c. (compared with 75.1 p.c. in 2005)¹⁰. These developments also contributed to the clear improvement in the financial situation of the European and US airlines that had survived the crisis years. In this respect, 2001 was certainly a transitional year for the aviation sector, which had been badly hit by the terrorist attacks of 11 September and the bursting of the internet bubble. Airlines in the United States and worldwide would soon have to start restructuring quickly, faced not only with an evidently temporary, but often fatal, drop in passenger numbers, but also a drastic review of security standards in airports and on board aircraft. This tightening of standards became even more unavoidable after the SARS epidemic in 2003. Whilst the airlines were in the midst of their consolidation phase¹¹, the parallel expansion of low-cost airlines (box 1) was gaining momentum on the market for domestic and intra-continental flights, thus contributing to a doubling of airline passenger traffic in Europe in the space of fifteen years (1990-2005). More recently, the rise in oil prices has finally fed through to affect an energy-guzzling sector and which, unlike maritime transport, was very quickly driven to find ways of reducing its greenhouse gas emissions. The next round of environmental standard tightening, notably at the European level and in the post-Kyoto context (box 2), had already been anticipated by the aircraft manufacturers on the one hand, and the airlines on the other hand, since the air transport sector accounts for 3 p.c. of all emissions worldwide.

Latterly, it has been the Asia-Pacific zone that has seen the fastest growth in capacity, with the US and European intercontinental airlines adjusting in order to cover longer distances. Here, there are two conflicting practices: *point-to-point* and *hub-and-spoke*. The latter approach is frequently called into question, and the implementation of the new Open Sky agreements signed at the end of 2007 between the United States and the European Union, which will soon enable any airline to move into transatlantic transport services, will not do anything to weaken this trend. At the same time, the EU is striving to set up a genuine Single European Sky. Even today, the EU still spans 27 independent airspaces, a patchwork which tends to generate inefficiency, not least from the environmental point of view, as well as safety problems as a direct result of congested airspace over Europe. On the domestic front, competition with the budget airlines has also forced the so-called conventional carriers to reduce their costs, for example by limiting stopover time and improving aircraft occupancy rates.

The air transport sector in Belgium is of course subject to the same constraints. The six airports that our country hosts also saw the growth of the late 1990s, the post 9/11 crisis that continued until 2003, before returning to moderate growth rates, which picked up speed in 2006 and 2007. As will be shown in point 2.1 below, the number of passengers transported out of Belgium rose by 5 p.c. in 2006 and 7.7 p.c. in 2007. There has been good performance on the cargo side, too, with an increase of 7.6 p.c. in 2006 and 12.7 p.c. in 2007. Brussels, a secondary hub on the international scene, is serving more and more intra-European air links, and retains a very strong foothold on routes to and from Africa. In the future, with the development of primary hubs¹² and the growth of the "sixth freedom"¹³ airports", mainly in the Middle East and in Asia, Belgium's leading airport will soon have to turn more closely towards activities that are less suitable for those airports, like short- and middle-haul air links, low-cost flights, and therefore complement what the primary hubs have to offer. Until only very recently run by public authorities, the Belgian airports are now opening up to competition more and more and are competing with each other for services. The distinction between the services they offer is paramount in this respect.

¹⁰ 2006 statistics published by the International Civil Aviation Organization (ICAO).

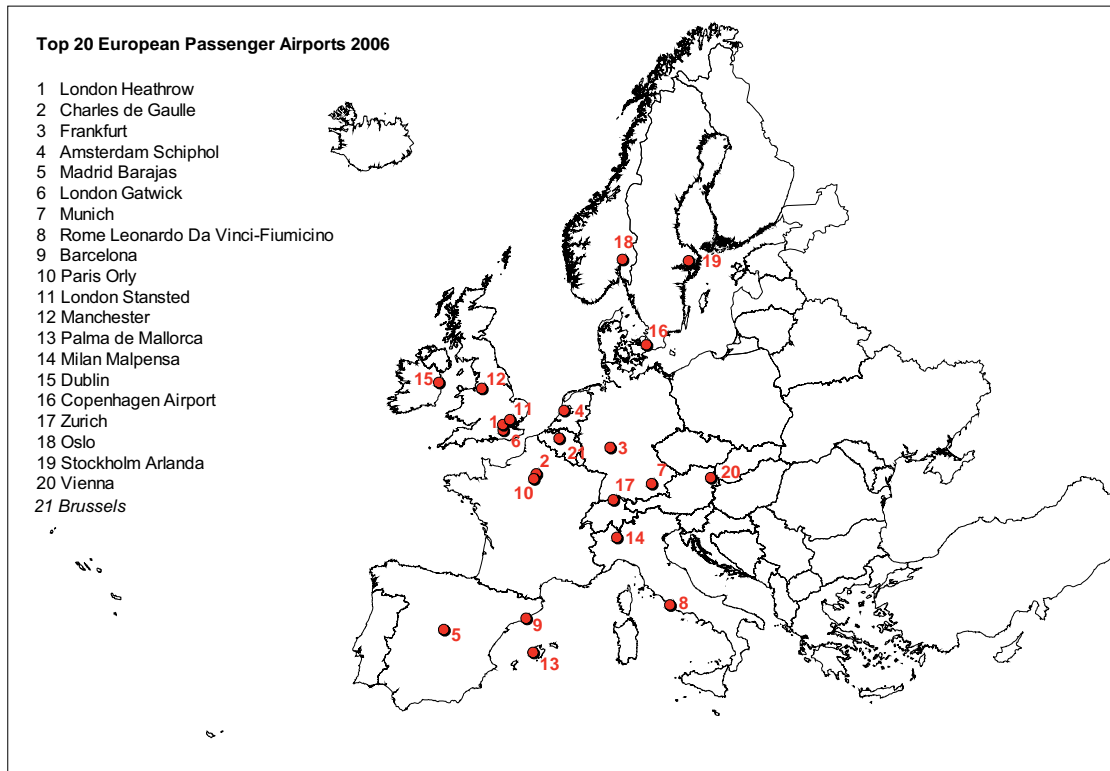
¹¹ In recent years, three big alliances of network carriers have emerged from the crisis at world level, namely Star Alliance, SkyTeam and Oneworld. New transnational companies are springing up in their wake.

¹² Belgium is located at the centre of the so-called "FLAP quadrangle", formed by the four largest European airports in terms of passenger and freight traffic: Frankfurt, London, Amsterdam and Paris, which are all primary hubs to major international airline companies. Cf. figures 1 and 2, and tables 1 and 2.

¹³ Sixth freedom refers to the use by an airline of country A of two sets of third and fourth freedom rights to carry traffic between two other countries but using its base at A as a transit point. Third freedom relates to the right to carry revenue traffic from your own country A to the country B of your treaty partner. Fourth freedom refers to the right to carry traffic from country B back to your own country A. More explanation in Doganis R. (2006), *The Airline Business*.

No Belgian airport features in the top 20 European airports¹⁴ for passenger transport (figure 1 and table 1), Brussels Airport only being ranked in 21st position in 2006. On the other hand, Brussels Airport and Liège Airport are both in the top 10 for cargo transport, respectively in 6th and 8th positions (figure 2 and table 2). Ostend Airport comes 20th in this ranking. Both these rankings are topped by the international airports of London Heathrow, Paris Charles de Gaulle, Frankfurt and Amsterdam Schiphol. Together they form the so-called "FLAP quadrangle", at the centre of which lies Belgium. These four airports are primary hubs to major international airline companies, such as Air France - KLM, Lufthansa, British Airways, etc.

FIGURE 1 TOP 20 EUROPEAN PASSENGER AIRPORTS IN 2006



Source: Airport operators and authorities; Air Transport World (2007).

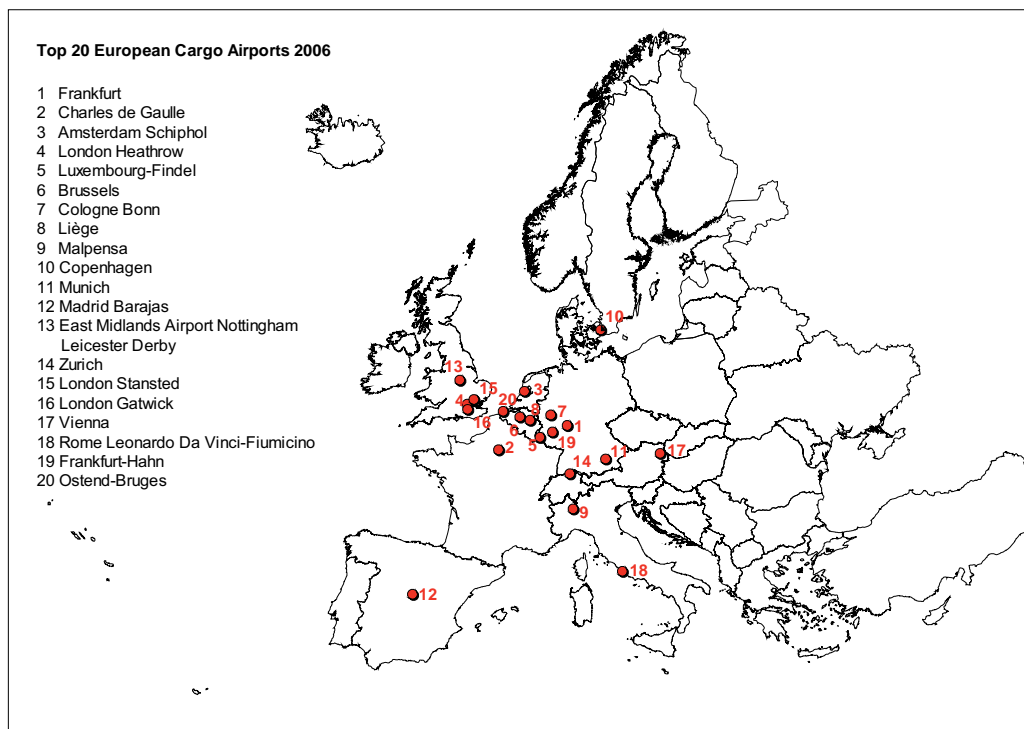
¹⁴ This refers to continental Europe. In 2006, Brussels Airport was in 19th place and not 21st in the league table if it is limited to the EU-27, a ranking that would exclude Zurich and Oslo.

TABLE 1 TOP 20 EUROPEAN PASSENGER AIRPORTS IN 2006: RANKING
(in million passengers)

Rank	Airport	Number of passengers
1	London Heathrow	67.5
2	Charles de Gaulle.....	56.8
3	Frankfurt	52.8
4	Amsterdam Schiphol	46.1
5	Madrid Barajas	45.5
6	London Gatwick	34.2
7	Munich.....	30.8
8	Rome Leonardo da Vinci Fiumicino	30.1
9	Barcelona	30.0
10	Paris Orly.....	25.6
11	London Stansted	23.7
12	Manchester	22.8
13	Palma de Mallorca.....	22.4
14	Milan Malpensa	21.6
15	Dublin	21.2
16	Copenhagen	20.9
17	Zurich	19.2
18	Oslo	17.7
19	Stockholm Arlanda	17.5
20	Vienna	16.9
21	Brussels	16.7

Source: Airport operators and authorities; Air Transport World (2007).

FIGURE 2 TOP 20 EUROPEAN CARGO AIRPORTS IN 2006



Source: Klaver S. et al. (2007).

TABLE 2 TOP 20 EUROPEAN CARGO AIRPORTS IN 2006: RANKING
(in thousands of metric tonnes)

Rank	Airport	Tonnage
1	Frankfurt	2,057.1
2	Charles de Gaulle	1,884.2
3	Amsterdam Schiphol	1,526.5
4	London Heathrow	1,263.1
5	Luxembourg-Findel	752.3
6	Brussels	720.0
7	Cologne Bonn	698.3
8	Liège	406.5
9	Malpensa	405.4
10	Copenhagen	380.0
11	Munich	321.7
12	Madrid Barajas	315.8
13	East Midlands Nottingham Leicester Derby	272.3
14	Zurich	257.1
15	London Stansted	224.3
16	London Gatwick	211.9
17	Vienna	187.9
18	Rome Leonardo Da Vinci-Fiumicino	123.2
19	Frankfurt-Hahn	123.2
20	Ostend-Bruges	98.5

Source: Klaver S. et al. (2007).

Aims of the study

The NBB devoted a first study on this subject to analysing the economic impact of Zaventem Airport in 1996¹⁵. Owing to a lack of resources and taking account of the difficult context in which the sector found itself at the start of the 21st century, this exercise has not been repeated since. The main objective of this paper is to estimate the economic impact of the six recognized airports in Belgium: Brussels National international airport called Brussels Airport for short (Zaventem), as well as five regional airports, namely Antwerp Airport (Deurne), Brussels South Charleroi Airport or BSCA (Gosselies), hereafter referred to as Charleroi Airport, Kortrijk-Wevelgem Airport (Wevelgem), hereafter called Kortrijk Airport, Liège Airport (Bierset) and Ostend-Bruges Airport (Oostende), which we shall refer to simply as Ostend Airport.

The aim is to measure the activity of these airports by studying different variables, including direct or indirect value added and employment, generated from the airport facilities and by firms established in the surrounding zone depending on the airport for business. The airports' perimeters are clearly defined at regional level, following the regional planning which presents the airports' property boundaries (see maps supplied by the regional authorities and airport operators in annex 1). The airport authorities¹⁶ are competent on the zone where they manage the airport operations and the allocation of concessions and the building and maintenance of infrastructure, would this relate to the development of airport services or to the land granting policy which links them to all the airport actors and users. But this economic impact assessment exercise goes beyond the boundaries of the airports, because a whole range of activities clearly identified as characteristic of our country's air transport sector are also dealt with. This division into sectors is discussed in point 1.

¹⁵ NBB Louvain (1996).

¹⁶ Private in the case of Brussels Airport, public in the case of Antwerp, PPP in the case of Liège and under privatisation in the case of Charleroi, Kortrijk and Ostend. The Flemish government, supported by its Ministry for Mobility and Public Works, Airport Policy division, shares the management of the Flemish airports, investments included, with the Flemish airport operators. *Société wallonne des Aéroports*, SOWAER, the Walloon Airport Authority, plays the same role at the Walloon airports.

BOX 1 LOW-COST AIRLINES

Born in the USA in 1967 and baptised by the Texan company Southwest, the low-cost air travel model, first of all conquered the southern state's medium-haul market, and then branched out to the rest of the United States from the 1970s onwards. In Europe, it was not until the end of the 1980s and the liberalisation of civil aviation in the EU countries that the budget airline model saw a similar rapid development. Today, low-cost airlines are springing up all over the world. The key to the success of this model lies in what is called "yield management", in other words; automated management of supply and demand and setting air fares in real time. This is the keystone of the whole system, which relies on permanent cost-cutting, and thus taps "the lowest part of the demand curve", in which no traditional airline (network carrier) had really been interested up to then. This race to cut costs implies in particular (1) a high aircraft utilisation rate, with an optimal aircraft occupancy rate (> 80 p.c.) and an absolute minimum turnaround time at airports (+/- 20 min.), which enables (2) the use of congestion-free regional airport infrastructure with low airport taxes, (3) a minimalist service, including "no-frills", no seat allocation and self-booking over the internet, and lastly (4) innovative human resource management. These airlines also earn a substantial part of their revenue from (5) advertising, an omnipresent feature, with the practice of cross-marketing being at the heart of a system that gives the impression of free tickets on sale.

The leading European low-cost airline, both from the historical point of view as in size terms, is Ryanair, with an estimated 60 million passengers in 2008. This Irish company founded in 1985 initially concentrated on Ireland and the United Kingdom before taking an interest in the Old Continent from 1997 onwards, its business did not really take off until the post-millennium decade with the launch of its internet site. However, it very soon had to come to terms with head-on competition from the British firm EasyJet, founded in 1995, followed shortly afterwards by a series of other companies like Virgin Express, Wizzair, FlyBe, Vueling Airlines, etc. Belgium's low-cost air travel is dominated by Ryanair too, as the Irish company's continental base is at Charleroi Airport. Ryanair currently accounts for 85 p.c. of BSCA's client base. The airline also operated out of Ostend at the beginning of this decade. Brussels Airport already has several low-cost links to offer as well, and is expected to open a new terminal for these airlines by the end of 2009. Belgium's national airport has a lot of room for expansion on this market. While around 15 p.c. of passengers travelling through European airports of a similar size to Zaventem use low-cost airlines, this figure is still only 3 p.c. at Brussels Airport at present (2007 figures).

The emergence and subsequent development of budget airlines have brought air transport to the masses by making it accessible to people who had not been able to afford to travel by air before. Roughly one-third of Europeans currently use the low-cost formula and this sector has now entered a consolidation phase, with only a few low-cost airlines (LCAs) expected to survive in the long term, like the network carriers. Growth of these airlines is constant and sustained, to such an extent that the traditional carriers, with which they compete on short- and medium-haul routes, have been forced to adopt some of their management principles themselves. The European authorities are paying close attention to these developments and are watching carefully to ensure that principles governing free competition in air transport are being respected, which should safeguard a place for the conventional airlines, whose growth has been losing steam in comparative terms for several years.

Sources: European Parliament (2007), VRT (2008), and Decker M. (2004).

BOX 2 MEASURES FOR REDUCING CO₂ EMISSIONS IN THE AVIATION SECTOR

The year 2008 will have been particularly difficult for the airlines, whose kerosene consumption accounts for a major share of their costs. Following the surge in oil prices up until the middle of the year, some of them thus saw their fuel costs rise by 50 p.c. compared with 2007. Against this backdrop of increasingly volatile energy prices, the aircraft manufacturers have for several years now been working on the design of aircraft that use much less kerosene, with a fuel consumption that should be around 30 p.c. less than that of today's aircraft. The Airbus A-380¹⁷, which came into service in October 2007, was designed especially with this in mind, since it only uses, under normal conditions, 3 litres of fuel for 100 kilometres per passenger carried, compared with almost 4 litres for the traditional jumbo jets.

But here there is another fundamental element that is also taken into consideration: present and future international and European regulations for reducing CO₂ emissions in a sector that accounts for about 3 p.c. of total man-made emissions¹⁸. The Kyoto Protocol only tackles domestic CO₂ emissions. Therefore air transport has so far not been formally covered. As a consequence, international flights, which also enjoy large tax exemptions, are still not affected by any restrictive regulation on this front. According to the European Commission, "Air transport performs many important functions in modern societies. Aviation facilitates economic and cultural exchanges and is a significant source of employment and growth in many regions. However, aviation also contributes to global climate change, and its contribution is increasing. While the EU's total greenhouse gas emissions fell since 1990, emissions from EU aviation increased by more than 80 p.c. within the same period of time. Even though there has been significant improvement in aircraft technology and operational efficiency this has not been enough to neutralise the effect of increased traffic, and the growth in emissions is likely to continue in the decades to come, as air travel becomes cheaper without its environmental costs being addressed."

On 20 December 2006, the Commission tabled a proposal for legislation to include aviation in the EU Emissions Trading Scheme (ETS). The intention is for the EU ETS to serve as a model for other countries considering similar national or regional schemes, and to link these to the EU scheme over time. Therefore, the EU ETS can form the basis for wider, global action: "The European Commission today underscored its firm commitment to combating climate change by proposing legislation to bring greenhouse gas emissions from civil aviation into the EU Emissions Trading Scheme (EU ETS). EU emissions from international air transport are increasing faster than from any other sector. This growth threatens to undermine the EU's progress in cutting overall greenhouse gas emissions. Including civil aviation in the EU ETS is a cost-effective way for the sector to control its emissions and implements an approach endorsed by the International Civil Aviation Organization (ICAO). The proposed Directive will cover emissions from flights within the EU from 2011 and all flights to and from EU airports from 2012. Both EU and foreign aircraft operators would be covered. Like the industrial companies already covered by the EU ETS, airlines will be able to sell surplus allowances if they reduce their emissions and will need to buy additional allowances if their emissions grow. Any increase in ticket costs resulting from the scheme is expected to be limited (the price of a typical return flight within the EU could rise by between 1.8 and 9 euro), and significantly lower than rises due to oil price changes in recent years. Without action, the growth in emissions from flights from EU airports will by 2012 cancel out more than a quarter of the 8 p.c. emission reduction the EU-15 must achieve to reach its Kyoto Protocol target. By 2020, aviation emissions are likely to more than double from present levels."

This Directive was endorsed by the European Parliament in July 2008, a move that was not welcomed by a sector already exposed to the sharp rise in fuel prices. For its part, the International Air Transport Association (IATA) recommends pushing ahead with the Single European Sky project, which it feels is more likely to help reduce CO₂ emissions by reducing flying time.

Sources: European Commission (2006b), International Energy Agency, Belspo (2008) and various press articles.

¹⁷ The A-380 cannot be accommodated without specific fitting-out of primary hub airports. Consequently, Brussels is not affected by this activity for the time being.

¹⁸ By way of comparison, the energy sector is responsible for 45 p.c. of worldwide CO₂ emissions, industry and construction as well as road transport for 18 p.c., shipping 2 p.c. and households 8 p.c. 2003 figures. Source IEA (2005). The share held in this total by the transport sector has been constantly increasing in the last years, in contrast to most industrial sectors.

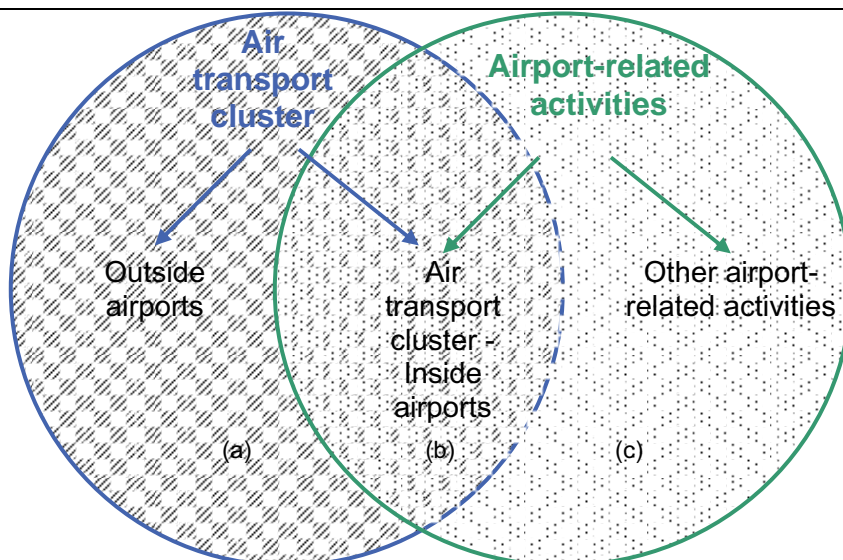
1 DEFINITIONS AND METHODOLOGY

This working paper is concerned with the entire range of activities generated by airports and the various branches of the air transport industry, including those that are not necessarily part of that industry. Two categories of economic activity are therefore used in the analysis, the first grouping together the branches that fall under the official definition of the air transport sector, and the second covering other branches of activity which are affected because of their geographical situation, located either in or around airports. It has not been easy to find one single definition as to what constitutes an airport, and even less so to outline precisely what operations falling under the airport function consist of. The two following sub-sections focus on the definitions borne in mind and on the methodology adopted for the economic impact assessment of the sector under review.

1.1 DEFINITIONS

This working paper focuses on estimating the economic impact of the branches of activity present within the six Belgian airports, in other words, the facilities necessary for air traffic but also all the services that contribute to ensuring these facilities work smoothly or which simply use them themselves. This distinction is highlighted via the grouping of activity by cluster¹⁹, as set out in point 1.2.1. But the analysis also concerns air transport activities in the wider sense based elsewhere in the country. What is referred to as the air transport cluster has to do with aerial navigation and the branches that are inextricably linked to it. Here also companies building aircrafts are included, as they play a crucial role in the air transport cluster by providing the basic provision of air transport, i.e. the aeroplane. The air transport cluster is present both inside and outside airport zones, as shown in figure 3. The economic impact of the air transport branches based outside airports is tackled separately (subset (a)), so as to complement the economic impact analysis of the business carried out within the six airport zones (subsets (b) and (c)). The study starts with a chapter devoted to the air transport cluster, mainly because certain data access facilities have made it possible to study developments in this sector which can serve as a barometer for all the activities under review, whether they are recorded as being inside or outside airports.

FIGURE 3 CATEGORIES OF ACTIVITY STUDIED



Source: NBB.

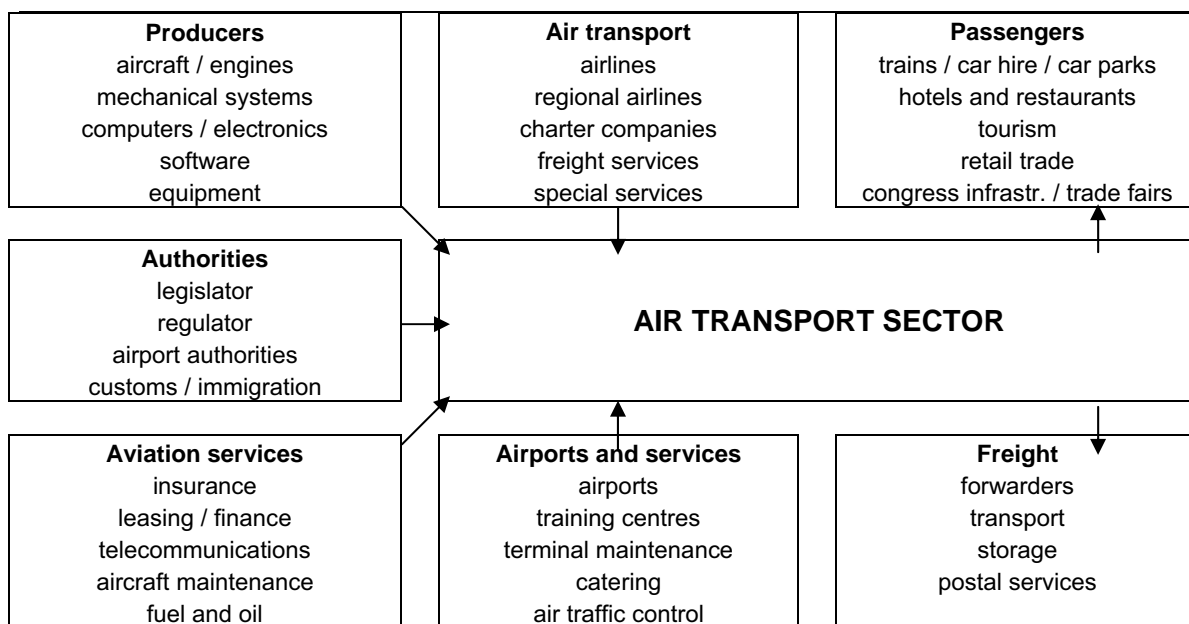
¹⁹ The OECD gives a general definition of clusters: Networks of production of strongly interdependent firms (including specialised suppliers) linked to each other in a value-adding production chain. (see OECD, "Boosting Innovation: The Cluster Approach", 1999, Paris). Since the appearance of Porter's study on "The competitive advantage of nations" (The Free Press, New York, 1990), the cluster concept has become a central element of industrial policy.

The word "airport" first appeared in 1919 in the American press. An official definition is set out in an annex to the Convention on International Civil Aviation, signed in Chicago on 7 December 1944: *An airport is said to be an area of land or water used or intended to be used for landing and takeoff of aircraft, including buildings and facilities*²⁰. The ICAO specifies that the main part of the airport is nevertheless the zone stretching from the takeoff and landing strip, along the taxiways and the parking areas for aircraft²¹. The term "airport" is commonly defined as being an "Airfield catering for passenger travel, especially a large one with customs facilities" (Oxford dictionary) or, in French, "*l'ensemble des installations - aérodrome, aérogare, ateliers - nécessaires au trafic aérien intéressant une ville ou une région*" (dictionnaire Robert) (all facilities - aerodrome, air terminal, hangars - needed for air traffic concerning a town or a region). The words "aeronautics" or "aviation" refer to "*tout ce qui a rapport à la navigation aérienne*" (Robert) (anything that concerns aerial navigation) or "relative to the operation of aircraft, or to the development and manufacture of aircraft" (Oxford).

The various approaches set out below inspired the definition of air transport and airport-related activity and the sectoral split used in this working paper, in the same way as the actual classification of enterprises active within airport territory.

- In the NBB study focused on the economic impact of Brussels Airport in 1996 and entitled *Het economisch Belang van de Luchthaven Zaventem*²², the results are set out according to the following sectoral split:
Air transport, forwarders and agents, road transport, air transport related activities, other services to companies, miscellaneous (private + public sector). The public sector comprises the following services: airspace control, air traffic management, air force, State security, the Post, SNCB - NMBS (Belgian railways), Federal Police in Zaventem, Zaventem local authority (police, fire brigade and administration),
- In the paper by Prof. Dr. L. Sleuwaegen et al. *Vers un Nouvel Equilibre entre Economie et Ecologie: Etude de l'Impact Economique de l'Aéroport de Bruxelles sur l'Economie Belge*²³, the air transport sector is presented as in the following diagram (figure 4):

FIGURE 4 AIR TRANSPORT SECTOR



Source: Sleuwaegen L. et al. (2003).

²⁰ Zantke (1976).

²¹ ICAO (2006b).

²² NBB Louvain (1996).

²³ Sleuwaegen et al. (2003).

- The 2004 SERV/GOM Vlaams Brabant study entitled *Het belang van de luchthaven als vestigingsfactor voor bedrijven en als economische motor in de luchthavenregio*, analyses several sectors' degree of specialisation in the airport region (i.e. Zaventem and the surrounding Flemish and Brussels districts of Machelen, Vilvoorde, Steenokkerzeel, Kortenberg, Evere and Woluwe-St-Lambert). The sectors with the highest degree of specialisation²⁴ are, in decreasing order: 621-622 air transport, 353 aircraft and space construction, 746 safety and investigations, 921-922 recreation, culture and sport, 642 telecommunications, 711-714 renting of rolling stock, 518 wholesale trade in industrial equipment.
- The 2006 report from Ciriec (Belgian section, ULg), entitled *Evaluation des retombées économiques en termes d'emplois des aéroports régionaux wallons (i.e. Assessment of the economic impact in terms of jobs at regional airports in Wallonia)*, makes a global estimate of the knock-on effects on the economy. One particular table (see page 136) nevertheless sets out a whole range of specific business activities, for which the multiplier coefficient has been worked out in the framework of the wider estimate of indirect effects, calculated from the number of jobs generated both upstream and downstream. In decreasing order of multiplier coefficient, these activities are: renting without operator (71), transport auxiliary services (63), air transport (62), construction (45), transport and transport auxiliary services (60 to 63), trade, transport and business-related services (50 to 74), trade and transport and communication (50 to 64), wholesale and retail trade (50 to 52), hotels, restaurants and catering (55).

1.2 METHODOLOGY

Airport activity consists of two major categories of activity, grouped together under the headings of air transport cluster and other airport-related activities. Using these sectors as a starting point and drawing on a geographical selection of enterprises eligible for the study, the economic impact is measured in terms of direct and indirect value added and employment. Other variables also come up in the analysis, as indicated below. The study also looks at air transport activity generated outside airports.

1.2.1 Classification of activities

The goal of this research project is to estimate, following a single approach, the economic impact of the activities generated by each of the six above-mentioned airports. This comes down to evaluating the economic activities produced by the companies established within the airport areas, i.e. the territory managed by the airport authorities, on the one hand, and the indirect effects of these companies, on the other.

The activities considered within airports pertain to two separate clusters:

(1) Air transport activities: all the economic branches which are specific to and generate air transport, and therefore the airport operations. These branches, which define and are essential to the air transport business, are also paramount for airport activities, since they have very close links with the heart of air transport business, i.e. the air transport branch (NACE 62)²⁵. They will be jointly referred to as the "**air transport cluster**":

- Air transport: aviation, airlines and airline services (passengers, cargo, specialised, etc.)
- Travel agencies and tour operators: service providers in relation to passengers air transport (trips involving flights, booking, ticketing, etc.)
- Forwarding offices: service providers whose main task is to organise the shipment and air transport of cargo (N.B.: selected only inside airport areas)

²⁴ The sectors mentioned in this paragraph present a degree of specialisation above 400 p.c. in the airport region. In other words, their activity is at least four times as concentrated in the reviewed area as it is on average at national level.

²⁵ Cf. Lagneaux (2008): the air transport branch is closely linked upstream to branches like building and repairing of aircraft, other supporting transport activities, renting of transport equipment, etc. Downstream, it has very strong connections with the travel agencies and tour operators sector. All these branches come within the air transport cluster.

- Airport operator: airport operating companies
- Airport handling: management of baggage, aircrafts, flight operations, passengers and airside cargo
- Other air transport supporting activities: air traffic control agencies, flying school activities, renting of aircraft and other companies which contribute to airport operations (maintenance and development for instance); with airport operator and airport handling, this makes up the air transport supporting activities category
- Building and repairing of aircraft: aircraft equipment, manufacturing and maintenance of aircrafts (engines, technological or computing equipment, etc.)

(2) The economic branches using the airport infrastructure and/or, on the airport's grounds, complementing the air transport activities mentioned above, are grouped under the heading "**other airport-related activities**", which is the second and last cluster analysed in this study:

- Passenger land transport: all the services linked to the airport, in the field of passenger land transport, mainly by road (taxi, bus, car parks, etc.) and train
- Cargo handling and storage: airport-based cargo handling and storage
- Freight transport by road: airport-based road transport of goods
- Courier and postal services: airport-based courier and postal companies
- Public services: airport-based public administrations, including customs and excise, police, fire brigade, health inspection, the military, etc.
- Security and industrial cleaning: private companies in charge of security and cleaning within the airport perimeter
- Trade: all businesses active in trade (shops, etc.) inside airports
- Hotels, restaurants and catering: operated within the airport area
- Other services: any other services not registered in previously-mentioned categories and established inside the airport area
- Other industries: any other manufacturing industries not registered in previously-mentioned categories and established inside the airport area, including construction and infrastructure companies

The distinction between these two clusters is based on the difference between air transport specific activities (1) and those which complement its offer of services and/or use the facilities, but which are not specific to air transport as such (2). A taxi company or a hotel are indeed not intrinsically, or by definition, linked to air transport. But the mere fact that they are active at airports makes them worth considering in our economic impact study. In terms of air transport, the first cluster is a producing one (*producerend*), while the second one is partly using (*afnemend*), but not only: public services such as customs or fire brigade, even though they are not specific to air transport in their definition, are necessary for the operations of the airport. This notion of "producing - using" can vary a lot in the second cluster, whereas all the activities recorded in the first cluster can be considered as "producing".

The approach adopted for the geographical selection of firms depends on whether they belong to one or other of these clusters. The companies in the air transport cluster, wherever they are established, define the air transport activities and have a direct economic link with the air transport sector and the airports. Moreover, the sectors pertaining to the air transport cluster present close links with each other. For example, the air transport sector (branch 62) is closely linked to building and repairing of aircraft, wholesale trade, other supporting transport activities (upstream) and tour operators and travel agencies (downstream). In contrast, the activities of companies in the airport-related sectors may well sometimes have only a subtly *mediate* economic link with the airports, as they do not intrinsically pertain to the air transport business. That link thus needs to be supplemented by their geographical presence in the airport. Figure 3 (see section 1.1) highlights the different geographical approaches followed in the selection of activities (see also section 1.2.3). Table 3 presents the distinction between those activities, grouped under the two hitherto defined clusters.

1.2.2 Selection of firms for the population

The selection of firms used for the study is based on the list of concessionaires from each of the airports. All the data collected are for the year 2006 and for previous years wherever possible²⁶. The latest updates for the 2006 accounting year, either from the Central Balance Sheet Office or from national accounts, the two main sources of information, were published in the Spring of 2008²⁷. An automatic selection of firms established at or around the airports had actually been considered, modelled on that required for the studies on the Belgian ports, but did not yield any convincing results. By basing the sample on the geographic boundaries of the airports and on the list of branches that are highly concentrated in airport regions²⁸, as has been done for the port studies since the 2002 report²⁹ was issued, data from the Central Balance Sheet Office have been obtained for the year 2006. Ninety-five percent of the firms included in this extract had nothing to do with airports, while barely 20 p.c. of the enterprises that are active in the Belgian airports could be found in this sample. This is naturally due to the fact that airports not only accommodate a lot of foreign firms, but also a good many companies established in different regions of the country, also called multi-district firms. An automated selection of firms established at or around the airports has therefore not been able to be developed. The option is nevertheless being kept open for any eventual update of this study later on.

For these reasons, it was decided to base information for this first study on the lists of concessionaires supplied by the management of the six airports, which contain all the information about active employment in firms operating within the perimeter of each airport³⁰. This area, it should be recalled, is confined to the airport zone as defined in the regional plans. It therefore corresponds to the borders of the airport's property, within which it manages the infrastructure and grants concessions to all the various service providers. In the case of the four Flemish airports, the lists of concessionaires are for the year 2006, i.e. the last year for which all the figures for the variables analysed in this report are available. These microeconomic data mainly come from the Central Balance Sheet Office - the main data, employment, value added, etc. - and from NAI, national accounts - classification of activities, regional breakdowns, sectoral aggregates, supply-use tables, input-output tables, etc. -. The Bank's statistical data are extremely useful for checking the figures - especially those on employment - provided by the airports. For the airports in Wallonia, on the other hand, calculations for this study were based on the lists of firms featured in the latest study from Ciriec³¹ as the necessary information could not be obtained directly from the airport management. This institute had carried out a wide-ranging survey on business activity within Wallonia's airports during the year 2004. Matched against the extract from the Central Balance Sheet Office and with a full update of the statistics, a list was able to be compiled for the year 2006, and then approved by the airport authorities concerned. These are the figures used for this study.

As already mentioned in point 1.2.1, the economic activity recorded within the airports can be grouped together in two major business categories: those that *de facto* define air transport activity, and those that do not meet this criterion but which contribute to the normal operation of the airports because of their geographical presence inside airport zones. Table 3 summarises this division of sectors, while also giving some details about the NACE branches chosen and the selection method applied to companies from the different branches.

²⁶ For Brussels Airport, in addition to a review for the 2000 - 2006 period, it has been possible to make a reliable estimate of developments in 2007. See points 1.2.4 and 2.5.2.3.

²⁷ At the Central Balance Sheet Office, the 2007 accounts will not be officially closed until the beginning of 2009. The same occurs at the NAI. Therefore it was only possible to cover the period up to 2006 in an exhaustive manner.

²⁸ See following studies: NBB Louvain (1996), SERV-GOM Vlaams Brabant (2004).

²⁹ Lagneaux (2004).

³⁰ See airport maps in Annex 1.

³¹ Ciriec (2006).

TABLE 3 BRANCHES CONSIDERED FOR THE STUDY

Cluster & sector	NACE-5 branches ³²	Selection method
AIR TRANSPORT CLUSTER		
Air transport ³³ Passengers Cargo	62100; 62200 <i>Distinction made on the basis of information from the national accounts</i>	all Belgian territory
Travel agencies and tour operators		
Forwarding offices	63401; 63405	inside airports
<i>Air transport supporting activities:</i>		
> Airport operator	63230	inside airports
> Airport handling	63230	inside airports
> Other air transport supporting activities, incl. renting of aircraft and flying school activities	63230; 71230 and 80412*	all Belgian territory
Building and repairing of aircraft	35300*	all Belgian territory
OTHER AIRPORT-RELATED ACTIVITIES		
Passenger land transport	60211 to 60230	inside airports
Cargo handling and storage	63111 to 63220; 63402 to 63404; 63406	inside airports
Freight transport by road	60241 to 60243	inside airports
Courier and post activities	64110 and 64120	inside airports
Public services	airport-related public services	in relation to airports
Security and industrial cleaning	74601 to 74820	inside airports
Trade	50101 to 52740	inside airports
Hotels, restaurants and catering	55101 to 55522	inside airports
Construction	45211 to 45340	inside airports
Other services	Other branches from NACE 6, 7, 8 and 9	inside airports
Other industries	Other branches from NACE 15 to 45	inside airports
* Only a part of these sectors was used: the part of branch 35300's business realised in the aircraft manufacturing and repair area (not spacecraft), the part of tour operators and travel agencies' business carried out in the air transport sector, only the flying schools (not the navigation schools).		

Source: NBB.

The selection of firms is of paramount importance for studying the resultant direct effects, as well as the indirect effects.

³² NACE 2003. Source: National Accounts Institute (NAI).

³³ Air transport **sector** should not be confused with air transport **cluster**. The former concerns aviation activity in the strict sense of the word, i.e. airlines operating scheduled (NACE 62100) and non-scheduled (NACE 62200) passenger or goods transport services, while the latter concerns a much wider range of activities, as illustrated in Table 3. The *air transport sector* is of course at the heart of the grouping of activities referred to as the *air transport cluster*.

AIR TRANSPORT CLUSTER:

The first cluster, *air transport cluster*, encompasses all companies that typify the country's aviation business. The selection is therefore made at the national level in this case. However, using the sectoral selection grid set out in table 3 and drawing on the lists of concessionaires supplied, we are also able to identify the firms in this first cluster that are present inside the airports. This cluster is therefore analysed in two parts, the first focusing on air transport activity recorded throughout national territory, and the second with the same business carried out within the airports themselves. For some NACE-5 branches whose definition also includes activities falling outside the scope used for this study, a certain percentage of these activities has been applied to the calculation of the whole range of variables:

(a) NACE branch 35300 entitled "Manufacture of aircraft and spacecraft" also includes space construction, which is not covered by this paper. Therefore, using the annual accounts and reports of companies in this branch, we have estimated the average share of their turnover attributable to aircraft manufacture. In 2006, it worked out at 95 p.c.

(b) NACE branches 63301 and 63302 entitled respectively "Travel agencies" and "Tour operators" also refer to activities related to the organisation of trips other than air travel, while air travel is the only item concerned by the field under review. In the framework of this study, a survey was made of the main firms in these branches, and more specifically the sale of travel schedules involving flights and/or the sale of plane tickets from Belgium. On the basis of calculations obtained for 2006, this share comes to 72 p.c. on average. Furthermore, this percentage corresponds to that mentioned in the WES study, in which the travel behaviour of Belgians is analysed on a two-year basis. In 2006, 2,434 million euro was spent by Belgians on vacation (see table 4), of which 1,766 million (72.5 p.c.) on holidays by plane.

TABLE 4 TRAVEL BEHAVIOUR OF BELGIANS

Type of trip	Number of trips	Expenditure (in million euro)
Vacation by car	1,571,000	450
Vacation by plane	1,967,000	1,766
Vacation by coach	309,000	143
Other types (train, cruise etc.)	111,000	75

Source: WES (2008).

Although this 72.5 p.c. figure reflects the result that was obtained from the survey, the WES data on expenditure also includes spending on holidays. After the survey and the comparison with the data from WES, the results were compared with another calculation, this time, on the basis of IATA results for the BSP (Billing and Settlement Plan) of Belgian travel agencies and tour operators to give the percentage of BSP sales in proportion to overall sales. Here again, a percentage of around 72 p.c. was reached for the most important groups.

In conclusion, after obtaining a percentage of approximately 72 p.c. for air transport-related activities with three different datasets (each with its own advantages and disadvantages), it was decided to use this percentage in the study.

(c) Likewise, NACE branch 80412, "Flying and navigation school activities", contains some activities that fall outside the scope of this study, such as inland navigation schooling. After surveying the main companies active in the sector and analysing their annual reports, it turned out that 96 p.c. of their turnover from this NACE branch comes from flying activities.

In the case of (a) and (c), the indicated percentages have only been used for the activities of firms in the first cluster which are not listed in any airport. Staff, value added, as well as other economic data related to enterprises in the same branches but established inside airports are actually fully accounted for in the findings of the study. Therefore, if a flying school or an aircraft manufacturer is active in at least one Belgian airport, then its business is considered to match the definition chosen for the air transport cluster. For example: the Ostend Air College and Sabena Technics, which are present at airports, are regarded as being 100 percent related to air transport and are therefore fully integrated into this research project's findings.

OTHER AIRPORT-RELATED ACTIVITIES:

As regards the second cluster, airport-related activities, the geographical condition applies without exception, so firms from this cluster must at least have a branch inside an airport zone. The airport zone plans, as officialised by the regional regulatory authorities (MOW Afdeling luchthavenbeleid and Sowaer) are set out in annex 1 of this report. These are territories managed by the airport operators, whether they are public, private or PPPs.

NOTE:

There are two major exceptions to the geographical selection rules sketched out so far. Firstly, not 100 p.c. of the staff in the public services selected for the study of the economic impact of airports is constantly present inside the airport area but these services are closely linked to the airports' business³⁴. Therefore they are included in the calculations. However, some public administrations not mentioned on the lists provided by the airport operators as being established inside the airport zones are retained too, but in the air transport cluster outside the airports category (e.g. Sowaer). Secondly, the forwarding offices (NACE³⁵ 63.401 and 63.405) recorded here are those having offices inside the airport area. Compared to the travel agencies and tour operators' business, the forwarding sector is highly concentrated. The recorded activities of forwarding offices established within the six airports under review account for no less than 14 p.c. of the total activity noted at national level for that branch. In view of the fact that cargo transport business by air is still only marginal in our country compared to road and maritime transport, and that only 8.8 p.c. of air transport actually occurs in cargo transport in Belgium (see NAI³⁶ statistics for 2004, in terms of turnover), this percentage is quite remarkable. Likewise, airport operators and airport handling, recorded within the so-called air transport supporting activities, are *per se* operated within the boundaries of the airport.

Another clarification should be made concerning the air transport sector (NACE 62.1 and 62.2): a distinction between passenger and cargo business can be made from the statistical data drawn from the supply-use tables (national accounts). In the use tables, which link the branches of activity to their production, it is possible to calculate, according to the production approach, the share that each type of transport - goods vs. passengers - accounts for in the total for the activity of the air transport sector branch. Expressed as a share of turnover, this percentage can then be applied to the value added and employment variables, using the proportionality assumption. The latest supply-use table dates from 2004. Given a stable percentage of freight in the total air transport activity over time, this can be applied to the reference year for the study, i.e. 2006. This figure is 8.8 p.c.³⁷

1.2.3 Geographical distinction

It is worth going back to the distinction between air transport and airport activities. This study is in fact a double measure as it is not only interested in air transport activity as a whole, with no distinction as to the place where it is registered, but also in operations carried out within airport zones, this time with no distinction being made as to the type of service offered by the firms established there. What we are looking at is therefore two entities, the one concerning everything carried out within the airports, and the other covering everything involving air transport activity as set out in points 1.2.1 and 1.2.2. These two subsets overlap, as many important air transport activities are carried out in airports.

An initial impact assessment concerning these datasets and subsets brings the total, in direct employment terms, to:

- (a) +/- 10,300 FTEs
- (b) +/- 11,400 FTEs
- (c) +/- 10,000 FTEs

TOTAL +/- 31,700 FTEs

³⁴ This is one reason why the title "airport-related activities" was favoured over simply "airport activities", even though these are only exceptions, the vast majority of the companies belonging to the airport-related activities being settled inside the airport perimeter.

³⁵ NACE 2003. Source: National Accounts Institute (NAI).

³⁶ National Accounts Institute.

³⁷ See also Lagneaux (2008).

This is an early assessment (direct employment in 2006) that needs to be confirmed in the course of the study. It refers to the three subsets represented in figure 3: subsets (b) and (c), which make up the airport-related activities cluster, together cover 483 firms. Taking into account the fact that some of them are established on several airport sites, there are in fact 548 business establishments in all. Subset (a) relates to the activities of around 1,283 firms from the air transport cluster established outside airports. These firms are generally smaller than companies based inside the airports. Moreover, only part of their operations have been taken into account, as explained above.

1.2.4 Direct effects

The study focuses first on analysing the actual activities of firms in the population, or their **direct effects**. This edition contains the 2006 figures, which is based on a selection made using the information supplied by the airport authorities and on the basis of our own calculations.

The calculations essentially concern the following economic indicators, relating to the activities of all the firms in the population and based on the examination of a series of items in the balance sheet and profit and loss account:

- Value added (or VA) at current prices³⁸: corresponds to the value that the enterprise adds to its inputs during the year, via the production process, i.e. the sum of staff costs (items 62 and 617 in the annual accounts), depreciation and downward value adjustments (items 630 and 631/4), provisions for liabilities and charges (item 635/7), certain operating expenses and the operating result, that is, operating profit (item 70/64 marked +) or loss (item 64/70 marked -), less operating subsidies (item 740). A firm's VA, summed up by item 9800, gives an indication of its contribution to the income (GDP) of the country or region, etc.;
- Salaried employment: the average number of paid staff members working in the firms in the population considered. The change in the average size of the workforce during the year is calculated in full-time equivalents or FTEs (item 9087).

A third variable is presented in a very brief form: investment. Only a general picture is given for this variable, concerning all six airports, as well as the air transport cluster.

- Investment at current prices³⁹: this corresponds to tangible fixed assets acquired during the year, including capitalised production costs.

Beside these variables, an attempt is made to assess the social situation, through an analysis of the social balance sheet. The company's financial health is then assessed on the basis of an analysis of some financial ratios: return on equity after tax, liquidity and solvency.

However, there is an issue here, as far as the availability of data is concerned. A considerable number of companies established inside the airports do not file accounts with the NBB Central Balance Sheet Office (see above). For instance, most airlines active in the air transport sector (NACE 62100 and 62200) in Belgium are established abroad (more than 80 p.c.) and, even though they employ staff in Belgium⁴⁰, do not necessarily file accounts in Belgium. These companies account for approximately 20 p.c. of the total value added or employment active at airports and presented in this report for that specific sector. Therefore estimates have to be made on the basis of employment data passed on by the airport operators. These first have to be checked and translated into FTEs⁴¹. Value added is then

³⁸ Unless otherwise stated, value added is reported at current prices throughout the text. Changes at constant prices are clearly indicated. Value added at constant prices was calculated using the gross value added deflator.

³⁹ Unless otherwise stated, investment is reported at current prices throughout the text. Changes at constant prices are clearly indicated. Investment at constant prices was calculated using the gross fixed capital formation deflator.

⁴⁰ There is one exception to this rule: Ryanair. The Irish airline officially does not employ staff on Belgian soil. Its activities are therefore not recorded neither in the annual accounts (Central Balance Sheet Office) nor in the national accounts (NAI). However, for the sake of exhaustiveness, and as Ryanair plays a major role at Charleroi Airport, its activities are recorded in this study (see section 2.5.3.2).

⁴¹ According to Heuse P., Ph. Delhez and H. Zimmer (2007), the national nominal employment / FTE ratio amounts to 90 p.c. on average over the period covered (2000 - 2006). Since the proportion of full-time workers is higher in the air transport cluster outside airports and not lower in the airports than the average proportion recorded for the national economy (see sections

calculated either on the basis of the accounting items presented above (if annual accounts are available) or on the basis of average VA/FTE ratios calculated for each SUT branch (99X9 branches, i.e. 3-digit NACE branches) per region. This method could not be transposed to the estimation of social balance sheet facts, nor to the study of the investment or the financial health assessment. The social balance sheet data and the financial situation are analysed by way of ratios and variation percentages. Therefore, their analysis can be restricted to the top-20 companies recorded for airports' VA and employment, which respectively account for roughly 80 and 75 p.c. of the airports' totals. The VA and employment top-20s contain more or less the same companies. To compensate for the differences, in order to assess changes in the social balance sheet, investment and the financial situation between 2005 and 2006 within airports, a common group of companies is used, which includes all companies contained in both the VA and the employment top-20 rankings⁴². These restrictions nevertheless do not apply to the study of the air transport cluster outside airports, for which variations are analysed for a constant population. For the sake of exhaustiveness, a presentation of the nominal investment data is provided for all private Belgian companies which filed their accounts with the Central Balance Sheet Office in 2006. They also include figures for state-owned airport operators.

Two approaches have been followed in this study, the one focusing on the air transport cluster, for which microeconomic data are widely available over the whole period, and the other concerning the activity featuring in the economic impact study of the airports. For this reason, changes in the air transport cluster's activity (subsets (a)+(b) from figure 3) can be analysed over the period 2000 - 2006, while the economic impact of the airports (subsets (b)+(c) from the same figure) is only shown for the year 2006. These two points will therefore be analysed in separate sections. There is one exception, however. Brussels Airport supplied company lists for the entire period from 2000 to 2007. Using the constant sample made up of the top-20 firms over the entire period, this makes it possible to see changes in value added and direct employment between 2000 and 2006, and give an initial estimate of the results for Brussels Airport in 2007, the data for top-20 being almost complete for this year.

1.2.5 Indirect effects

Based on the most recent information concerning branch-to-branch relations, i.e. the IOT 2000 and the SUT 2004, **indirect effects** are estimated, for both value added and employment. To that end, we need three sets of information:

- the share of the studied population in each SUT branch, for each variable
- the branch-to-branch relations depicted in the IOT and SUT tables⁴³
- the national figures of VA and employment per SUT branch.

The indirect VA and employment are the VA and the employment generated upstream, i.e. on the supply side of the companies recorded in the studied population. This does not end at the first level of suppliers but goes well beyond, towards the infinite level.

This process is referred to as the "top-down" approach, as we apply national figures (IOT/SUT and VA and employment per SUT branch) to a more local level. As the study of the six Belgian airports is a national-level one, this top-down approach is all the more tenable. The theory behind this algorithm is provided in more detail in annex 2. For any study focusing on branch-to-branch relations actually taking place at an even more local level, e.g. if we decide to focus on one specific airport, then a "bottom-up" approach can be considered⁴⁴. Having a rather scattered population with many of the companies filing no annual accounts in Belgium, this exercise may prove difficult. But, based on a sample of Belgian companies active on that (sub-)regional level, this may well be feasible, for instance at the level of Brussels Airport.

2.2.1.3 and 2.3.2.2), there is no reason to assume this ratio is lower than 90 p.c. in the reviewed sectors. Therefore, this ratio was retained in all subsequent calculations.

⁴² This group consists of the concatenation of VA and employment top-20s. It contains the following companies: Brussels Airport Company, Brussels Airlines, DHL Aviation, Belgocontrol, European Air Transport, Flight Care, AviaPartner, TNT Express Worldwide, Sabena Technics, TNT Airways, TNT Express Belgium, Fedex Express, Secuirair (Securitas), DHL Global Forwarding, Federal Police, Belgian Sky Shop, Société anonyme belge de Constructions aéronautique (SABCA), VLM Airlines, Restair and LSG Sky Chef Belgium.

⁴³ Input-output table / Supply-use table.

⁴⁴ Coppens F. et al. (2007).

Like in the port studies of the Bank, we also have to recall that the reader should be very careful with the interpretation of the results, as far as the indirect effects of the individual airports are concerned. Indeed, the calculations are based on assumptions like e.g. that the technical coefficients for the country are also valid on a regional level.

1.2.6 Induced and catalytic effects

Many international and regional studies⁴⁵ regularly mention two other types of effects: **induced effects** and **catalytic effects**.

The former effects refer to the activity generated by the expenditure of direct and indirect employment incomes, through the airport workers' and fund raisers' revenues, which end up being spent elsewhere in the national territory. The latter effects mean the activity created within the Belgian economy from the presence of the airports, which act as a powerful magnet attracting new enterprises and businesses to settle in their vicinity. See box 3 below.

BOX 3 INDUCED AND CATALYTIC IMPACT

Induced Impact

Employment, income/value added, output and tax revenues generated by the expenditure of the direct and indirect employment incomes, for example - purchases by employees with companies located throughout the economy of the local area.⁴⁶

Catalytic Impact

Employment, income/value-added, output and tax revenues generated by the attraction, retention or expansion of economic activity within the economy of the study area as a result of accessibility to markets due to the airports, for example - inward investment by companies located approximately within 60 minutes of the airport by road.

Source: ACI Europe.

Induced or derived effects are generally estimated from figures on employment in the airports and passenger traffic established in each airport, backed up by data on the length of stays in our country.

Catalytic or spread effects are generally calculated from sectoral specialisation coefficients measured within the airport's region of influence. In SERV (2004) for example, in line with the research work carried out eight years earlier by the NBB's Louvain branch, the airport region of Zaventem extends some way beyond the contractual boundaries of Brussels Airport, spanning the seven Flemish and Brussels municipalities of Zaventem, Machelen, Vilvoorde, Steenokkerzeel, Kortenberg, Evere and Woluwe-St-Lambert. Back in 2004, this was an area where more than 146,000 people were working at the time. This region is highly specialised in the following sectors: trade, air transport, cargo handling, land transport, post and telecommunications, computing services and other business-related services. This means that, in the economy of these seven districts, the share represented by these sectors is (much) higher than the national average. These observations are useful for estimating factors attracting economic activities to the territory under review, which are the essence of the catalytic effects described above. The SERV (2004) resorts to the so-called "shift and share" method, while Sleuwaegen (2003) and IDEA Consult (2007) base their estimates on multiplier coefficients established at the international level, presenting their findings according to several different scenarios.

Those two effects relate to the downstream repercussions of airports on the regional and national economies, whereas the indirect effects studied in this report refer to the impact upstream. Besides, induced and catalytic effects are very difficult to measure, if not scientifically questionable⁴⁷. Anyway, these two concepts, interesting though they may be, do not fit into our methodology, as our purpose is to

⁴⁵ ACI Europe (2004), SERV/GOM Vlaams Brabant (2004), Sleuwaegen L. (2003), VIL (2005), Idea Consult (2007) and Ciriec (2006). See bibliography.

⁴⁶ For a formal definition of induced effects see e.g. Coppens F. (2006) (the chapter on open and closed Leontieff models)

⁴⁷ See Sleuwaegen (2003).

avoid any double counting. Therefore, only for information purposes, some findings about these effects will be presented in the report, but no conclusions will be drawn from them. Induced and catalytic effects will therefore only be taken up as a rough guide, based on studies already carried out for the airports in Brussels, Charleroi and Liège. For the others, coefficients that have already been calculated for comparable airports will be applied.

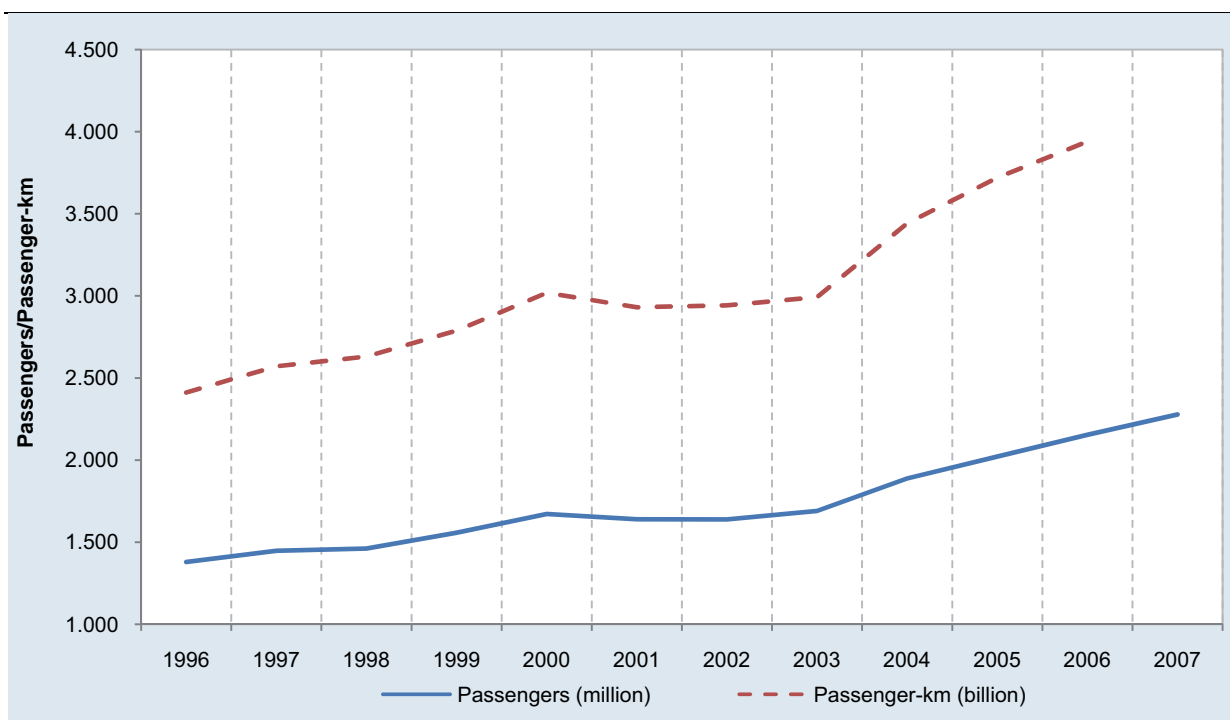
2 ECONOMIC IMPORTANCE OF AIR TRANSPORT AND AIRPORT ACTIVITIES

2.1 PASSENGER AND FREIGHT ACTIVITIES

2.1.1 Passengers: recent developments

2.1.1.1 World level

CHART 1 WORLD AIR PASSENGER TRAFFIC 1996 - 2007



Source: ICAO (1997-2007).

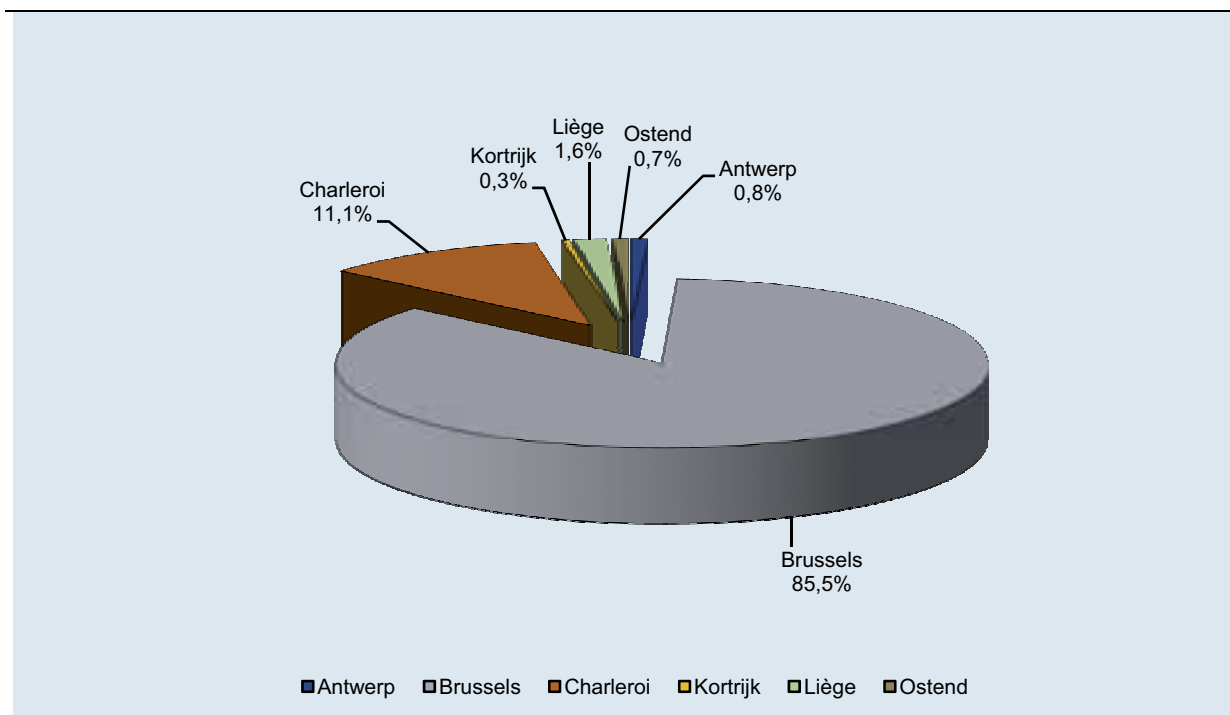
Chart 1 shows the evolution of world passenger traffic between 1996 and 2006. A steady growth of passenger traffic as well as passenger-kilometres⁴⁸ can be seen over the period as a whole. Passenger traffic grew by more than 56 p.c. between 1996 and 2006 and passenger-kilometres by roughly 63 p.c. In 2000, a first peak was reached, but as a result of the economic downturn and the 9/11 terrorist attacks, passenger traffic dropped in 2002. Traffic subsequently stayed level until 2003, partly because of the 2003 SARS crisis in Asia, but recovered after 2003 and continued on a steady growth path. This growth was higher for passenger-km than for passengers in general, due to the strong growth of international passenger traffic since 2003. In 2007, a growth rate of 5.8 p.c. was able to be achieved, which is above the average yearly growth of 4.5 p.c. between 1996 and 2006, but slightly below the 2005-2006 growth rate of 6.5 p.c. Indeed, this growth is expected to slow down in the future, especially due to rising fuel costs, the financial downturn as well as increasing congestion at the main airports.

⁴⁸ A passenger-kilometre takes into account the number of passengers and the distance flown. This unit is commonly used to refer to traffic volumes.

2.1.1.2 Situation in Belgian airports

The six airports under review operate in the passenger transport segment, but this sector is heavily dominated by two airports: Brussels and Charleroi.

CHART 2 SHARE OF BELGIAN AIRPORTS IN TERMS OF PASSENGER TRAFFIC IN 2006



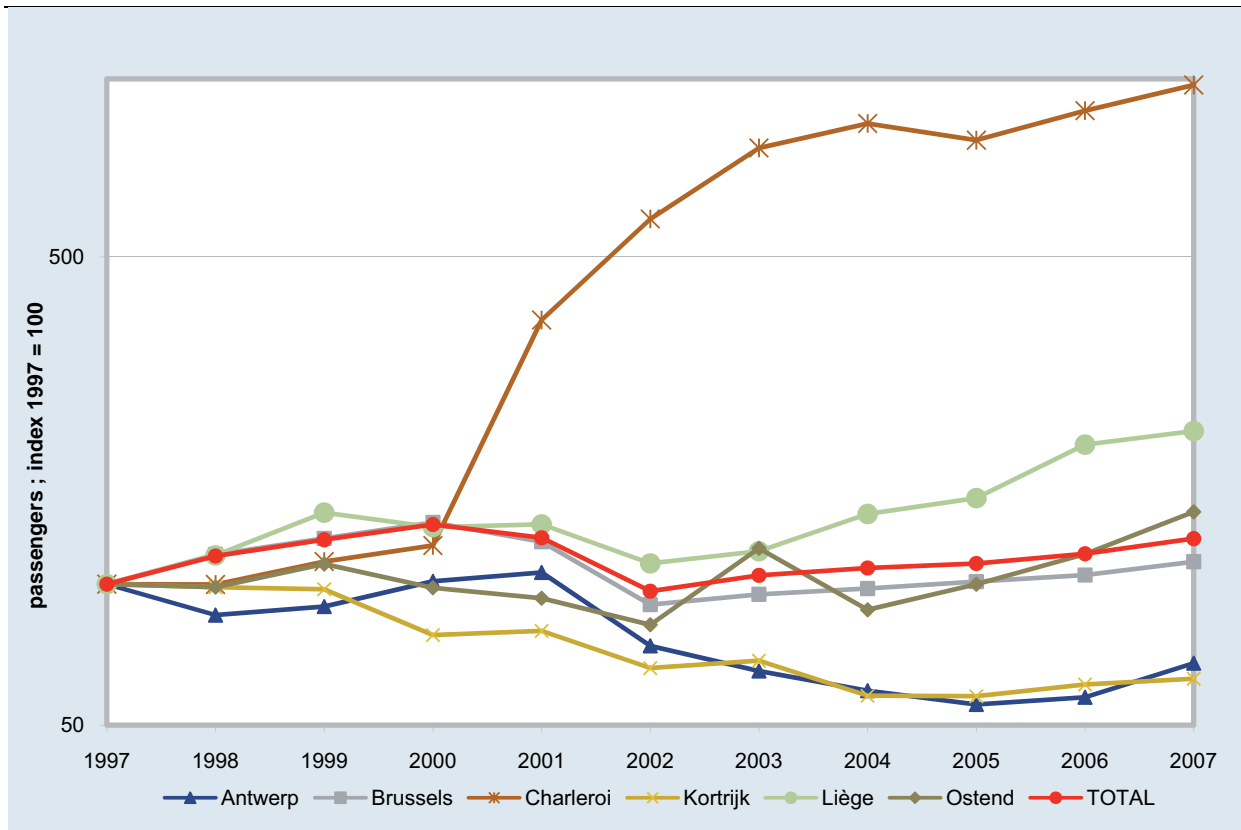
Source: Airport operators.

Passenger traffic is dominated by Brussels Airport, which represents over 85 p.c. of the approximately 20 million passengers recorded in the six airports under review in 2006 (chart 2). Next comes Charleroi with over 11 p.c., Liège, Antwerp, Ostend and finally Kortrijk. Of the six airports, it is Charleroi which has seen the biggest expansion in passenger traffic over the period, as the activities of the main airline operating at Gosselies did not really take off until the early years of this century, whereas that period was synonymous with a decline, which has since been offset, at Brussels Airport. Liège Airport also saw a very marked rise in passenger traffic, while Ostend witnessed some expansion, too, but Antwerp and Kortrijk experienced a steady decline (chart 3).

For the first time in six years, passenger traffic passed the 20 million mark again in 2007 (table 5), a level not reached since 2001, as a result of the strong expansion at Brussels and Charleroi, the former recording a better passenger load factor while the latter combined this advantage with a steady increase in the number of flights. There was also some expansion, admittedly more modest in absolute terms but nonetheless noteworthy, at the other four airports. In reality, the effects of the terrorist attacks on 11 September 2001 were not felt until 2002, a year in which substantial restructuring had been undertaken in the United States and in the rest of the world, having a very marked impact on traffic levels. Since then, the total number of annual movements at the six Belgian airports has not exceeded 500,000 units.

Over the period, the average annual increase in the number of passengers travelling from the six airports under review came to 2.3 p.c. From 2005 to 2006 it was 5 p.c., and from 2006 to 2007, 7.7 p.c. An acceleration was in fact apparent at the end of the period, in line with figures at world level (cf. chart 1). However, the worldwide average annual growth exceeds the pace seen at Belgium airports. While the average annual increase in traffic came to 2.3 p.c. in Belgium, it grew by 4.6 p.c. on average at world level.

CHART 3 PASSENGER TRAFFIC VIA BELGIAN AIRPORTS FROM 1997 TO 2007
(LOGARITHMIC SCALE)



Source: Airport operators.

TABLE 5 PASSENGER TRAFFIC VIA BELGIAN AIRPORTS FROM 1997 TO 2007

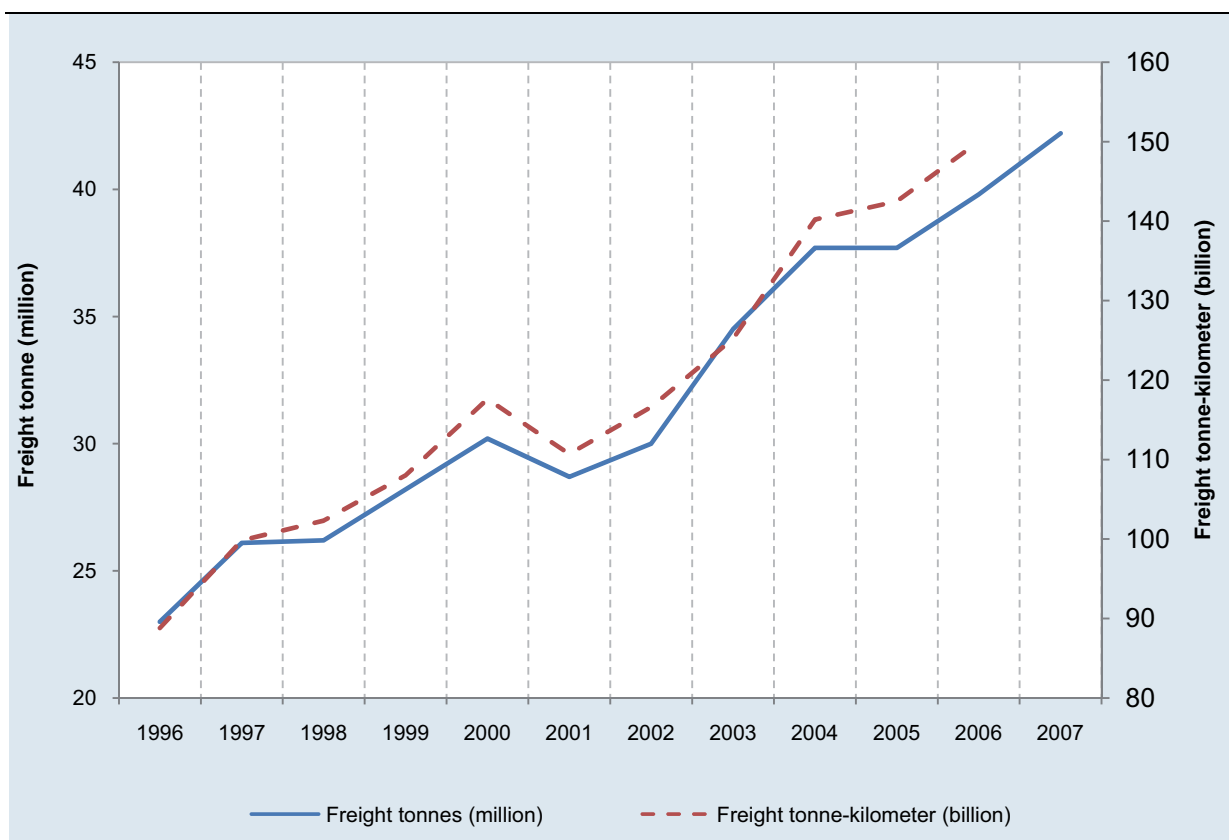
(x 1000 pax)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Annual average growth (in p.c.)
Antwerp	258	222	231	262	273	190	168	153	143	148	175	-3.8
Brussels.....	15,969	18,482	20,005	21,638	19,680	14,446	15,194	15,635	16,180	16,708	17,839	+1.1
Charleroi.....	211	211	236	255	774	1,272	1,804	2,034	1,873	2,166	2,458	+27.8
Kortrijk	107	105	104	83	85	71	73	62	62	65	67	-4.5
Liège.....	157	181	223	207	210	174	184	221	239	311	333	+7.8
Ostend.....	126	124	139	124	118	103	151	111	126	146	180	+3.6
TOTAL	16,828	19,324	20,938	22,570	21,139	16,256	17,574	18,216	18,623	19,545	21,052	+2.3

Source: Airport operators.

2.1.2 Freight: recent developments

2.1.2.1 World level

CHART 4 WORLD AIR CARGO TRAFFIC 1996 - 2007



Source: ICAO (1997-2007).

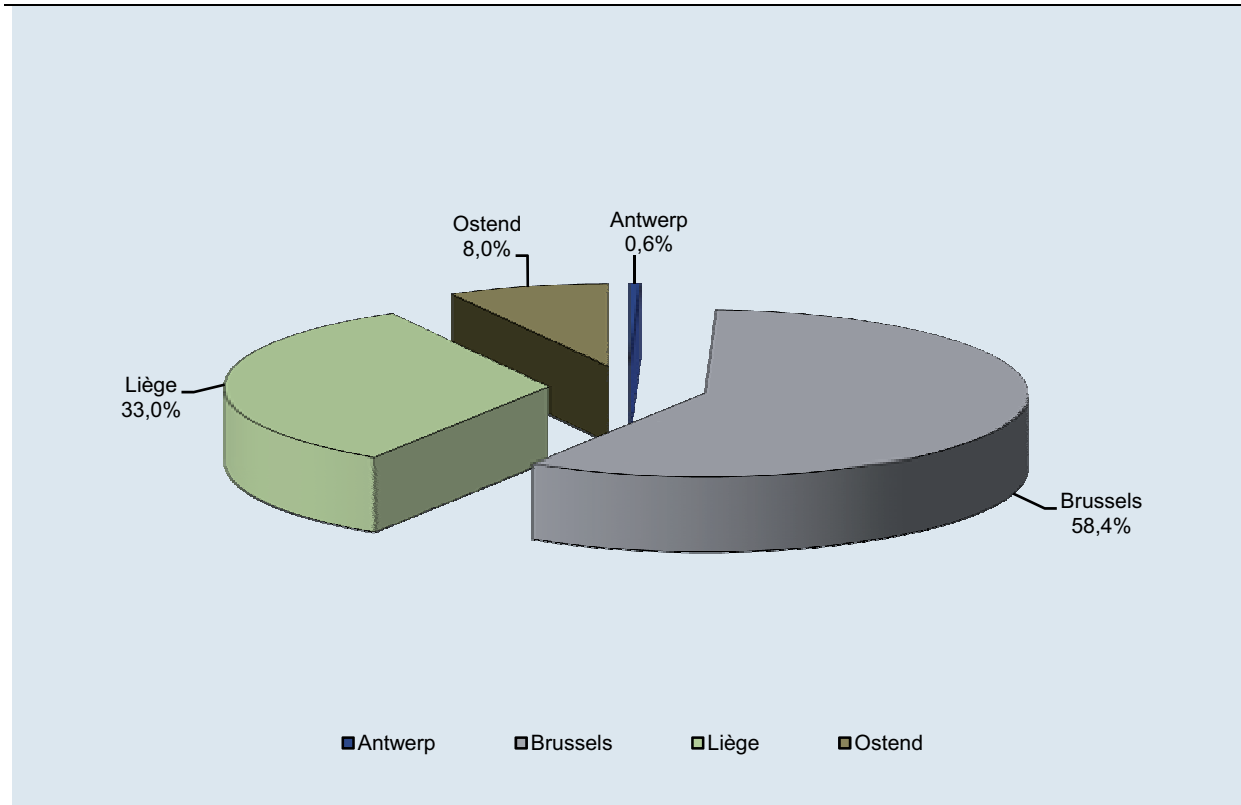
The evolution of world cargo traffic between 1996 and 2006 is shown in chart 4. When comparing its trends with world passenger traffic, it can be seen that cargo traffic also shows overall positive growth, which is stronger than that of passenger traffic. In 2006, the freight-tonne volume was 73 p.c. above the 1996 figure, and the level of freight tonne-kilometres⁴⁹ was 69 p.c. above its 1996 level. In 2000, a peak in cargo traffic can be found too, followed by a decrease in 2001. However, traffic recovered very quickly and, in 2002, a positive growth rate could be observed once again. The quick recovery is partly derived from the peculiarity of air cargo, which historically recovers more quickly from external shocks than passenger traffic. Cargo traffic grew at an annual average rate of 4.9 p.c. between 1997 and 2007, 0.3 percentage points more than passenger traffic. Between 2005 and 2006 alone, cargo traffic rose by 5.6 p.c. in tonnes. The next year, that percentage was as high as 6 p.c.

⁴⁹ A tonne-kilometre is a combined measure of the transport of passengers, freight and post, which also takes into account the distance covered.

2.1.2.2 Situation in Belgian airports

In contrast to passenger traffic, cargo business is concentrated primarily in Brussels, Liège and Ostend, while it is virtually absent in Antwerp and totally absent at Charleroi and Kortrijk.

CHART 5 SHARE OF BELGIAN AIRPORTS IN TERMS OF CARGO TRAFFIC IN 2006



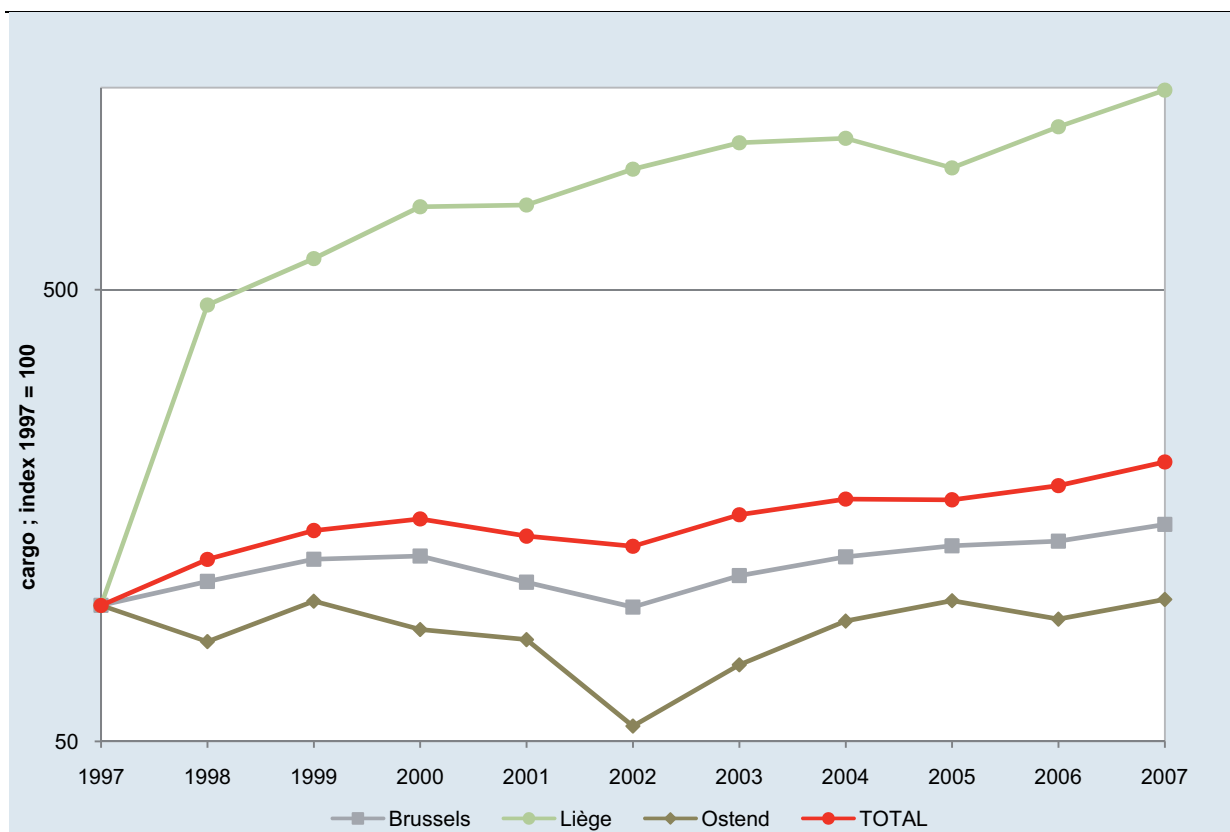
Source: Airport operators.

Here, too, it is Brussels Airport which takes the lion's share, accounting for almost 60 p.c. of Belgium's air freight traffic, but followed relatively closely by Liège Airport which represents one-third of the same total (chart 5). Ostend is in third place with 8 p.c. The strongest growth occurred at Liège Airport which has recorded an impressive 30 p.c. annual average increase since 1997. This airport, which is currently two places behind Brussels in the European ranking of freight airports, in eighth position, aims to be among the top 5 in the medium term, on the basis of the steady growth of air cargo (chart 6). As the managers of this airport like to point out, Liège Airport is "the first European airport to focus its development strategy on air cargo".

In comparison with passenger traffic, freight traffic was little affected by the events of 2001 – 2002. But as cargo represents barely 9 p.c. of the activities of the air transport sector in Belgium, this steady growth (+7.6 p.c. per annum on average, table 6) has an impact which, though positive, is relatively limited at the level of the economic variables employment and value added.

Over the period, the average annual increase in the tonnage dispatched via the six airports under review was 7.6 p.c. With this percentage, the growth of Belgian cargo traffic is well above the annual growth of world air cargo traffic (4.9 p.c.). This difference mainly derives from the exceptional growth of air cargo at Liège Airport during that period. From 2005 to 2006 alone, the air cargo growth rate in Belgium was again 7.6 p.c. (in tonnes), and from 2006 to 2007 it was as much as 12.7 p.c.

CHART 6 CARGO TRAFFIC VIA BELGIAN AIRPORTS FROM 1997 TO 2007
(LOGARITHMIC SCALE)



Source: Airport operators.

TABLE 6 CARGO TRAFFIC VIA BELGIAN AIRPORTS FROM 1997 TO 2007

(x 1000 tonnes)	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Annual average growth (in p.c.)
Antwerp	8	7	7	8	7	5	5	4	5	7	5	-4.0
Brussels.....	519	586	656	667	584	514	604	664	703	720	784	+4.2
Charleroi.....	1	1	0	0	0	0	0	0	0	0	0	n.
Kortrijk	0	0	0	0	0	0	0	0	0	0	1	n.
Liège.....	35	164	208	270	273	327	375	383	330	407	490	+30.0
Ostend.....	106	88	108	93	89	57	78	98	108	99	109	+0.3
TOTAL	669	845	979	1,039	952	904	1,061	1,150	1,145	1,232	1,389	+7.6

Source: Airport operators.

2.2 AIR TRANSPORT CLUSTER: SITUATION IN 2006 AND DEVELOPMENTS

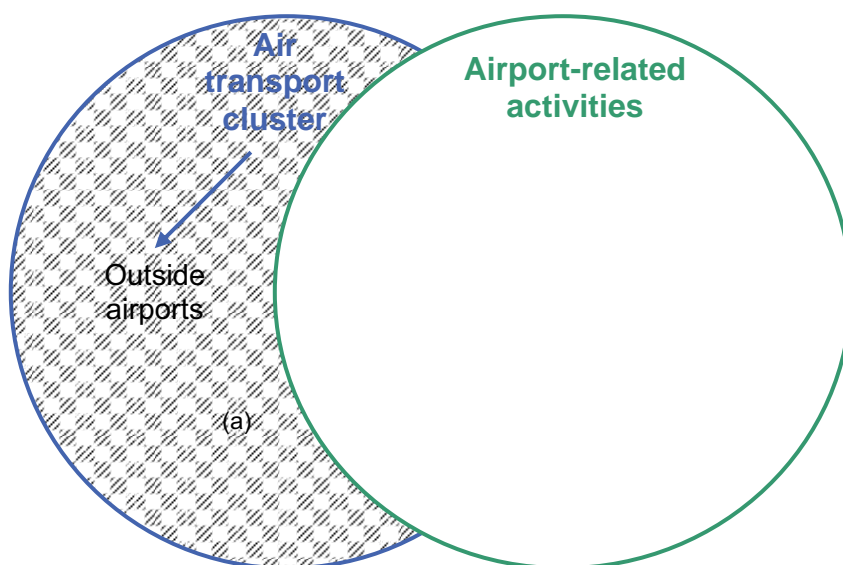
As a result of facilities for access to micro-economic data on the activities of this cluster, it is relatively easy to study developments in their case. Those developments can also serve as a barometer for all the activities under review, whether they are recorded within the airports or outside. The study of the economic impact therefore begins with this section.

This section concerns the whole air transport cluster, i.e. the air transport cluster (cf. subsets (a) and (b) in figure 3). It is divided into two sub-sections, one focusing on the economic results of the cluster outside airports in 2006 (= (a)), the other on developments over the period 2000 - 2006 for the country as a whole (= (a) + (b)). This difference of approach is justified owing to the nature of the activities. Section 2.3 is devoted to the situation regarding employment, VA and investment in 2006 relating to air transport activities in airports, while analysis of the movement in these variables is possible only for air transport activities. That is why the 2006 snapshot in absolute figures is confined to activities outside airports, while the study of the changes relates to all activities, taking all geographical locations together.

2.2.1 *Economic results of the air transport cluster outside airports in 2006*

This concerns all air transport activities recorded outside the airport zones for the 2006 financial year (subset (a) in figure 3, shown in figure 5). In fact, these figures, once added to those for activities recorded inside airports, permit an estimate of the overall impact of air transport activities and related activities in Belgium. The overall impact figures will be presented at the end of the report.

FIGURE 5 AIR TRANSPORT CLUSTER OUTSIDE AIRPORTS



Source: NBB.

This study not only focuses on the transport branches strictly depending on air transport⁵⁰, but also encompasses the industrial activities and services which intrinsically constitute the air transport business as a whole. Building and repairing of aircraft is one of these. Companies belonging to this sector may be established inside the airports, while many others are positioned in the vicinity of - and therefore outside - the airport perimeters. This is why a great deal of their business is generated outside airports, as this section shows.

⁵⁰ This approach actually differs from that followed in Lagneaux (2008).

2.2.1.1 Value added

- Direct VA

Sector	Value added (in million euro)	Share (in p.c.)
Air transport.....	134.4	16.1
Travel agencies and tour operators.....	259.9	31.1
Building and repairing of aircraft.....	378.4	45.3
Other air transport supporting activities.....	63.0	7.5
TOTAL	835.8	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

Direct Value Added (VA), i.e. the value which each enterprise adds to its inputs during the financial year, came to almost 840 million euro in 2006 in the air transport cluster, excluding the activities of airports (table 7). This table also permits an estimate of the breakdown of VA within air transport according to the type of transport: 8.8 p.c. of the 134 million euro, or almost 12 million euro, is considered to relate to air cargo activities, while the remaining 122 million corresponds to passenger transport. The VA of the cluster outside airports is dominated by the building and repairing of aircraft sector, which accounts for more than 45.3 p.c. of the total. In second place are the travel agencies and tour operators (31.1 p.c.), for whom only activities relating to air transport were included. This sector thus reduced to its air transport activities represents almost one-third of the air transport cluster outside airports. The airlines (air transport) represent over 16 p.c. of the total, the bulk of this activity being recorded in airports while the other air transport supporting activities account for 7.5 p.c. of the same total.

- VA top 20

This section develops the analysis of the VA of the air transport cluster. The ranking of the VA top 20 (table 8) and the figures in the last column refer to activities taking place outside airports. Otherwise, Brussels Airport Company would have been at the top of this list. But since that company is included 100 p.c. in the figures for Brussels Airport, it was not taken into account in this chapter. Another example: 58.9 p.c. of the activities of the cargo airline owned by the DHL Aviation Group, European Air Transport (EAT), take place in the airports under review. The figures set out below in relation to that company therefore reflect the remaining 41.1 p.c. of its activities.

The top 20, which represents more than 80 p.c. of the activities of the cluster outside airports, is dominated by the building and repairing of aircraft sector, and especially Techspace Aero, Sonaca and Sabca. The second most important sector, travel agencies and tour operators, owe their position to companies such as Thomas Cook Belgium and JetAir, the leading Belgian tour operators, Carlson Wagonlit Travel (CWT) and a number of others. The activities of airlines outside airports make European Air Transport (DHL group) the leader in this sector, followed by Thomas Cook Airlines Belgium and TUI Airlines Belgium. The 18.4 p.c. recorded outside the six airports under review by the autonomous public enterprise Belgocontrol⁵¹ are sufficient to position this Belgian air traffic control authority at the top of the list of enterprises involved in other air transport supporting activities, followed by Sowaer, based in Namur (Jambes).

The top 10 alone accounts for 66.6 p.c. of the direct VA of the air transport cluster outside airports, which seems to indicate that the sector is highly concentrated.

⁵¹ Belgocontrol is an autonomous public company in charge of the safety of air traffic in the civil lower airspace (< 24,500 feet, i.e. roughly 7,500 metres) for which the Belgian State is responsible. It fulfils this mission by optimising costs and punctuality, by increasing capacity and by ensuring the sustainable development of air traffic. Belgocontrol provides all the services essential for the safe management and control of air traffic: (1) ATM - air traffic management and air traffic control; (2) Technology - infrastructure and systems of ATM data processing, communication, navigation, surveillance and meteo; (3) AIS and Meteo - aeronautical information and meteorological information services. Information on www.belgocontrol.be

TABLE 8 VALUE ADDED TOP 20 IN THE AIR TRANSPORT CLUSTER OUTSIDE AIRPORTS IN 2006

	Name of company or organisation	Sector	Recorded in airports	Value added (in million euro)
1	Techspace Aero	Building and repairing of aircraft	no	166.6
2	Société Nationale de Construction Aérospatiale (SONACA)	Building and repairing of aircraft	no	86.6
3	European Air Transport	Air transport	yes	57.8
4	Société anonyme belge de Constructions aéronautique (SABCA)	Building and repairing of aircraft	yes	52.6
5	ASCO Industries	Building and repairing of aircraft	no	45.6
6	Thomas Cook Belgium	Travel agencies and tour operators	yes	33.4
7	JetAir	Travel agencies and tour operators	yes	31.1
8	Thomas Cook Airlines Belgium	Air transport	no	29.0
9	TUI Airlines Belgium	Air transport	no	29.0
10	Belgocontrol	Other air transport supporting activities	yes	24.8
11	Société Wallonne des Aéroports (SOWAER)	Other air transport supporting activities	no	24.0
12	CWT Belgium	Travel agencies and tour operators	no	18.3
13	BCD Travel Belgium	Travel agencies and tour operators	no	15.4
14	Jetaircenter	Travel agencies and tour operators	yes	12.7
15	American Express Corporate Travel	Travel agencies and tour operators	no	12.3
16	Technical Airborne Components Industries	Building and repairing of aircraft	no	10.1
17	Sune Reizen - Voyages Sun	Travel agencies and tour operators	no	6.4
18	Liege Air Cargo Handling Services	Other air transport supporting activities	no	5.7
19	SN Airholding	Air transport	no	5.6
20	Connections - Eurotrain	Travel agencies and tour operators	yes	5.1
TOTAL				672.2
Share in total air transport cluster outside airports				80.4 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

- **Indirect VA**

Indirect VA in 2006 amounted to 1,466.6 million euro. Therefore, by comparison with direct VA presented above, the multiplier is as high as 2.75. This means that every euro of VA directly generated by air transport cluster companies established outside airports eventually produces 2.75 euro of income within the national economy, taking account of the VA generated by their suppliers at every level. This is more than the average recorded in transport logistics (1.65⁵²), which means that air transport, in spite of the sector's limited size in Belgium, has a substantial impact on other industries. For the record, these are the multipliers of some other major sectors: 2.3 in the maritime ports, 2.8 in car manufacturing, 2.4 in the steel industry, 2.5 in the chemical industry and 2.1 in construction.

⁵² More details in section 2.2.1 of Lagneaux (2008).

2.2.1.2 Employment

- **Direct employment**

Sector	Employment (in FTEs)	Share (in p.c.)
Air transport.....	1,094	10.7
Travel agencies and tour operators.....	4,314	42.0
Building and repairing of aircraft.....	4,443	43.3
Other air transport supporting activities.....	416	4.0
TOTAL	10,267	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

Direct employment, i.e. paid employees active in the air transport cluster excluding the activities of airports, came to more than 10,000 full-time equivalents (FTEs) in 2006 (table 9). This table also permits an estimate of the breakdown of air transport by type of transport: 8.8 p.c. of the 1094 FTEs, or almost 100 FTEs, are considered to be involved in air cargo activities, while the remaining 1000 FTEs correspond to passenger transport activities. Like in the VA, employment is the highest in the building and repairing of aircraft sector (43.3 p.c.), closely followed by the travel agencies and tour operators (42 p.c.). The shares represented by the airlines (air transport) and other air transport supporting industries are smaller than in the case of VA, at almost 10.7 and 4 p.c. respectively.

- **Employment top 20**

This section provides an opportunity to put names to enterprises in the sectors mentioned. This ranking (table 10) and the figures in the last column refer to activities taking place outside the airports. Otherwise, Brussels Airport Company would have been at the top of this list. But since that company is included 100 p.c. in the figures for Brussels Airport, it was not taken into account in this chapter.

The top 20, which represents 74 p.c. of the employment recorded in the air transport cluster outside airports, is also dominated by enterprises belonging to the building and repairing of aircraft sector, Sonaca topping the list here, followed by Techspace Aero and Sabca. But the most important sector in relative terms is the travel agencies and tour operators sector, which owes its position to companies such as Thomas Cook Belgium, JetAir and Carlson Wagonlit Travel (CWT Belgium). The share of Belgian airlines not present in the airports places TUI Airlines Belgium at the top of this sector in terms of employment, very closely followed by European Air Transport. The activities of Belgocontrol recorded outside the six airports under review nevertheless position it at the top of the other air transport supporting activities sector.

The top 10 alone represents 60 p.c. of the direct employment of the air transport cluster outside airports, which seems to confirm that the sector is actually highly concentrated.

- **Indirect employment**

Indirect employment in 2006 amounted to 20,440 FTEs. The comparison with direct employment presented above indicates a multiplier of 2.99. This means that, taking account of the upstream effects of the air transport cluster at every level, each job in companies established outside airports in this cluster eventually generates 3 jobs in the national economy as a whole. This is more than the average recorded in transport logistics (1.57⁵³), which means that air transport, in spite of the sector's limited size in Belgium, has a substantial impact on other industries in terms of employment as well. This figure is also much higher than multipliers encountered in other economic sectors (see above).

⁵³ More details in section 2.2.1 of Lagneaux (2008).

TABLE 10 EMPLOYMENT TOP 20 IN THE AIR TRANSPORT CLUSTER OUTSIDE AIRPORTS IN 2006

	Name of company or organisation	Sector	Recorded in airports	Employment (in FTEs)
1	Société Nationale de Construction Aérospatiale (SONACA)	Building and repairing of aircraft	no	1,622
2	Techspace Aero	Building and repairing of aircraft	no	1,269
3	Société anonyme belge de Constructions aéronautique (SABCA)	Building and repairing of aircraft	yes	637
4	ASCO Industries	Building and repairing of aircraft	no	511
5	Thomas Cook Belgium	Travel agencies and tour operators	yes	423
6	TUI Airlines Belgium	Air transport	no	381
7	European Air Transport	Air transport	yes	367
8	JetAir	Travel agencies and tour operators	yes	341
9	CWT Belgium	Travel agencies and tour operators	no	330
10	Jetaircenter	Travel agencies and tour operators	yes	280
11	BCD Travel Belgium	Travel agencies and tour operators	no	273
12	Thomas Cook Airlines Belgium	Air transport	no	229
13	American Express Corporate Travel	Travel agencies and tour operators	no	222
14	Belgocontrol	Other air transport supporting activities	yes	184
15	Technical Airborne Components Industries	Building and repairing of aircraft	no	117
16	Sabena Technics BRU	Building and repairing of aircraft	yes	101
17	Liege Air Cargo Handling Services	Other air transport supporting activities	no	88
18	Connections - Eurotrain	Travel agencies and tour operators	yes	86
19	SABCA Limburg	Building and repairing of aircraft	no	74
20	General Tour	Travel agencies and tour operators	no	65
TOTAL				7,601
Share in total air transport cluster outside airports				74.0 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

2.2.1.3 Social balance sheet

This section concerns all air transport cluster companies which filed full-format accounts in both 2005 and 2006 and are part of the constant sample for this study. This constant sample represents 87.5 p.c. of the employment recorded in the air transport cluster outside airports for the year 2006. Table 11 summarises the main developments concerning the social balance sheets of the companies belonging to that sample.

Type of contract and human resources

As will be discussed in section 2.2.2.1, while the VA of air transport activities taking all locations together grew by 2 p.c. in real terms between 2005 and 2006, the same is not true of employment, which declined by 0.8 p.c. during the same period. That decline applied to the activities of the air transport cluster as a whole, but here we are interested in employment in the air transport cluster outside airports, on the basis of a constant sample relating to firms which filed full-format accounts in 2005 and 2006. Contrary to all expectations, there was a slight increase in the average number of employees recorded in the staff register, and in the number of hours worked and the staff costs. The number of hours per FTE also increased, exceeding the level seen in the airports (see below); the same is true of staff costs per FTE and hourly labour costs, which are higher than the national average.

Although declining, the proportion of white-collar workers is higher than the national average, in contrast to blue-collar workers. Exceeding the national average again in 2006, the other staff categories recorded strong expansion; of course, this includes managerial and supervisory staff. The breakdown of staff by gender is relatively close to the national average, with a lower proportion of men than in the airports. Conversely, the proportion of full-time workers is considerably higher than in the airports, or in the rest of the economy.

TABLE 11 SOCIAL BALANCE SHEET IN THE AIR TRANSPORT CLUSTER OUTSIDE AIRPORTS

		2005	2006
1/ TYPE OF CONTRACT AND COMPOSITION OF WORKFORCE			
1.1	Hours worked and costs of own staff		
	Change in the average number of employees on the staff register (p.c.)		+0.4
	Change in the number of hours actually worked (p.c.).....		+2.1
	Change in staff costs (p.c.)		+3.1
	Average number of hours worked per annum per FTE.....	1495.9	1526.2
	Average annual staff costs per FTE (euro)	54587.3	55999.4
	Average staff costs per hour worked (euro).....	36.0	36.4
1.2	Internal workforce		
	- by professional category		
	white-collar (p.c.).....	68.9	65.2
	blue-collar (p.c.)	28.8	28.5
	other staff (p.c.).....	2.3	6.3
	- by sex		
	males (p.c.)	65.8	65.0
	females (p.c.)	33.8	34.2
	- by working time		
	full-time (p.c.)	90.9	90.3
	part-time (p.c.).....	9.1	9.7
1.3	External staff: hired temporary staff and staff placed at the enterprise's disposal		
	Share of external staff in total employment (on the basis of the number of hours actually worked) (p.c.)	3.8	4.8
	Change in the number of hours actually worked (p.c.).....		+28.7
	Change in costs (p.c.)		+37.0
2/ STAFF TURNOVER			
2.1	Staff hired, by educational level		
	- University education (p.c.)	10.0	8.1
	- Higher non-university education (p.c.)	36.0	35.3
	- Secondary education (p.c.).....	50.9	51.8
	- Primary education (p.c.).....	3.1	4.8
2.2	Staff leaving, by reason for termination of contract		
	- Retirement (p.c.)	1.6	1.7
	- Early retirement (p.c.)	4.2	2.9
	- Dismissal (p.c.)	18.8	19.0
	- Other reason (p.c.).....	75.3	76.4
2.3	Turnover rate ⁵⁴ (p.c.).....	16.0	17.4

Source: NBB (Central Balance Sheet Office, own calculations).

⁵⁴ Number of staff departures in t, divided by the workforce recorded at the beginning of the year t (i.e. the workforce recorded at the end of the year t less staff recruitments plus departures recorded during this year). For more information, see Heuse P., Ph. Delhez and H. Zimmer (2007).

TABLE 11 SOCIAL BALANCE SHEET IN THE AIR TRANSPORT CLUSTER OUTSIDE AIRPORTS (CONTINUED)

		2005	2006
3/ TRAINING⁵⁵			
3.1	Participation rate		
	- males (p.c.)	53.8	51.2
	- females (p.c.)	60.9	50.8
3.2	Number of hours' training per person		
	- males (hours)	36.2	44.3
	- females (hours)	26.6	37.1
3.3	Training costs per hour		
	- males (euro)	64.8	53.6
	- females (euro)	42.6	36.4
3.4	Percentage of the number of hours worked devoted to training (p.c.)	1.2	1.4
	Training costs as a percentage of total staff costs (p.c.)	2.0	1.9

Source: NBB (Central Balance Sheet Office, own calculations).

In the case of hired temporary staff and staff placed at the enterprise's disposal, the proportion of the number of hours which they represent was still below the national average in 2005, though the difference was cancelled out in the following year when there was a very substantial increase in both the number of hours worked and the costs associated with this staff category. This occurred mainly in the sectors comprising the building and repairing of aircraft and other air transport supporting activities, and to some extent in air transport (scheduled air transport).

Staff turnover

Staff recruitment broken down by level of education was variable between 2005 and 2006, in contrast to the general picture in the economy, since more of the lower skilled were recruited in 2006 than in the previous year. This group is dominated more than ever by the secondary education level, followed by non-university higher education, university education and finally, elementary education, these last two categories appearing in the reverse order of that seen in airports.

The main reasons stated for the termination of contracts are, in the first place, "other reasons", which include the expiry of temporary contracts and voluntary departures. Although the figure is up slightly, the 76 p.c. recorded is a little below the national average, though still above the score recorded for transport logistics firms. The proportion of retirement is below the national average, early retirement is fairly close to the average, but redundancies exceed both the national average and the average for branches in transport logistics.

The cluster comprising air transport outside airports has a fairly high staff turnover rate. That rate increased between 2005 and 2006 to exceed 17 p.c., which is above the national average (14.3 p.c. for the reduced population considered in the Social Balance Sheet 2006⁵⁶), but below the average for transport logistics (almost 20 p.c.⁵⁷) and the score recorded in airports (20.8 p.c., cf. point 2.3.2.2). High turnover levels generally occur in the smallest firms, in contrast to large companies where internal mobility is more common. However, the constant sample used for this analysis contains only large firms,

⁵⁵ Here training is meant in the formal sense, i.e. courses in premises reserved for that purpose, within the firm or outside. It therefore excludes on-the-job training, for example, mentoring and self-training.

⁵⁶ Heuse P., Ph. Delhez and H. Zimmer (2007).

⁵⁷ Lagneaux (2008).

so that there seems to be relative social instability in the air transport cluster outside airports, particularly in air transport and other air transport supporting activities.

Training

Despite a general decline in participation in formal training in 2006 and a cut in hourly expenditure on such training, all the ratios presented in table 11 in this section are still above the average levels in the national economy. There are two useful indicators here: the percentage of working time reserved for training, and training costs as a percentage of total staff costs, which are both above the national averages, the latter ratio remaining steady at the 1.9 p.c. target set by the 2006 Generation Pact. Although the training effort is down slightly, it is therefore a reality in this sector, where the trend in the workforce is fairly stable.

2.2.1.4 Investment

- **Direct investment**

TABLE 12 DIRECT PRIVATE INVESTMENT IN THE AIR TRANSPORT CLUSTER OUTSIDE AIRPORTS IN 2006

Sector	Investment (in million euro)	Share (in p.c.)
Air transport.....	58.2	28.5
Travel agencies and tour operators.....	23.8	11.7
Building and repairing of aircraft.....	51.0	25.0
Other air transport supporting activities.....	70.9	34.8
TOTAL	203.9	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

The direct private investment recorded in firms in the air transport cluster outside airports came to roughly 204 million euro in 2006 (table 12).

Here, it is other air transport supporting activities which account for the largest share – over one-third – of the amounts invested in air transport activity by firms in this sector based outside airports. What counts here is the firm’s place of head office. This detail is important, because some of the investments mentioned in this section correspond to operations, projects or infrastructure, etc. executed inside airports (cf. the case of Sowaer above). Next comes the air transport branch (28.5 p.c.), followed by building and repairing of aircraft (25 p.c.) and travel agencies and tour operators (11.7 p.c.).

- **Private investment top 20**

This ranking (table 13), and the figures shown in the last column, refer to activities taking place outside airports. It goes into more detail on the preceding observations.

The top 20, which represents nearly 90 p.c. of the investment recorded in the air transport cluster outside airports, is dominated this time by the other air transport supporting activities branch, headed by Sowaer. The Walloon Airport Authority, though based outside airports, invests in particular in upgrading the Walloon airport infrastructures (extending runways, access, etc.), and in support facilities for local residents – property management, information and sound insulation Sowaer is currently managing two noise plans for the Walloon Region: the PEB (noise exposure plan) and the PDLT (long-term development plan).⁵⁸ This concerns the relevant Belgian and European standards. Next come companies such as the airline European Air Transport (fleet expansion and improvement) which records more than 40 p.c. of its activity outside Brussels Airport, hence its place in this top 20, and numerous companies involved in building and repairing of aircraft, starting with Sonaca. The latter has invested heavily in automation, high speed machining and new composite materials, while Techspace Aero and

⁵⁸ More information on this subject is available at www.sowaer.be.

the other companies in the same branch are investing in the acquisition of new production facilities. The tour operator Thomas Cook is in a good position, as is Belgocontrol, whose new site, equipped with new office facilities, was in the completion phase in 2006, thus accounting for a large percentage of the investments recorded.

TABLE 13 PRIVATE INVESTMENT TOP 20 IN THE AIR TRANSPORT CLUSTER OUTSIDE AIRPORTS IN 2006

	Name of company or organisation	Sector	Recorded in airports	Investment (in million euro)
1	Société Wallonne des Aéroports (SOWAER)	Air transport supporting activities	no	60.1
2	European Air Transport	Air transport	yes	46.5
3	Société Nationale de Construction Aérospatiale (SONACA)	Building and repairing of aircraft	no	16.7
4	Techspace Aero	Building and repairing of aircraft	no	10.4
5	ASCO Industries	Building and repairing of aircraft	no	9.6
6	SABCA Limburg	Building and repairing of aircraft	no	9.1
7	Belgocontrol	Air transport supporting activities	yes	3.5
8	Société anonyme belge de Constructions aéronautique (SABCA)	Building and repairing of aircraft	yes	3.1
9	Noordzee Helikopters Vlaanderen	Air transport	yes	3.0
10	Thomas Cook Belgium	Travel agencies and tour operators	yes	2.8
11	Sky Services	Air transport	no	2.3
12	TUI Airlines Belgium	Air transport	no	1.9
13	Les Voyages François Lenoir	Travel agencies and tour operators	no	1.8
14	Heli and Co	Air transport	no	1.4
15	Westvlaamse Intercommunale Vliegveld Wevelgem-Bissegem	Air transport supporting activities	no	1.4
16	Flying Service	Air transport	no	1.0
17	Voyages A tout Coeur	Travel agencies and tour operators	no	1.0
18	Sabena Flight Academy	Air transport supporting activities	yes	0.8
19	Technical Airborne Components Industries	Building and repairing of aircraft	no	0.8
20	Lauwers	Travel agencies and tour operators	no	0.8
TOTAL				178.0
Share in total air transport cluster outside airports				87.3 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

The top 10 alone represents 80.8 p.c. of investment in the air transport cluster outside airports, which tends to confirm that the sector is highly concentrated in this area, too.

2.2.1.5 Financial situation

TABLE 14 FINANCIAL SITUATION IN THE AIR TRANSPORT CLUSTER OUTSIDE AIRPORTS

	Airport top-20 companies		Non-financial corporations	
	2005	2006	2005	2006
Return on equity after tax (in p.c.)	9.1	7.8	10.1	9.4
Liquidity in the broad sense.....	1.50	1.47	1.29	1.30
Solvency (in p.c.).....	31.0	31.4	43.4	44.9

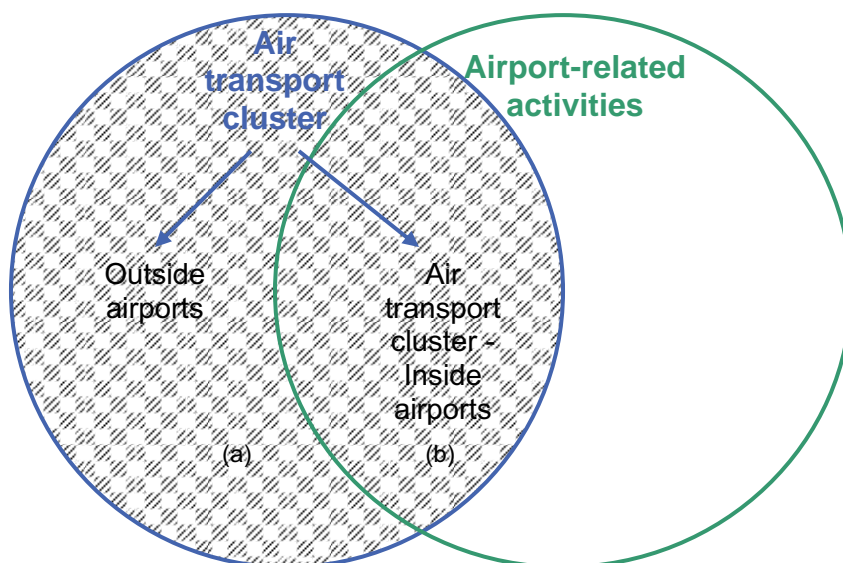
Source: NBB (Central Balance Sheet Office, own calculations).

In line with the national trend, the return on equity after tax of the air transport cluster companies established outside airports declined slightly between 2005 and 2006 to just under the national average (table 14). This ratio declined in the building and repairing of aircraft and in some other air transport supporting activities but rose in air transport and in travel agencies and tour operators. Liquidity is high in the companies considered, and remained stable between 2005 and 2006, as the net working capital decreased in the building and repairing of aircraft whereas it increased in other sectors. Solvency remained below the national average, although it improved slightly in air transport and other air transport supporting activities, whereas it declined in the building and repairing of aircraft sector.

2.2.2 Developments of VA, employment and direct investment in the air transport cluster

This section examines developments in the air transport cluster between 2000 and 2006, both outside and inside the airport zones (subsets (a) + (b) in figure 3, shown in figure 6), in terms of value added, employment and direct investment. It was useful to measure these changes taking all activity locations together, in order to obtain the broadest possible picture. Given the extent of the area analysed, as an initial approximation it is in fact reasonable to say that the curves shown below offer a fairly accurate picture of developments in the sector as a whole, in view of the close links between the other airport branches and the air transport branches.⁵⁹ It should be remembered that 95 p.c. of the activities of NACE branch 35300 (building and repairing of aircraft and spacecraft) were taken into account, 72 p.c. in the case of NACE branches 63301 and 63302 (tour operators and travel agencies) and 96 p.c. in the case of NACE branch 80412 (boat piloting and airplane flying schools).

FIGURE 6 AIR TRANSPORT CLUSTER INSIDE AND OUTSIDE AIRPORTS

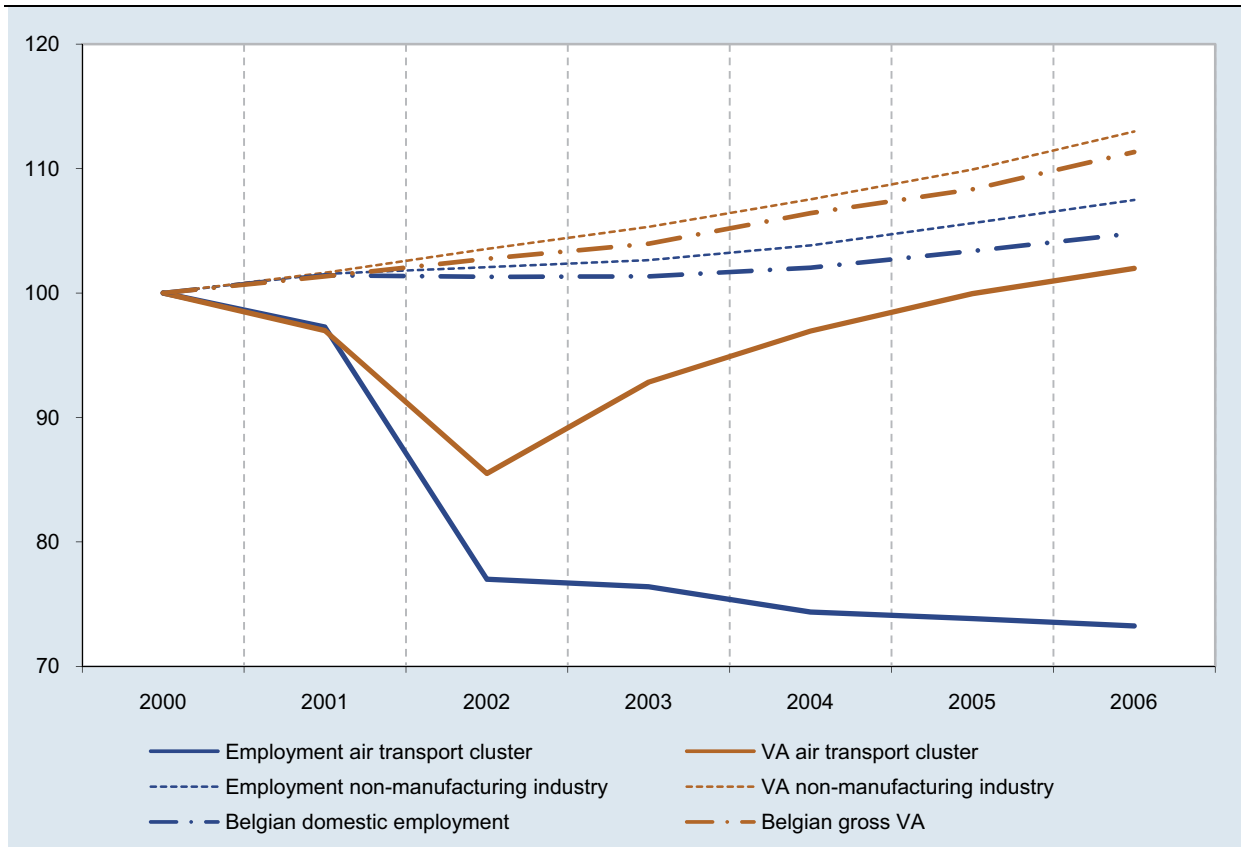


Source: NBB.

⁵⁹ Cf. Lagneaux (2008) and comments on the sections relating to the indirect effects in 2.3.1 and 2.3.2.1. For example, the air transport branch has very close upstream links with the branches building and repairing of aircraft, wholesale trade, other supporting transport activities, renting of automobiles and other transport equipment, etc. Downstream, it is closely linked with the travel agencies and tour operators sector.

2.2.2.1 Direct value added and employment

CHART 7 COMPARISON OF CHANGES IN TERMS OF VALUE ADDED AND EMPLOYMENT IN THE AIR TRANSPORT CLUSTER AS A WHOLE
(index 2000 = 100; constant prices, FTEs)



Source: NBB and NAI.

In 2001, there was a slight fall in both employment and VA, which was dramatically confirmed in 2002 (chart 7). Having respectively reached 29,644 FTEs and 1,925 million euro - at 2006 constant prices - in 2000, employment and VA dropped to 22,828 FTEs and 1,645.9 million euro two years later (figures in table 15 obtained by repolation⁶⁰). Over the whole period 2000-2006, VA still grew by an annual average of 0.3 p.c. at constant prices, while employment dropped at an annual average of 5.1 p.c.

2001 was a really gloomy year for the air transport sector in Belgium, particularly following the collapse of Sabena (air transport). In the air transport branch over 7,700 FTE jobs were lost at the end of 2001, including over 5,000 job losses at Sabena alone, which is not reflected in these charts as they focus on the annual average staff numbers. In total, these reductions were only partly offset by the expansion of other air transport supporting activities. 2001 also saw the most serious crisis to hit the international civil air transport sector, following the terrorist attacks on 11 September; though implicated itself, the air transport sector recovered well, and the effects were felt mainly in 2002. This was a phenomenon specific to the air transport sector, considering that both VA and employment in Belgium remained steady or even expanded, particularly in non-manufacturing industry which did better than the average for the national economy, though that category of activities does include the branches under review. While employment recovered slightly in 2002, the sector's financial problems depressed value added in the building and repairing of aircraft, a sector where employment has been falling at a constant, sustained pace, particularly as a result of productivity gains, essential for this sector which faces strong competition at European and world level. Conversely, the figures were maintained or even increased, following the 2001 peak, in the case of the activities of travel agencies and tour operators, and other air

⁶⁰ Figures for the air transport cluster as a whole obtained by applying the changes observed within the cluster over a period on the 2006 figures.

transport supporting activities, while there was a gradual recovery in the VAT of airlines to the pre-2001 level at the end of the period, though this did not bring any significant increase in employment in that sector.

Between 2001 and 2006, the direct VA of the air transport cluster including airports increased by an average of 1 p.c. at constant prices, or half the increase in GDP over the same period (+2 p.c.), in a context of continuous expansion of non-manufacturing branches. VA at constant prices rose by 2 p.c. between 2005 and 2006, while employment was down by 0.8 p.c.

TABLE 15 ESTIMATED CHANGES IN TERMS OF VALUE ADDED AND EMPLOYMENT IN THE AIR TRANSPORT CLUSTER AS A WHOLE

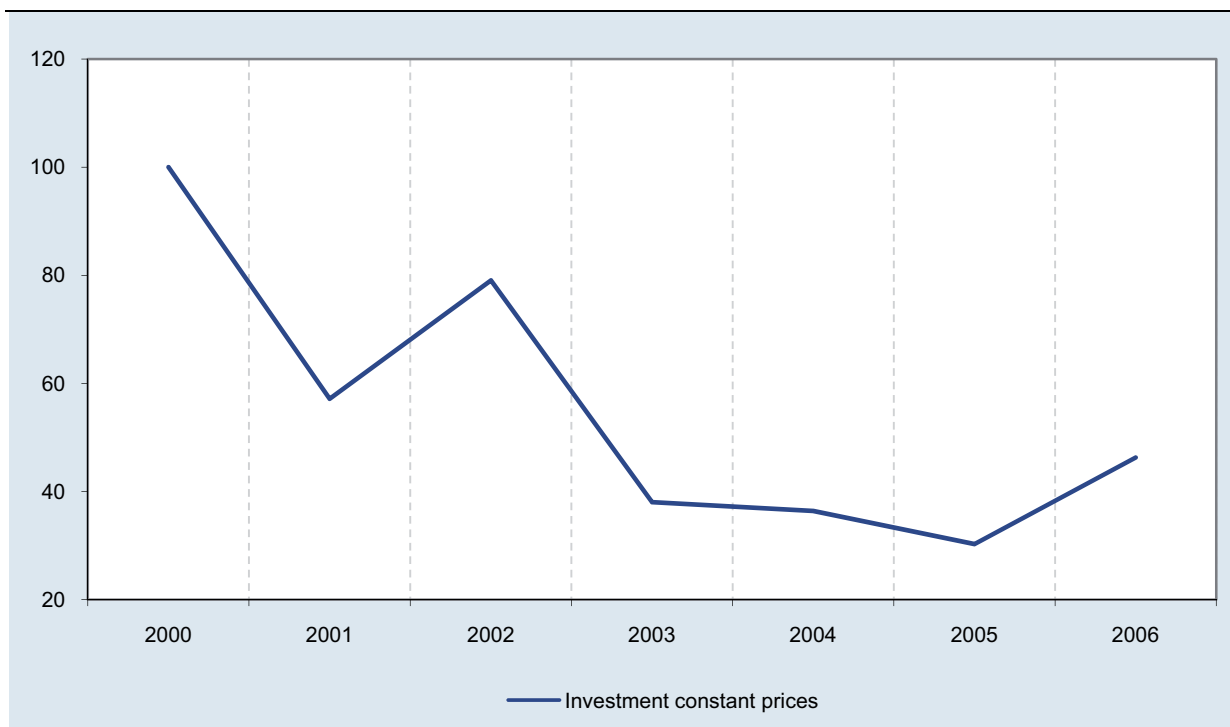
	2000	2001	2002	2003	2004	2005	2006	Change from 2005 to 2006 (in p.c.)	Annual average change from 2000 to 2006 (in p.c.)
VA (million euro, constant prices)	1,925.0	1,866.7	1,645.9	1,787.0	1,866.1	1,923.9	1,963.0	+2.0	+0.3
Employment (FTEs)	29,644	28,831	22,826	22,648	22,044	21,887	21,713	-0.8	-5.1

Source: NBB (Central Balance Sheet Office, own calculations).

2.2.2.2 Direct investment

This variable is cyclical by definition. That is clear from the figures set out below (chart 8).

CHART 8 CHANGES IN TERMS OF PRIVATE INVESTMENT IN THE AIR TRANSPORT CLUSTER AS A WHOLE
(index 2000 = 100; constant prices)



Source: NBB (Central Balance Sheet Office, own calculations).

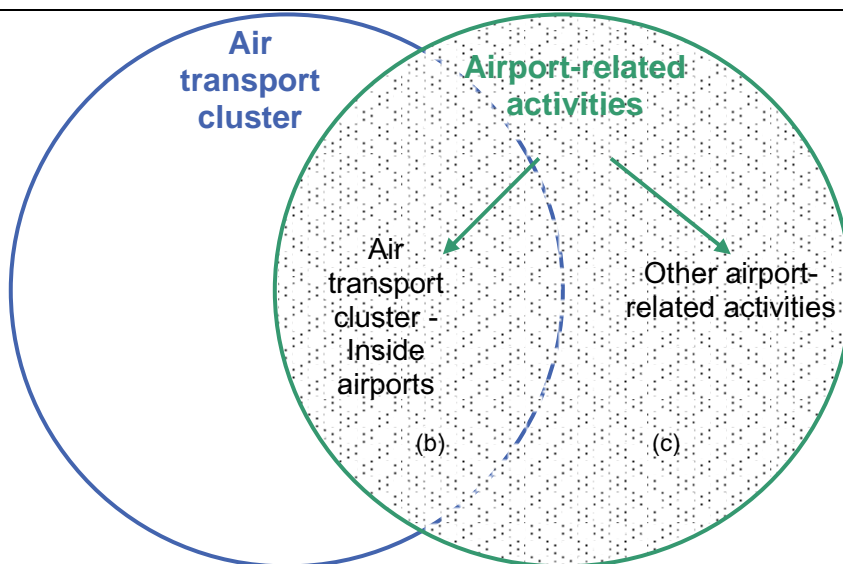
Private investment, a highly volatile variable by definition, declined sharply over the period in the case of the air transport cluster's activities, as the level recorded in 2006 was only 50 p.c. of the amount spent six years earlier. In fact, the events of 2001 had a profound impact on the sector, where propensity to invest weakened considerably over the period. In 2001, private investment in the air transport sector (airlines) was already in steep decline, picking up slightly in the following year then collapsing again in 2003. 2003 was also a year of significant transition, because almost all the sectors in the air transport cluster cut back their investment, following an increase in 2002, particularly in building and repairing of aircraft, tour operators and travel agencies and other air transport supporting activities.

2006 was the year of recovery, with strong expansion of activity, exceeding the symbolic threshold of 20 million passengers travelling via the airports, and restoring some optimism to the sector. This growth was also evident at the level of private investment, which was up by over 50 p.c. at constant prices between 2005 and 2006. New infrastructures were provided at airports (runway extensions, air terminals, etc.), research or projects concerning new equipment and materials are in progress in firms engaged in the building and repairing of aircraft, while the air transport branch and travel agencies and tour operators also saw an investment revival. This growth is definitely being driven by the competition between airports in the flourishing low-cost market, the steady growth of air tourism, particularly the "city-trips" segment, and participation in major international projects (Airbus A-380, etc.) by firms in the building and repairing of aircraft sector.

2.3 AIRPORT ACTIVITY: GENERAL SITUATION IN 2006

This section deals with the activities recorded in firms⁶¹ considered in 2006 in the six Belgian airports, and offers a general view of the relative importance of those airports and of the sectors based there. It therefore covers all airport-related activities for the 2006 financial year (subsets (b) + (c) in figure 3, shown in figure 7). Once these figures are added to those for air transport cluster activities recorded outside the airports it is possible to estimate the overall impact of air transport activities and related activities in Belgium, a point which will be discussed at the end of the report.

FIGURE 7 AIRPORT-RELATED ACTIVITIES



Source: NBB.

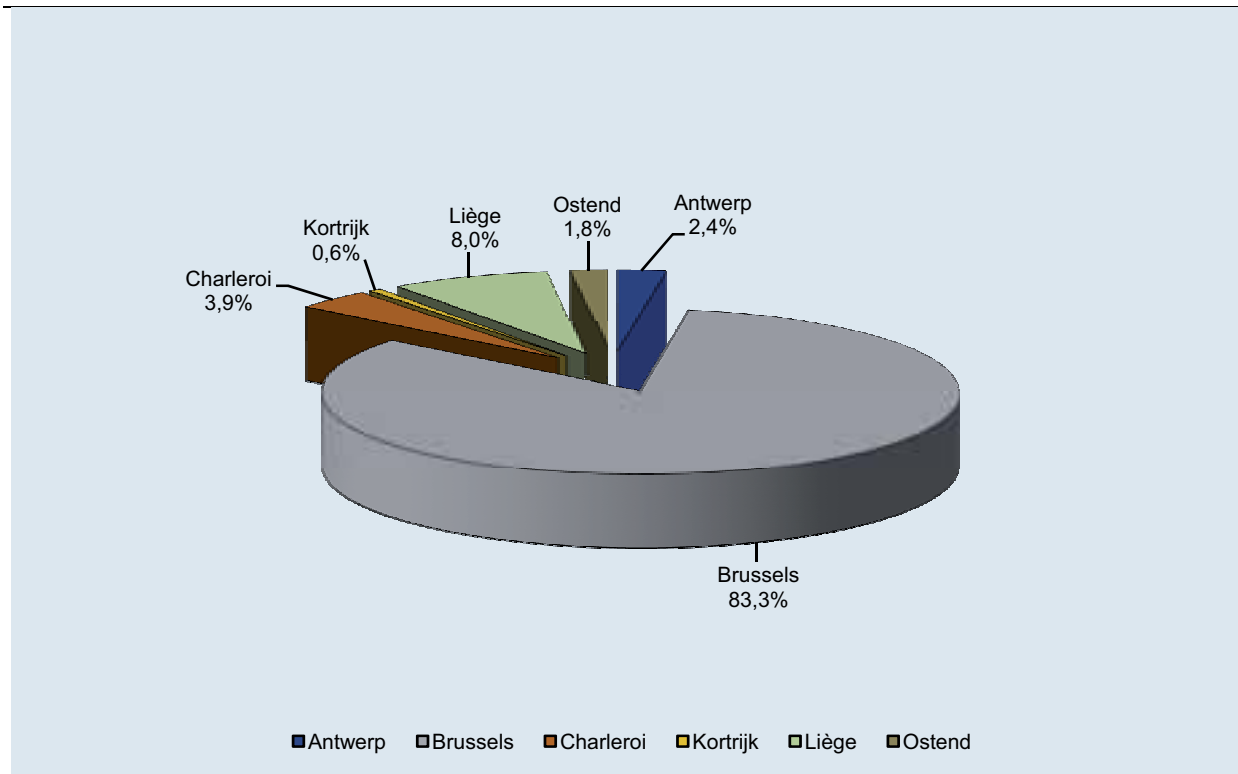
⁶¹ This corresponds to 548 business establishments which, in 2006, pursued activities within the geographical boundaries of the airports. Taking account only of firms producing value added within the airport perimeters, the real total comes to 471 firms distributed as follows: 77 in Antwerp, 250 in Brussels, 31 in Charleroi, 34 in Kortrijk, 44 in Liège and 35 in Ostend. NB: some firms or public agencies are present at multiple sites.

2.3.1 Value added

- **Direct VA: presentation per airport**

The analysis produces no surprises in regard to value added, since Brussels Airport is very much the dominant airport in Belgium, with over 83 p.c. of value added (chart 9), almost the same as its share of passenger traffic (85.5 p.c., see above). Next, a long way behind, come Liège (8 p.c.), Charleroi (3.9 p.c.), Antwerp (2.4 p.c.), Ostend (1.8 p.c.) and Kortrijk (0.6 p.c.).

CHART 9 DIRECT VALUE ADDED OF AIRPORTS IN 2006: BREAKDOWN BY AIRPORT



Source: NBB (Central Balance Sheet Office, own calculations).

At over 1.4 billion euro (table 16), the value added of Brussels Airport represents a considerable contribution to national income. Two-thirds of that VA comes from the activities of the air transport cluster, which more or less corresponds to the average for all six airports (65.4 p.c., see below). The other Flemish airports are even more dependent on air transport activity (69 p.c.), while at the two Walloon airports there is more of a balance between the two clusters (air transport cluster = 55.5 p.c. of the total).

TABLE 16 DIRECT VALUE ADDED IN 2006

Airport	Cluster	Value added (in million euro)	Share of clusters (in p.c.)
Antwerp	AIR TRANSPORT	26.4	63.3
	OTHER AIRPORT-RELATED	15.3	36.7
Antwerp Total		41.7	
Brussels	AIR TRANSPORT	955.9	66.6
	OTHER AIRPORT-RELATED	479.7	33.4
Brussels Total		1,435.6	
Charleroi	AIR TRANSPORT	48.2	71.7
	OTHER AIRPORT-RELATED	19.0	28.3
Charleroi Total		67.2	
Kortrijk	AIR TRANSPORT	7.4	75.5
	OTHER AIRPORT-RELATED	2.4	24.5
Kortrijk Total		9.8	
Liège	AIR TRANSPORT	66.0	47.6
	OTHER AIRPORT-RELATED	72.7	52.4
Liège Total		138.7	
Ostend	AIR TRANSPORT	23.5	75.1
	OTHER AIRPORT-RELATED	7.8	24.9
Ostend Total		31.3	
Grand Total		1,724.2	

Source: NBB (Central Balance Sheet Office, own calculations).

- **Direct VA: sectoral presentation**

At well over one billion euro, the VA of the air transport cluster active in the airports comprises activities which are crucial to the airports (over 65 p.c. of the total income generated there, table 17); the ranking is headed by the airlines (air transport), followed by airport operators, airport handling operations, and other air transport supporting activities. In the cluster comprising other airport-related activities, which account for over one-third of the total, top of the list for value added are courier and post activities and public services. Next, some way behind, come hotels, restaurants and catering, security and industrial cleaning, and other services, etc. Taking all clusters together, it is the air transport sector that dominates VA in the six airports, representing almost a quarter of the income generated (23.5 p.c.). Taking account of the national statistics, it can be estimated that 8.8 p.c. of the VA of air transport, or 35.7 million euro, relates to air cargo activities, while the remaining 370 million corresponds to passenger transport.

TABLE 17 DETAILED DATA ON DIRECT VALUE ADDED OF AIRPORTS PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Value added (in million euro)	Share (in p.c.)
Air transport cluster	1,127.2	65.4
Air transport.....	405.8	23.5
Travel agencies and tour operators.....	3.8	0.2
Forwarding offices.....	78.1	4.5
Airport operator	277.5	16.1
Airport handling	142.1	8.2
Other air transport supporting activities.....	130.9	7.6
Building and repairing of aircrafts.....	89.0	5.2
Other airport-related activities	596.9	34.6
Passenger land transport	26.9	1.6
Cargo handling and storage.....	28.3	1.6
Freight transport by road.....	14.1	0.8
Courier and post activities.....	263.3	15.3
Public services	106.8	6.2
Security and industrial cleaning.....	35.9	2.1
Trade.....	34.7	2.0
Hotels, restaurants and catering	40.7	2.4
Other services	29.8	1.7
Other industries.....	16.4	1.0
TOTAL	1,724.2	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

- **VA top 20**

This ranking (table 18) provides a clear view of the activities which contributed to the overall influence of the six airports in the national economy and beyond in 2006.

The third column in the table indicates the sector to which the firm belongs, while the fourth column shows the airport(s) in which the activities are recorded. The primary source of value added is Brussels Airport Company, at almost 240 million euro. The next two firms are also based at Brussels Airport, namely Brussels Airlines and DHL Aviation⁶². In fourth place is Belgocontrol, which operates at each of the airports, this group's VA being allocated according to the employment data. European Air Transport, which records almost 60 p.c. of its activity at Brussels Airport, is in fifth position. Next comes Flight Care followed by AviaPartner, leading companies in the airport handling sector, and both present at all the airports except Charleroi and Kortrijk. The main sectors represented in this top 20, which together generate almost 1.3 billion euro, account for three-quarters (76.3 p.c.) of the direct value added generated jointly by the six airports. The top 10 alone account for roughly 60 p.c. (60.3 p.c.), which means that activity is highly concentrated within the airports as well.

⁶² Trading as: DHL Worldwide Express. For details, see 2.4.1.

TABLE 18 VALUE ADDED IN AIRPORTS IN 2006

	Name of company or organisation	Sector	Recorded in airports	Value added (in million euro)
1	Brussels Airport Company	Airport operator	Brussels	239.4
2	Brussels Airlines ⁶³	Air transport	Brussels	192.5
3	DHL Aviation	Courier and post activities	Brussels	112.4
4	Belgocontrol	Other air transport supporting activities	Antwerp, Brussels, Charleroi, Kortrijk, Liège, Ostend	109.7
5	European Air Transport	Air transport	Brussels	82.7
6	Flight Care	Airport handling	Brussels, Liège, Ostend	75.7
7	AviaPartner	Airport handling	Antwerp, Brussels, Ostend	64.9
8	TNT Express Worldwide	Courier and post activities	Liège	60.1
9	Belgian Air Force 15 ^e Wing Luchttransport	Public services	Brussels	53.9
10	Sabena Technics	Building and repairing of aircraft	Brussels	49.0
11	TNT Airways	Air transport	Liège	43.5
12	TNT Express Belgium	Courier and post activities	Brussels	40.4
13	Fedex Express	Courier and post activities	Brussels	37.4
14	Securair (Securitas)	Security and industrial cleaning	Brussels, Charleroi, Liège	32.9
15	DHL Global Forwarding	Forwarding offices	Brussels, Liège	28.6
16	Federal Police	Public services	Antwerp, Brussels, Charleroi, Kortrijk, Liège, Ostend	23.5
17	Belgian Sky Shop	Trade	Brussels, Charleroi	22.3
18	Douanes / Customs	Public services	Antwerp, Brussels, Charleroi, Kortrijk, Liège, Ostend	20.1
19	Société anonyme belge de Constructions aéronautique (SABCA)	Building and repairing of aircraft	Charleroi	20.0
20	VLM Airlines	Air transport	Antwerp	17.5
TOTAL				1,326.4
Share in total airports				76.9 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

Since this top 20 concerns a significant proportion of the total activity of airports, it is interesting to measure the growth which occurred between 2005 and 2006: +7.4 p.c. at current prices, or +5.3 p.c. at constant prices, outstripping Belgium's GDP growth over the same period (+2.8 p.c.). That growth can be broken down into two parts: +4.1 p.c. for firms in this top 20 belonging to the air transport cluster, and +9.1 p.c. for those belonging to other airport-related activities. These growth figures are well in excess of the increase, over the same period, in the VA of the air transport cluster taking all locations together (+2 p.c. at constant prices, see above), which seems to point to some concentration of air transport activity in the six airports considered.

⁶³ The entities Brussels Airlines Fly, formerly Virgin Express, and Delta Air Transport (DAT), are grouped together under this heading. They actually merged in June 2008 to form Brussels Airlines.

- Indirect VA

TABLE 19 INDIRECT VALUE ADDED PER AIRPORT IN 2006

	Indirect value added (in million euro)	Multiplier
Antwerpen	71.5	2.71
Brussels.....	1,650.9	2.15
Charleroi.....	87.3	2.30
Kortrijk	18.7	2.91
Liege.....	255.8	2.84
Ostend.....	39.3	2.26
TOTAL	2,123.5	2.23

Source: NBB (Central Balance Sheet Office, own calculations).

Indirect value added, i.e. the income generated by suppliers (upstream) of firms based in the six airports totalled well over 2 billion euro (table 19). Comparison with direct VA (1.7 billion euro) permits an estimate of the multiplier, which comes to 2.23 overall. This means that one euro of VA generated directly by the firms under review will ultimately produce 2.23 euro via the intersectoral links between them and their suppliers. These coefficients vary from one airport to another, Kortrijk having the highest multiplier (2.91) and Brussels the lowest (2.15)⁶⁴. These differences are connected with the relative position of the various sectors of activity in the airports. In general the air transport sector (branches 62.1 and 62.2),⁶⁵ the trade branches, construction, renting of aircraft, flying schools and other services exhibit a closer link between indirect and direct effects than the other branches. Among the sectors which make up transport logistics⁶⁶, air transport is in fact a key sector, having considerable impact on its suppliers. The detailed results per airport are given in section 2.4.

⁶⁴ It is worth comparing these figures with those obtained in some major economic branches: 2.3 in the maritime ports, 2.8 in the car manufacturing industry, 2.4 in the steel industry, 2.5 in the chemical industry and 2.1 in construction.

⁶⁵ According to Lagneaux (2008), the air transport branch has very close upstream links with building and repairing of aircraft, wholesale trade, other supporting transport activities, renting of automobiles and other transport equipment, etc.

⁶⁶ See Lagneaux (2008).

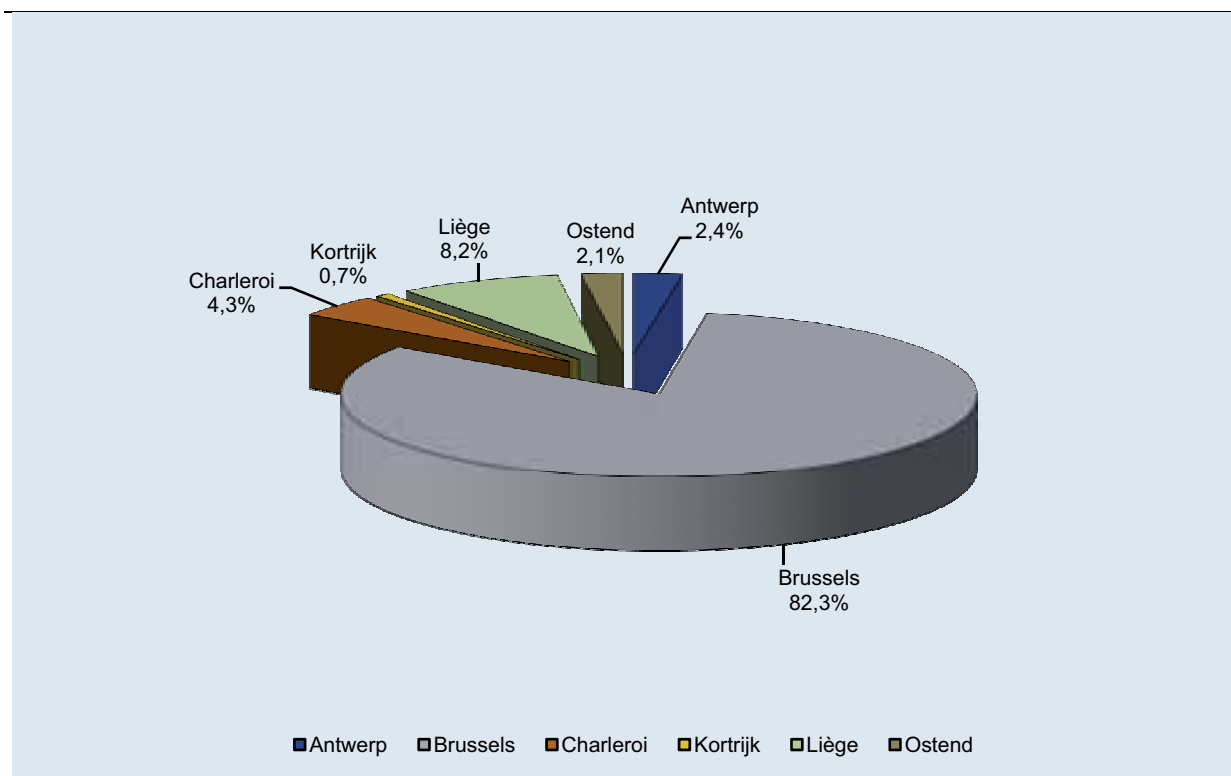
2.3.2 *Employment and social balance sheet*

2.3.2.1 Employment

- **Direct employment: presentation per airport**

Brussels Airport is also decidedly the dominant airport in Belgium in terms of employment, accounting for over 82 p.c. (chart 10). A very long way behind come Liège (8.2 p.c.), Charleroi (4.3 p.c.), Antwerp (2.4 p.c.), Ostend (2.1 p.c.) and Kortrijk (0.7 p.c.).

CHART 10 DIRECT EMPLOYMENT IN AIRPORTS IN 2006: BREAKDOWN BY AIRPORT



Source: NBB (Central Balance Sheet Office, own calculations).

At almost 18,000 FTEs, the workforce of Brussels Airport represents a substantial contribution to employment in the region and in the country (table 20). The percentages for the first cluster are significantly lower than in the case of VA. The ratio between VA and employment is therefore higher in the air transport cluster than in other airport-related activities. 54.1 p.c. of this labour force is employed in the air transport cluster, corresponding roughly to the average for all six airports (53.5 p.c., see below). The other Flemish airports are also largely dependent on air transport activities for jobs (53.1 p.c.), while the opposite applies at the two Walloon airports, since they are dominated by airport-related activities (54.2 p.c. of the total), particularly owing to the importance of courier and post services at Liège.

TABLE 20 DIRECT EMPLOYMENT IN 2006

Airport	Cluster	Employment (in FTEs)	Share of clusters (in p.c.)
Antwerp	AIR TRANSPORT	294	56.7
	OTHER AIRPORT-RELATED	225	43.3
Antwerp Total		519	
Brussels	AIR TRANSPORT	9,528	54.1
	OTHER AIRPORT-RELATED	8,089	45.9
Brussels Total		17,618	
Charleroi	AIR TRANSPORT	599	65.0
	OTHER AIRPORT-RELATED	322	35.0
Charleroi Total		922	
Kortrijk	AIR TRANSPORT	102	69.8
	OTHER AIRPORT-RELATED	44	30.2
Kortrijk Total		146	
Liège	AIR TRANSPORT	625	35.6
	OTHER AIRPORT-RELATED	1,130	64.4
Liège Total		1,755	
Ostend	AIR TRANSPORT	298	67.5
	OTHER AIRPORT-RELATED	143	32.5
Ostend Total		441	
Grand Total		21,400	

Source: NBB (Central Balance Sheet Office, own calculations).

- **Direct employment: sectoral presentation**

At 21,400 FTEs, direct employment in firms based in the airport zones is divided almost equally between the two clusters (table 21). The first, the air transport cluster, is dominated by airlines (air transport), followed by airport handling, building and repairing of aircraft, airport operators and forwarding offices. In the second, other airport-related activities, the list is headed by courier and post activities, followed by public services, security and industrial cleaning, and hotels, restaurants and catering. Taking all clusters together, it is the air transport sector that dominates employment in the six airports (18.2 p.c.), very closely followed by courier and post activities (18 p.c.). Taking account of the national statistics, it can be said that 8.8 p.c. of air transport jobs, or 343 FTEs, are in air freight, the other 3,550 FTEs corresponding to passenger transport.

TABLE 21 DETAILED DATA ON DIRECT EMPLOYMENT OF AIRPORTS PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Employment (in FTEs)	Share (in p.c.)
Air transport cluster	11,446	53.5
Air transport	3,893	18.2
Travel agencies and tour operators	50	0.2
Forwarding offices	1,079	5.0
Airport operator	1,361	6.4
Airport handling	2,478	11.6
Other air transport supporting activities	1,046	4.9
Building and repairing of aircraft	1,541	7.2
Other airport-related activities	9,954	46.5
Passenger land transport	417	1.9
Cargo handling and storage	392	1.8
Freight transport by road	222	1.0
Courier and post activities	3,862	18.0
Public services	2,051	9.6
Security and industrial cleaning	867	4.1
Trade	659	3.1
Hotels, restaurants and catering	841	3.9
Other services	340	1.6
Other industries	303	1.4
TOTAL	21,400	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

- **Employment top 20**

This ranking (table 22) offers a clear view of the activities which contributed to the overall impact of the six airports on employment in 2006.

As the top employer taking all airports together, Brussels Airlines has over 2,100 FTEs, followed - again at Brussels Airport⁶⁷ - by DHL (1,758 FTEs), which is in turn followed by Flight Care and AviaPartner, two labour-intensive businesses. Next come other entities using large amounts of labour, namely Belgian Air Force, Sabena Technics and TNT Express Worldwide. The main sectors are represented in this top 20, which totals over 15,600 FTEs, or almost three-quarters (73.1 p.c.) of direct employment in the six airports together. Taking just the top 10, the figure would be 54.5 p.c., a level which, though high, is considerably lower than in terms of value added.

⁶⁷ For developments specific to Brussels Airport, see point 2.5.2.3.

TABLE 22 EMPLOYMENT TOP 20 IN AIRPORTS IN 2006

	Name of company or organisation	Sector	Recorded in airports	Employment (in FTEs)
1	Brussels Airlines ⁶⁸	Air transport	Brussels	2,103
2	DHL Aviation	Courier and post activities	Brussels	1,758
3	Flight Care	Airport handling	Brussels, Liège, Ostend	1,233
4	AviaPartner	Airport handling	Antwerp, Brussels, Ostend	1,227
5	Belgian Air Force 15° Wing Luchttransport	Public services	Brussels	1,035
6	Sabena Technics	Building and repairing of aircraft	Brussels	995
7	TNT Express Worldwide	Courier and post activities	Liège	905
8	Belgocontrol	Other air transport supporting activities	Antwerp, Brussels, Charleroi, Kortrijk, Liège, Ostend	818
9	Securair (Securitas)	Security and industrial cleaning	Brussels, Charleroi, Liège	792
10	Brussels Airport Company	Airport operator	Brussels	790
11	Fedex Express	Courier and post activities	Brussels	545
12	European Air Transport	Air transport	Brussels	525
13	Federal Police	Public services	Antwerp, Brussels, Charleroi, Kortrijk, Liège, Ostend	451
14	TNT Express Belgium	Courier and post activities	Brussels	425
15	Douanes / Customs	Public services	Antwerp, Brussels, Charleroi, Kortrijk, Liège, Ostend	385
16	TNT Airways	Air transport	Liège	357
17	DHL Global Forwarding	Forwarding offices	Brussels, Liège	355
18	Restair (incl. Quick)	Hotels, restaurants and catering	Brussels	349
19	Belgian Sky Shop	Trade	Brussels, Charleroi	339
20	LSG Sky Chef Belgium	Hotels, restaurants and catering	Brussels	253
TOTAL				15,639
Share in total airports				73.1 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

Since this ranking concerns a large proportion of employment in the airports, it is worth measuring the changes which occurred between 2005 and 2006: +0.5 p.c. in FTEs, i.e. fairly stable. This figure is made up of a slight fall (-1.2 p.c.) in firms in the top 20 belonging to the air transport cluster, mirroring the decline in employment recorded throughout the air transport cluster taking all geographical locations together (-0.8 p.c. over the same period), but an increase (+3.7 p.c.) in firms in other airport-related activities. The concentration of air transport activities in airports, as mentioned in the case of value added, therefore does not apply here as the slight rise is attributable to the other branches.

⁶⁸ The entities Brussels Airlines Fly, formerly Virgin Express, and Delta Air Transport (DAT), are grouped together under this heading. They actually merged in June 2008 to form Brussels Airlines.

The employment top 20 contains more or less the same companies as the VA top 20. To compensate for the differences, a new top 20 ranking was created for the purpose of subsequent analysis of the movements in other variables. Therefore, in order to assess developments concerning the social balance sheet, investment and the financial situation between 2005 and 2006 within airports, a common group of companies is used, which includes all companies contained in both the VA top 20 and the employment top 20.⁶⁹

- Indirect employment

TABLE 23 INDIRECT EMPLOYMENT PER AIRPORT IN 2006

	Indirect employment (in FTEs)	Multiplier
Antwerpen	848	2.63
Brussels.....	19,732	2.12
Charleroi.....	1,065	2.16
Kortrijk	223	2.52
Liege.....	2,946	2.68
Ostend.....	465	2.06
TOTAL	25,279	2.18

Source: NBB (Central Balance Sheet Office, own calculations).

Indirect employment, i.e. the employment generated among the suppliers (upstream) of firms based in the six airports, came to over 25,000 FTEs (table 23). Comparison with direct employment (21,400 FTEs) indicates a multiplier of 2.18 overall. This means that one direct FTE working in the firms under review will ultimately generate 2.18 FTEs as a result of the intersectoral links with suppliers. These coefficients vary from one airport to another, Liège airport having the highest multiplier (2.68) and Ostend the lowest (2.06). As already mentioned, these differences are connected with the relative position of the various sectors of activity in the airports, with air transport - definitely the key sector - generating a large volume of indirect jobs (see above). Section 2.4 gives more details per airport.

⁶⁹ This group consists of the VA top 20 combined with the employment top 20. It contains the following companies: Brussels Airport Company, Brussels Airlines, DHL Aviation, Belgocontrol, European Air Transport, Flight Care, AviaPartner, TNT Express Worldwide, Sabena Technics, TNT Airways, TNT Express Belgium, Fedex Express, Securair (Securitas), DHL Global Forwarding, Federal Police, Belgian Sky Shop, Société anonyme belge de Constructions aéronautique (SABCA), VLM Airlines, Restair and LSG Sky Chef Belgium.

2.3.2.2 Social balance sheet

This section concerns the airport-based companies included in both the VA top 20 and the employment top 20 (see above). Altogether these represent approximately 80 p.c. of direct VA and 75 p.c. of direct employment recorded within the six airports. They all file their accounts in the full format and occupy the same top-ranking positions in both 2005 and 2006.

TABLE 24 SOCIAL BALANCE SHEET IN THE BELGIAN AIRPORTS

	2005	2006
1/ TYPE OF CONTRACT AND COMPOSITION OF WORKFORCE		
1.1 Hours worked and costs of own staff		
Change in the average number of employees on the staff register (p.c.).....		+0.8
Change in the number of hours actually worked (p.c.).....		+2.1
Change in staff costs (p.c.).....		+4.5
Average number of hours worked per annum per FTE	1,481	1,494
Average annual staff costs per FTE (euro).....	56,588	57,671
Average staff costs per hour worked (euro)	36.9	37.7
1.2 Internal workforce		
- by professional category		
white-collar (p.c.)	66.4	65.8
blue-collar (p.c.).....	31.2	30.9
other staff (p.c.)	2.5	3.3
- by sex		
males (p.c.).....	72.4	71.7
females (p.c.).....	27.6	28.8
- by working time		
full-time (p.c.).....	77.3	76.6
part-time (p.c.).....	22.7	23.4
1.3 External staff: hired temporary staff and staff placed at the enterprise's disposal		
Share of external staff in total employment (on the basis of the number of hours actually worked) (p.c.).....	4.3	5.2
Change in the number of hours actually worked (p.c.).....		+26.2
Change in costs (p.c.).....		+26.7
2/ STAFF TURNOVER		
2.1 Staff hired, by educational level		
- University education (p.c.).....	7.5	7.8
- Higher non-university education (p.c.).....	20.9	20.3
- Secondary education (p.c.)	59.2	60.5
- Primary education (p.c.)	12.5	11.4
2.2 Staff leaving, by reason for termination of contract		
- Retirement (p.c.).....	1.8	2.3
- Early retirement (p.c.).....	1.1	2.0
- Dismissal (p.c.).....	7.2	14.1
- Other reason (p.c.)	89.8	81.7
2.3 Turnover rate ⁷⁰ (p.c.).....	22.4	20.8

Source: NBB (Central Balance Sheet Office, own calculations).

⁷⁰ Number of staff departures in t , divided by the workforce recorded at the beginning of the year t (i.e. the workforce recorded at the end of the year t less staff recruitments plus departures recorded during this year). For more information, see Heuse P., Ph. Delhez and H. Zimmer (2007).

**TABLE 24 SOCIAL BALANCE SHEET IN THE BELGIAN AIRPORTS
(CONTINUED)**

	2005	2006
3/ TRAINING⁷¹		
3.1 Participation rate		
- males (p.c.).....	62.2	56.9
- females (p.c.).....	50.1	46.1
3.2 Number of hours' training per person		
- males (hours).....	33.5	39.7
- females (hours).....	32.8	34.3
3.3 Training costs per hour		
- males (euro).....	53.4	61.3
- females (euro).....	61.6	60.4
3.4 Percentage of the number of hours worked devoted to training (p.c.).....	1.3	1.4
Training costs as a percentage of total staff costs (p.c.).....	2.0	2.2

Source: NBB (Central Balance Sheet Office, own calculations).

The percentage of the companies' activities used for this analysis is the 2006 employment percentage, which was also applied to the 2005 figures. Table 24 presents the main developments concerning the social balance sheet of these top-20 companies.

- **Type of contract and human resources**

2006 was a good year for air transport (cf. section 2.2.2). That also applied to the airports, in view of the favourable developments recorded between 2005 and 2006 in the VA top 20 and the employment top 20 (see above), confirmed by the investment variable (see below). These favourable developments resulted in a small increase in the average number of employees on the staff register (+0.8 p.c.), which was also reflected in a rise in the number of hours worked (+2.1 p.c.) and in higher staff costs (+4.5 p.c.). Exceeding the national averages and most of the values recorded in the air transport cluster outside airports (cf. point 2.2.1.3), there were further increases in the number of hours worked and in staff costs per FTE, as well as in the cost per hour's work in 2006. This last ratio is higher than the level recorded in transport logistics as a whole.⁷²

The dominant category in the sector under review, white-collar workers represent a higher percentage than the national average, although slightly below the percentage in the air transport cluster outside airports. But the number of white-collar and blue-collar workers does not seem to increase as fast as the other categories of workers, headed by the managerial and supervisory class. Airport staff are predominantly male, with a percentage well above the national average, and the same applies in the air transport cluster outside airports. However, the proportion of women did increase in 2006. The full-time/part-time ratio is close to the national average, and is displaying the same trend towards part-time work.

The proportions of hired temporary staff and staff placed at the enterprise's disposal were in line with national levels in 2005, but the expansion was stronger in 2006, particularly in terms of the number of hours worked, as was evident in airlines and in the airport handling sector, and in the air transport cluster outside airports.

⁷¹ Here training is meant in the formal sense, i.e. courses in premises reserved for that purpose, within the firm or outside. It therefore excludes on-the-job training, for example, mentoring and self-training.

⁷² See Lagneaux (2008).

- **Staff turnover**

Staff recruitment presents a fairly stable breakdown by standard of education between 2005 and 2006. As in the Flemish ports⁷³, the secondary education level predominates, followed by higher non-university education, then elementary education and finally university education. There were no significant changes during this period, though it is interesting to note the relative increase in the number of university graduates recruited, while relatively fewer holders of certificates of elementary education were recruited by firms in the top 20.

The main reasons stated for the termination of contracts were "other reasons", which include the expiry of temporary contracts and voluntary departures. Though declining, the figure of 81.7 p.c. recorded here exceeds the percentage seen in the air transport cluster outside airports, and also the national average and the score for firms in transport logistics. Conversely, the early retirement and redundancy ratios are below the national average, while the 2.3 p.c. represented by the retirement category is close to that average.

The staff turnover rate in airports (firms in the top 20) is high. Though it declined between 2005 and 2006, it is still over 20 p.c., considerably higher than the average for the air transport cluster outside airports (17.4 p.c.) and the national average (14.3 p.c. for the reduced population used in the Social Balance Sheet 2006⁷⁴), and higher than the average in transport logistics (under 20 p.c.⁷⁵) and the total activities of the air transport cluster outside airports (17.4 p.c., cf. point 2.2.1.3). This phenomenon, which is common in small firms, is significant in the firms under review, yet they belong to the top 20 and are all large companies. Such a high turnover may therefore be a sign of some instability in the staffing of the main branches operating in airports, especially in courier and post activities, trade and hotels, restaurants and catering.

- **Training**

All the indicators are green in the case of formal training (cf. description above), as the rate of participation in training, the number of hours spent on training and the money allocated to these programmes are above the national averages. In relation to the air transport cluster outside airports, the participation rate is clearly biased in favour of men, the number of hours spent training is lower but the hourly cost of the training is higher. The most revealing indicator is probably this: while the percentage of working time reserved for training is above the national average, training costs as a percentage of total staff costs are also higher, actually exceeding the figure of 1.9 p.c. set by the 2006 Generation Pact. There is therefore every indication that, while employment is tending to decline gradually in the air transport sector (cf. chapter 2.2), becoming more concentrated in the airports (cf. small increase in employment in 2005-2006 noted above), that is being accompanied by a real effort in regard to training. The only downside is a decline in participation, by both men and women, the latter being at a disadvantage here, and in the hourly cost of training, down sharply for white-collar staff.

2.3.3 Investment

This section looks at the investment of Belgian private firms active at airports (including all public subsidies to airport operators) which file their accounts at the Central Balance Sheet Office. As these figures are not complete (total recorded for the six airports: 244.6 million euro), the detailed presentation gives only the relative figures, i.e. percentage of airports and sectors. A top 20 ranking is also provided, with figures calculated on the basis of the total investment for each firm and the percentage of activity taking place in each airport (basis: employment allocation key).

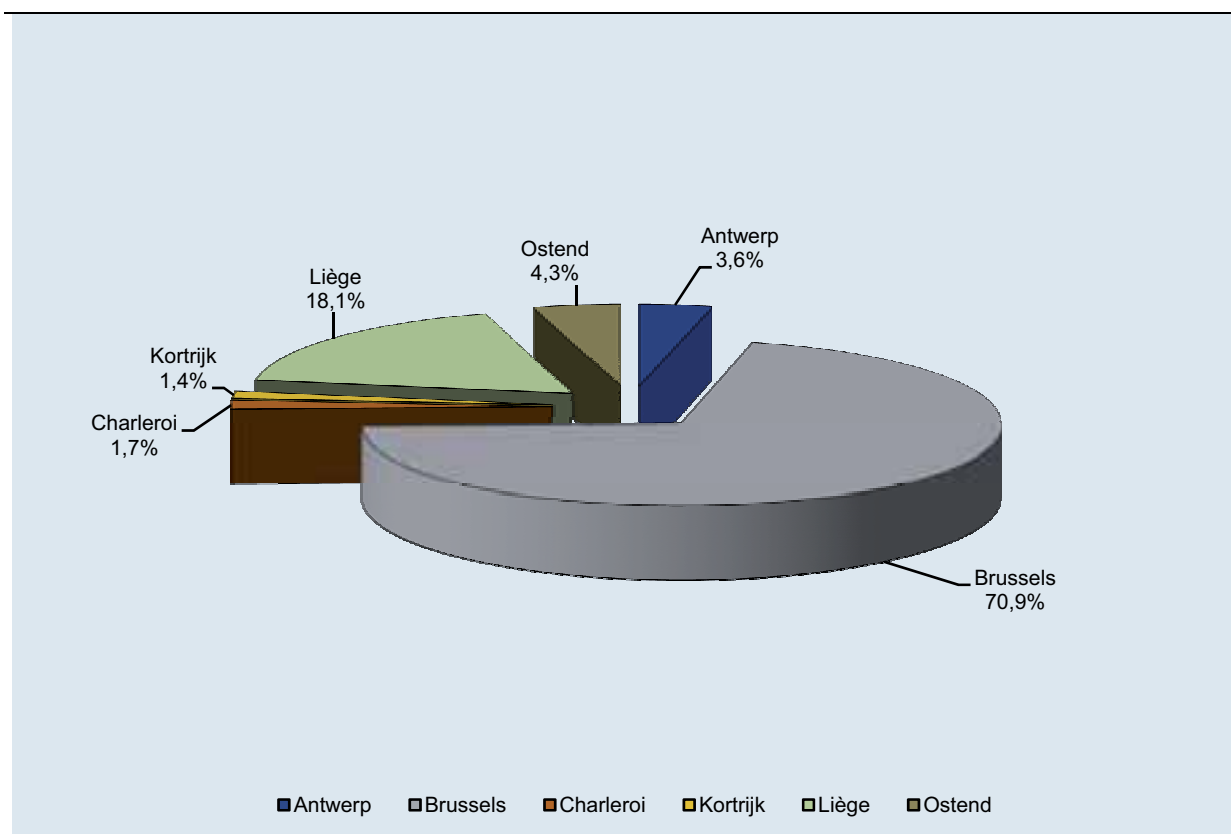
⁷³ See Vennix (2008).

⁷⁴ Heuse P., Ph. Delhez and H. Zimmer (2007).

⁷⁵ Lagneaux (2008).

- **Direct investment: presentation per airport**

CHART 11 PRIVATE INVESTMENT OF BELGIAN FIRMS IN 2006: BREAKDOWN BY AIRPORT



Source: NBB (Central Balance Sheet Office, own calculations).

The share of private investment in airports attributed to Brussels Airport, 70.9 p.c. (chart 11), is well below the percentages recorded for VA and employment (see above). The shares represented by Liège (18.1 p.c.), Ostend (4.3 p.c.) and Antwerp (3.6 p.c.) are considerable, while Kortrijk and particularly Charleroi lag well behind; in the latter case that is rather striking in view of its relative size. However, it is worth noting the investment put in by entities such as Sowaer (e.g. new terminal at BSCA) and the Flemish Region, and also the Flemish municipal associations (cf. investments by Westvlaamse Intercommunale Vliegveld Wevelgem-Bissegem), recorded in the sector outside airports (cf. point 2.2.1.4).

- **Direct investment: sectoral presentation**

Of the investments totalling around 245 million euro effected during 2006 by private Belgian firms (including the public operators of certain airports) based in the airport zones, the major part, or almost 40 p.c., is attributable to airlines (air transport), followed by airport operators, which account for almost 30 p.c. of the total, other air transport supporting activities, courier companies (courier and post activities) and other services. Table 25 provides a clearer view of the players in these various sectors.

- **Investment top 20**

This ranking is offered out of interest, and is not an exhaustive reflection of reality.

TABLE 25 PRIVATE INVESTMENT TOP 20 IN AIRPORTS IN 2006

	Name of company or organisation	Sector	Recorded in airports	Investment (in million euro)
1	European Air Transport	Air transport	Brussels	66.5
2	SAB (Liège Airport)	Airport operator	Liège	34.7
3	The Brussels Airport Company	Airport operator	Brussels	25.5
4	Belgocontrol	Other air transport supporting activities	Antwerp, Brussels, Charleroi, Kortrijk, Liège and Ostend	15.7
5	Brussels Airlines ⁷⁶	Air transport	Brussels	12.2
6	Sixt Rent a Car	Other services	Brussels	9.6
7	Sabena Flight Academy	Other air transport supporting activities	Brussels	7.8
8	DHL Aviation	Courier and post activities	Brussels	7.2
9	NHV	Air transport	Ostend	6.7
10	TNT Express Worldwide	Courier and post activities	Liège	6.6
11	Sabena Technics	Building and repairing of aircraft	Antwerp, Brussels	5.7
12	Vlaamse Overheid	Airport operator	Ostend	5.6
13	Interparking	Passenger land transport	Brussels	4.7
14	Abelag Aviation	Air transport	Brussels	2.6
15	Flightcare	Airport handling	Brussels, Ostend	2.6
16	ASL	Air transport	Antwerp, Kortrijk	2.0
17	VLM Airlines	Air transport	Antwerp	2.0
18	BSCA	Airport operator	Charleroi	1.8
19	TNT Airways	Air transport	Liège	1.6
20	Aviapartner Belgium	Airport handling	Antwerp, Brussels, Ostend	1.6
TOTAL				222.8
Share in total airports				91.1 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

In 2006, the leading private investor taking all airports together was European Air Transport (table 25), with a figure of 66.5 million euro recorded at Brussels Airport (fleet expansion and improvement). Next comes SAB, Liège-Bierset Airport Development and Promotion Company, which invested in its cargo terminals, improvements to parking facilities in the north zone, and a tanker park which came into service in 2007. In third place is Brussels Airport Company which invested substantial amounts in security, other major investment – particularly in passenger reception capacity – having been recorded in earlier years, and Belgocontrol which is continuing to spend on control equipment (control towers) and international cooperation (e.g. creation of the functional airspace block in which Eurocontrol is involved⁷⁷).

⁷⁶ The entities Brussels Airlines Fly, formerly Virgin Express, and Delta Air Transport (DAT), are grouped together under this heading. They actually merged in June 2008 to form Brussels Airlines.

⁷⁷ This is the European Organisation for the Security of Air Navigation, based at Maastricht, Netherlands. Eurocontrol's mission is to control the higher airspace (> 24,500 feet), and to harmonise and integrate air navigation services in Europe, aiming at the creation of a uniform air traffic management (ATM) system for civil and military users, in order to achieve the safe, secure, orderly, expeditious and economic flow of traffic throughout Europe, while minimising adverse environmental impact. More information on www.eurocontrol.int.

Many Belgian airlines also appear in this ranking, as do a significant number of services belonging to the first cluster. There are a few exceptions: Sixt Rent a Car, DHL Aviation, classified in the courier and post activities branch along with TNT Express and Interparking, classified in passenger land transport. This top 20 represented 91 p.c. of the investment recorded at the six airports in 2006. Taking the top 10 alone, the figure drops to 78.8 p.c., though that is still very high, indicating heavy concentration of investment in the airports.

To estimate the movement in investment between 2005 and 2006 by a method consistent with that used for VA, employment, the social balance sheet and the financial ratios, it seemed appropriate to use the same top 20 as for those various sections, namely the top 20 common to VA and employment (see remark in section 2.3.2.1 third item entitled "employment top 20"). Reference to these twenty firms reveals a significant increase at current prices over this period: +21.4 p.c., or +18.2 p.c. at constant prices, a figure made up of +35.1 p.c. in firms in the air transport cluster but -41.1 p.c. in firms in other airport-related activities.

2.3.4 Financial situation

This analysis is confined to the same airport VA and employment top-20 companies (see above). The percentage of the companies' activities used for this analysis is the 2006 employment percentage, which also applies to the 2005 figures.

TABLE 26 FINANCIAL SITUATION IN THE AIRPORTS

	Airport top-20 companies		Non-financial corporations	
	2005	2006	2005	2006
Return on equity after tax (in p.c.)	12.2	11.2	10.1	9.4
Liquidity in the broad sense	0.98	1.07	1.29	1.30
Solvency (in p.c.)	31.0	29.6	43.4	44.9

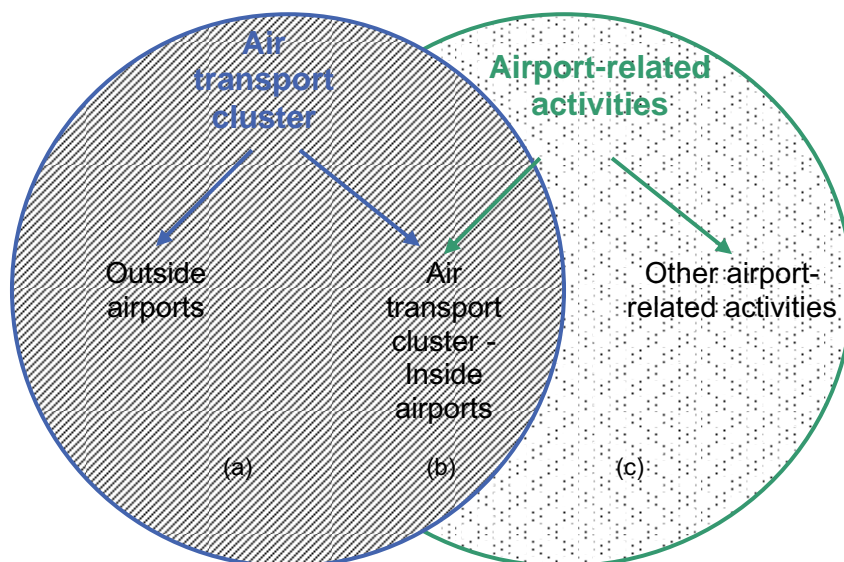
Source: NBB (Central Balance Sheet Office, own calculations).

In line with the national trend, the return on equity after tax of companies established inside airports declined slightly between 2005 and 2006, but remained above the national average (table 26). The decline stems from a fall in profits, in some cases, in forwarding offices and building and repairing of aircraft, partly offset by higher profits in some air transport companies. Net working capital became positive (i.e. liquidity > 1) thanks to significant rises in most of the companies surveyed, but it remained below the national level. Solvency declined slightly to an even lower level compared to national figures, after falls in air transport and forwarding services.

2.4 AIR TRANSPORT AND AIRPORT ACTIVITY: ECONOMIC IMPACT IN 2006

2.4.1 Direct and indirect economic impact of Belgian air transport and airports

FIGURE 8 AIR TRANSPORT AND AIRPORT ECONOMIC IMPACT IN 2006



Source: NBB.

This section and figure 8 summarise the previous observations concerning the economic impact of Belgian air transport and airports, value added and employment, which confirms the rough estimations established at section 1.2.3. Below are set out all the figures relating to the direct and indirect effects measured in the airports and outside. Once these figures are added together it is possible to quantify the relative importance of the sector for the Belgian economy in 2006.

Figure 8 summarises the economic impact of air transport and airports and gives a confirmation of.

The impact of these activities in 2006 is as follows:

(a) Air transport cluster outside airports:

- direct VA: 835.8 million euro - indirect VA: 1,466.6 million euro
- direct employment: 10,267 FTEs - indirect employment: 20,440 FTEs

(b) Air transport cluster inside airports:

- direct VA: 1,127.2 million euro - indirect VA: 1,388.8 million euro
- direct employment: 11,446 FTEs - indirect employment: 13,524 FTEs

(c) Other airport-related activities:

- direct VA: 596.9 million euro - indirect VA: 734.7 million euro
- direct employment: 9,954 FTEs - indirect employment: 11,755 FTEs

Total VA (direct+indirect inside and outside airports) = 6,150.1 million euro

This nearly 6.2 billion euro represents 2 p.c. of Belgian GDP⁷⁸ (0.8 p.c. if direct VA alone is considered). In relation to the regional economy⁷⁹, the following totals were obtained for the year 2006, including the figures for air transport activity outside airports allocated according to the respective position of the airports in terms of value added:

⁷⁸ Source: Belgostat (2008).

⁷⁹ Source: Regional accounts 2006, NAI 2008.

- Total value added of the 4 airports established in Flanders (Brussels Airport included) and Flemish air transport activities = 5,308.1 million euro, i.e. 2.9 p.c. of Flemish GDP
- Total value added of the 2 Walloon airports and air transport activities = 884.3 million euro, i.e. 1.2 p.c. of Walloon GDP.
- Value added multipliers amount to 2.23 in the six airports⁸⁰, 2.75 in the air transport cluster outside airports and 2.40 overall. This is quite high compared to other transport and transport logistics branches (1.65 in 2005).

The three major airports, i.e. Brussels Airport, Charleroi Airport and Liège Airport, alone account for 95.2 p.c. of the value added generated by the airports under review. They represent 0.5 p.c. of Belgian GDP and, taking account of the indirect effects, 1.1 p.c. of the national income

Total employment (direct+indirect inside and outside airports) = 77,386 FTEs

77,400 FTEs are equivalent to 2 p.c. of Belgian domestic employment (0.8 p.c. if direct employment alone is considered) or 2.4 p.c. of Belgian paid employment⁸¹. In relation to the regional economy, the following totals were obtained for the year 2006:

- Total employment of the 4 airports established in Flanders and Flemish air transport activities = 66,942.2 FTEs, i.e. 2.7 p.c. of employment in the Flemish region and 3.3 p.c. of Flanders' paid employment
- Total employment of the 2 Walloon airports and air transport activities = 11,184.8 FTEs, i.e. 1 p.c. of the employment in the Walloon region and 1.2 p.c. of Wallonia's paid employment.
- Employment multipliers amount to 2.18 in the six airports⁸², 2.99 in the air transport cluster outside airports and 2.44 overall, which is higher than the average for transport logistics (1.57 in 2005).⁸³

2.4.2 Induced and catalytic effects

These data are purely a guide, since they add nothing to the figures presented above. Not only is it difficult to calculate these effects - the method of calculation being subject to debate, as the experts are not unanimous in their opinion - the resulting figures also overlap with the indirect effects calculated and considered in this report.

Purely for information, the induced and catalytic effects in terms of employment were calculated on the basis of the direct employment figures, using the ratios calculated by Sleuwaegen (2003) for the 2002 situation at Brussels Airport, and those derived by le Ciriec (2006) for the airports of Charleroi and Liège in 2004. These are in fact the data which are easiest to analyse, with values deliberately kept within reasonable limits by systematic reference to the lower end of the range. The following method has been used to estimate the induced and catalytic effects at Antwerp, Kortrijk and Ostend airports. Since all three are regional airports, with Ostend focusing more on cargo and charter business, while Antwerp and Kortrijk are geared more to passenger traffic, it is possible to apply the ratios calculated for Charleroi Airport to Antwerp and Kortrijk airports, and to apply the ratios for Liège Airport to Ostend Airport.

Adopting the approach defined above, induced employment came to 10,500 FTEs in 2006, with Brussels Airport alone accounting for almost 9000. Catalytic employment totals 12,300 FTEs, with Belgium's main airport accounting for 11,200. For the same year, Idea Consult (2007) had estimated the induced employment at Brussels Airport at 11,900 units, i.e. 10,700 FTEs. According to the same research consultancy, catalytic employment totalled 13,200 FTEs. These differences highlight the difficulty of measuring these effects, in addition to the fact that the downstream effects in question here are not covered by the present study, which aims to quantify the direct and indirect impact upstream of air transport and airport activity.

⁸⁰ 2.17 on average in the four Flemish airports and 2.67 on average in the two Walloon airports.

⁸¹ Source: Belgostat (2008).

⁸² 2.14 on average in the four Flemish airports and 2.50 on average in the two Walloon airports.

⁸³ See Lagneaux (2008).

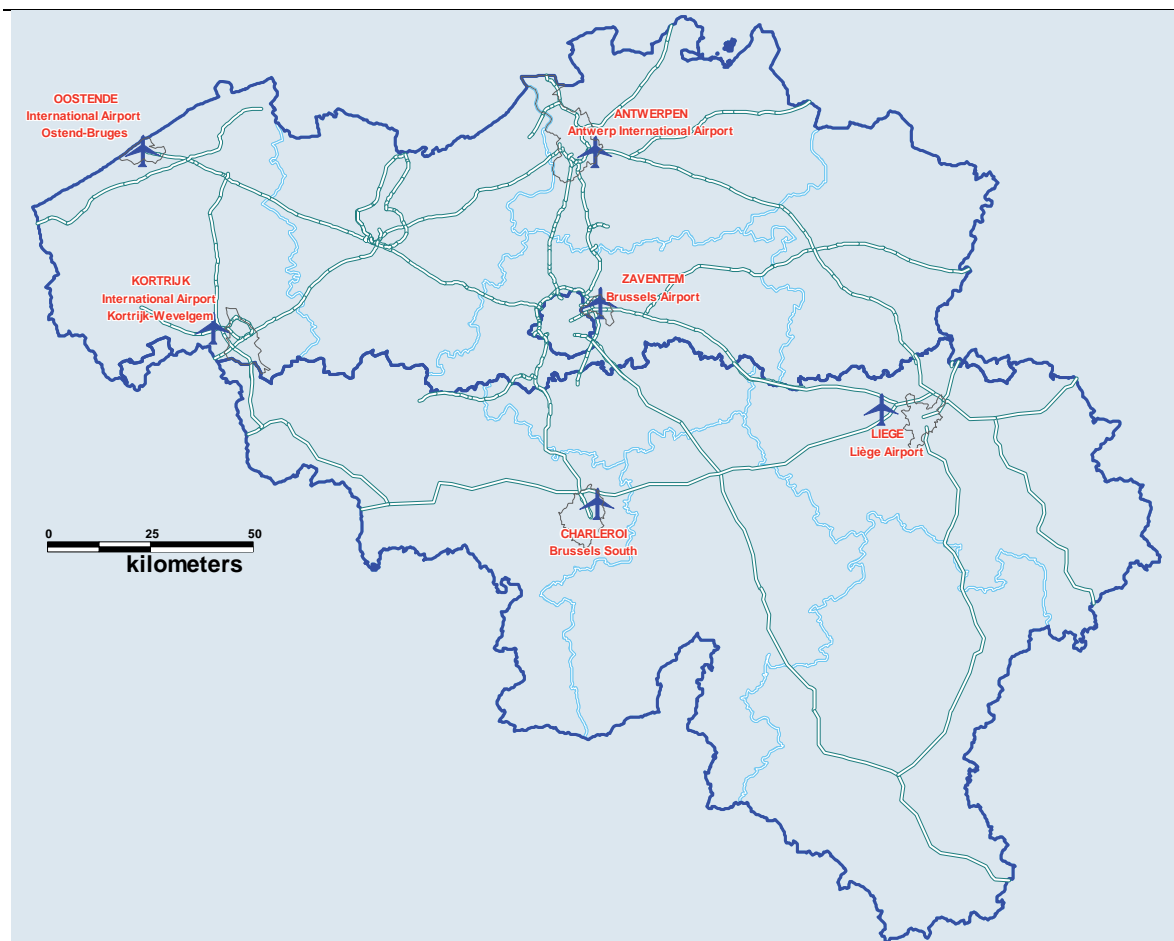
2.5 AIRPORT ACTIVITY: SITUATION AT EACH AIRPORT

2.5.1 *Geographic situation of the airports under review*

From a geographic point of view, three distinctions can be made between the six airports under review:

- Brussels Airport has an international dimension: the 19th largest airport in the EU-27, as well as being the twenty-first biggest for passenger transport and sixth largest for cargo in continental Europe. The other five Belgian airports, although open to international flights, which is quite normal given the size of the country, are essentially regional airports.
- The airports of Brussels, Antwerp, Ostend and Kortrijk are all located on Flemish territory, as figure 9 shows. But the economic repercussions of Brussels Airport go way beyond the borders of Flanders, not least because of the proximity of Brussels-Capital Region, which provides Zaventem with the lion's share of its labour and forms its immediate hinterland. Charleroi and Liège, on the other hand, are both Walloon airports.
- Antwerp, Brussels and Charleroi Airports are in fairly central Belgian locations, while those in Liège, Ostend and Kortrijk are more peripheral. Zaventem is only about ten kilometres from the centre of the capital of the EU, and Deurne (Antwerp Airport) is just a stone's throw from Antwerp, Belgium's second main city and the second largest sea port in Europe. Charleroi's airport, located in Gosselies, some 50 kilometres from Brussels, was named Brussels South Charleroi Airport, in a bid to make it more attractive by emphasising its geographic situation close to the capital city. The airports of Liège, Ostend and Kortrijk are nevertheless not completely outshone, since the first has the advantage of being close to the Liège metropolis and fast-growing logistics business, the second enjoys a unique coastal location near the city of Bruges, and the third is very close to the French urban zone of Lille.

FIGURE 9 BELGIAN AIRPORTS



Source: SERV.

2.5.2 Economic activity at Brussels Airport in 2006 and during 2000 - 2007

Given the availability of data on employment at Brussels Airport, notified by the airport operator for the years 2000 to 2007, it was possible to report on the latest developments in activity at Belgium's leading airport via the variables employment and value added.

This section is therefore divided into two parts, one focusing on a statement of activity in 2006 – as will be done later for the other five airports – and the other on developments occurring during the period 2000 - 2007.

2.5.2.1 Introduction⁸⁴

o Background

The area occupied by the airport at Zaventem sprang out of the construction of a hangar for Zeppelins, situated on a zone straddling the two districts of Evere and Haren, at the beginning of the First World War. The then monarch, Albert I, took a keen interest in the development of aviation and, in 1919, signed the articles of establishment of SNETA (*Syndicat National pour l'Etude des Transports Aériens*), which four years later gave rise to SABENA (*Société Anonyme Belge d'Exploitation de la Navigation Aérienne*). Still in its infancy during the inter-war period, civil aviation only really took off at the end of World War II, thanks to the efforts made by the RVA (*Régie des Voies Aériennes*), which was founded in 1946. After WW II, the airport moved further away from Brussels, towards its current location, at Melsbroek. At the time, the airport already had three runways, which have subsequently been lengthened on several occasions, to meet the growing needs of civil aviation. Currently, these runways are laid out in the form of a "Z" and measure 3638m for the 25R/07L strip, 3211m for 25L/07R and 2984m for 02/20.

Zaventem Airport was only really born in 1958 when Brussels hosted the World Expo. Operated by the RVA, it was soon to replace the airfield at Melsbroek, which was felt to be too small to cope with events and the expected increase in traffic over the coming years. The era of jet-propelled aircraft had effectively begun, and the national airport's infrastructure soon had to be renewed: runways lengthened, hangars expanded, terminal adapted, etc. In order to cope with the growth of business aviation, a peripheral building was brought into service from 1973, bringing the airport's handling capacity up from 6 to 8 million passengers per annum. Six years later, Brucargo was up and running, with its 100 hectares of storage space. After completion of the 1985 Master Plan and the "Zaventem 2000" project, BATC (Brussels Airport Terminal Company), BIAC (Brussels International Airport Company) and Belgocontrol were established. A new terminal built out of pier B was inaugurated in 1994. Then, in 2002, it was the turn of pier A to be opened, and two years later, a control tower was brought into service by Belgocontrol. The events of 11 September 2001 and the collapse of Sabena took their toll on the airport's business, but it soon returned to growth, in both passenger and cargo transport.

At the end of 2006, the company running the national airport was renamed Brussels Airport Company sa/nv, replacing the BIAC label. It is open round the clock seven days a week, despite some scheduling restrictions due to the noise pollution standards in force (currently maximum 25,000 night flights - between 11 pm and 6 am - per year). On 1 April 2008, DHL transferred a major part of its business from Brussels Airport to Leipzig, Germany, which helped reduce the number of night-time take-offs and landings. But numerous logistics and service-sector activities continued to develop within and around Brussels Airport, in the municipalities of Diegem and Evere for instance. According to the study on the economic impact of Belgian transport logistics⁸⁵, Brussels Airport is a major freight logistics "hotspot" in Belgium, second to the port of Antwerp. The Flanders Institute for Logistics (VIL) measured its importance as logistics platform⁸⁶. This is indeed a fact, backed by an abundant workforce and a particularly attractive tax regime. Likewise, an ambitious mobility planning could serve the Brussels Airport's position in the near future.

⁸⁴ Sources: www.brusselsairport.be, interviews with Brussels Airport officials and various other sources.

⁸⁵ Lagneaux F. (2008).

⁸⁶ Duponselle D. et al. -VIL- (2005)

- Facts and figures

- Surface area: 1,245 ha
- Traffic in 2006: 16.7 million passengers and 720,000 tonnes
- Number of active companies in 2006: 250
- Main projects: New Diabolo rail link; new terminal C exclusively for low-cost airlines; extensions at Brucargo
- Airport operator's shareholdership: Since the end of 2004, the Brussels Airport Company has been 70 p.c. owned by a consortium of Australian investors led by Macquarie airports (MAp). The Belgian State holds the remaining 30 p.c. of the share capital.

2.5.2.2 Economic results of Brussels Airport in 2006

According to the Brussels Airport board of directors, 2006 was a very successful year for Belgium's leading airport. It was given a new image on 19 October, under the name "Brussels Airport", traffic growth was good (+3.3 p.c. for passenger and +2.4 p.c. for cargo) and the financial results were also outstanding (cf. 2-digit growth of VA, section 2.4.1.2).

The slogan "Welcome to Europe" is the foundation of the new image which Brussels Airport aims to promote, with the benefit of infrastructures and services whose excellence was recognised, for instance by the "Airport People Award" which it won in 2006 on the basis of a vote by passengers.

Value added

- **Direct VA**

At Brussels Airport direct VA comes to 1,435.6 million euro. By far the biggest sector active at Brussels Airport, air transport represents almost a quarter of the value added recorded in 2006 (22.6 p.c.). This activity is followed by the airport operator, Brussels Airport company, and then courier and post activities, airport handling, other air transport supporting activities, public services, forwarding offices and building and repairing of aircraft, to mention just the main players, The air transport cluster represents two-thirds of the income production, or almost 1 billion euro (table 27), at Brussels Airport, which is also home to the development of numerous logistics activities, particularly those connected with the express courier sector.

TABLE 27 BRUSSELS AIRPORT: DETAILED DATA ON DIRECT VALUE ADDED PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Value added (in million euro)	Share (in p.c.)
Air transport cluster	955.9	66.6
Air transport	324.9	22.6
Travel agencies and tour operators	2.5	0.2
Forwarding offices	74.0	5.2
Airport operator	239.4	16.7
Airport handling	136.5	9.5
Other air transport supporting activities	113.8	7.9
Building and repairing of aircraft	64.9	4.5
Other airport-related activities	479.7	33.4
Passenger land transport	22.4	1.6
Cargo handling and storage	25.2	1.8
Freight transport by road	13.4	0.9
Courier and post activities	202.3	14.1
Public services	87.6	6.1
Security and industrial cleaning	31.3	2.2
Trade	29.6	2.1
Hotels, restaurants and catering	38.0	2.6
Other services	16.4	1.1
Other industries	13.5	0.9
TOTAL	1,435.6	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

• **VA top 10**

TABLE 28 BRUSSELS AIRPORT VALUE ADDED TOP 10 IN 2006

	Name of company or organisation	Sector	Value added (in million euro)
1	The Brussels Airport Company	Airport operator	239.4
2	Brussels Airlines	Air transport	192.5
3	DHL Aviation	Courier and post activities	112.4
4	Belgocontrol	Other air transport supporting activities	93.7
5	European Air Transport	Air transport	82.7
6	Flightcare	Airport handling	75.1
7	Aviapartner Belgium	Airport handling	61.3
8	Belgian Air Force 15° wing Luchttransport	Public services	53.9
9	Sabena Technics	Building and repairing of aircraft	49.0
10	TNT Express Belgium	Courier and post activities	40.4
	TOTAL		1,000.5
	Share in total Brussels Airport		69.7 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

In 2006, the ten firms generating the most value added represented almost 70 p.c. of the total for all activities recorded at the national airport, exceeding the billion euro mark (table 28). Easily the dominant member of this top 10 is the Brussels Airport Company. Since the end of 2004, the company which runs the national airport has been 70 p.c. owned by a consortium of Australian investors led by Macquarie Airports (MAp), and was renamed Brussels Airport Company sa/nv at the end of 2006, replacing the name BIAC.⁸⁷ The high VA is due to an increase in income from air transport, car parks and small shops, following a substantial rise in traffic. Brussels Airlines, the result of the 2006 merger between SN Brussels Airlines and Virgin Express, holds second place in the ranking. The 192.5 million euro corresponds to the sum of the VA of the two entities, members of SN Airholding, which is recorded outside the airport. DHL Aviation is in third place, followed by Belgocontrol and European Air Transport⁸⁸, the aviation subsidiary of DHL Aviation. Next come the two airport handling companies, Flightcare and Aviapartner. The Belgian Air Force is in eighth place and the top 10 ends with Sabena Technics and TNT Express Worldwide.

- **Indirect VA**

Indirect VA, i.e. the income produced by the suppliers of firms recorded at Brussels Airport, came to 1,650.9 million euro in 2006⁸⁹. Taking account of the total for direct VA, the multiplier therefore comes to 2.15. In other words, one euro of VA generated by firms at Brussels Airport ultimately produces 2.15 euro if account is taken of the activity generated upstream at all levels. That is a fairly modest ratio in comparison with the figures for the other airports. There are two factors here: first, the larger the population considered and the more activities it includes, the greater its percentage of the national economy and the fewer the indirect effects at national level, if all proportions remain the same; secondly, while air transport – deemed to generate a large volume of indirect effects – dominates the sectoral breakdown at Brussels Airport, that is not so in the case of the trade branches and other services. However, those branches also generate large amounts of indirect VA. Courier and other airport supporting activities are also branches with a strong presence at Brussels Airport, but generate proportionately little indirect value added.

Employment

- **Direct employment**

Direct employment at Brussels Airport comes to 17,618 FTEs. Top of the employment ranking, too, at Brussels Airport, air transport represents over 18 p.c. of the total in 2006. This activity is followed by courier and post activities, then airport handling, public services, building and repairing of aircraft, forwarding offices, other air transport supporting activities and the airport operator, Brussels Airport company. The air transport cluster represents a smaller percentage of employment than of value added, 54.1 p.c. as opposed to 66.6 p.c. (table 29). That shows the degree to which other airport-related sectors, which represent over 8000 direct FTEs and are dominated by the logistics activity connected with courier services, are important for employment at Brussels Airport. Employment totals 17,618 FTEs, or around 19,575 jobs, bringing the ratio of jobs per million passengers to 1172. Brussels Airport is therefore what one could call a high-density airport, comparable to London Heathrow, Paris CDG or Amsterdam.⁹⁰

⁸⁷ Brussels International Airport Company.

⁸⁸ European Air Transport is based in Brussels, Belgium and provides capacity for DHL's European network as well as long-haul services to the Middle East and Africa, using Boeing 757SF/PF and Airbus A300B4 aircraft.

⁸⁹ As stipulated in 1.2.5 the reader should be very careful in interpreting the indirect effects.

⁹⁰ See Sleuwaegen (2003). Source: York Consulting.

TABLE 29 BRUSSELS AIRPORT: DETAILED DATA ON DIRECT EMPLOYMENT PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Employment (in FTEs)	Share (in p.c.)
Air transport cluster	9,528	54.1
Air transport	3,182	18.1
Travel agencies and tour operators	33	0.2
Forwarding offices	1,001	5.7
Airport operator	790	4.5
Airport handling	2,384	13.5
Other air transport supporting activities	896	5.1
Building and repairing of aircraft	1,241	7.0
Other airport-related activities	8,089	45.9
Passenger land transport	360	2.0
Cargo handling and storage	345	2.0
Freight transport by road	210	1.2
Courier and post activities	2,937	16.7
Public services	1,681	9.5
Security and industrial cleaning	757	4.3
Trade	573	3.3
Hotels, restaurants and catering	777	4.4
Other services	222	1.3
Other industries	229	1.3
TOTAL	17,618	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

- **Employment top 10**

The ten leading employers at Brussels Airport in 2006 are listed in table 30. Together they represent over 11,000 FTEs and therefore account for 62.4 p.c. of direct employment at the national airport. They provide a clear illustration of the importance of the main sectors located at Zaventem, such as air transport, courier and post activities and airport handling, which top the list here, too. Compared to the VA top 10, the percentage is lower, which seems to indicate that employment is less concentrated than income production at the country's leading airport. Well in the lead in this top 10 is Brussels Airlines, which employed over 2,100 FTEs in 2006. Next come DHL Aviation, Flightcare, Aviapartner and Belgian Air Force, which employed over 1,000 persons each. Sabena Technics and Brussels Airport Company are in sixth and seventh positions, the latter employing 790 FTEs. Last in this ranking are Belgocontrol, Securair and Fedex Express.

TABLE 30 BRUSSELS AIRPORT EMPLOYMENT TOP 10 IN 2006

	Name of company or organisation	Sector	Employment (in FTEs)
1	Brussels Airlines	Air transport	2,103
2	DHL Aviation	Courier and post activities	1,758
3	Flightcare	Airport handling	1,224
4	Aviapartner Belgium	Airport handling	1,160
5	Belgian Air Force 15° wing Luchttransport	Public services	1,035
6	Sabena Technics	Building and repairing of aircraft	995
7	The Brussels Airport Company	Airport operator	790
8	Belgocontrol	Other air transport supporting activities	697
9	Securair	Security and industrial cleaning	696
10	Fedex Express	Courier and post activities	545
TOTAL			11,002
Share in total Brussels Airport			62.4 p.c

Source: NBB (Central Balance Sheet Office, own calculations).

- **Indirect employment**

Indirect employment, or the labour which suppliers require to ensure the smooth operation of firms recorded at Brussels Airport, came to 19,732 FTEs in 2006. Taking account of the total for direct employment, the multiplier is therefore 2.12. In other words, one FTE active in firms at Brussels Airport generates upstream activity ultimately sufficient to mobilise 2.12 FTEs. This ratio is fairly close to the airport average, though below it for the reasons already mentioned.

Prospects⁹¹

As the next section will show, activities have continued expanding at Brussels Airport. Traffic is also growing. Tables 5 and 6 presented right at the beginning of the report indicate that growth is accelerating, with a rise of 6.8 p.c. in the number of passengers between 2006 and 2007 and 8.9 p.c. in the cargo tonnage. In contrast, 2008 looks like a more difficult year for cargo, with the partial closure of DHL's European hub, relegated to a sub-hub and replaced by Leipzig. Passenger traffic is likely to continue expanding, although the economic crisis and the steep increase in ticket prices following the rise in kerosene prices are liable to curb that growth. Other factors could influence the pattern of activity at Brussels Airport, such as Lufthansa's gradual acquisition of shares in Brussels Airlines, currently 70.1 p.c. owned by a group of Belgian shareholders and 29.9 p.c. by the Virgin Group, and the complex issue of noise pollution which regularly comes to the fore.

The main projects in the pipeline are (1) the opening of a new terminal C dedicated to low-cost airlines by the end of 2009⁹², at the site of the old south pier of the 1958 terminal, (2) the forthcoming 50 p.c. expansion of the premises run by Brucargo, the cargo subsidiary of Brussels Airport, e.g. with the construction of new buildings on the new "Brucargo West" site, to compensate for the partial loss of activities at DHL, and (3) the PPP agreement on the entry into service, in 2012, of a new Diabolo rail link, which will connect the airport to the rest of the network via the new Schaerbeek-Mechelen-Antwerp line.

Bolstered by a buoyant economy, plus funding commensurate with the ambitions of its strong shareholders, Brussels Airport has staged a growth revival and faces the future with confidence. The

⁹¹ Sources: www.brusselsairport.be, interviews with Brussels Airport officials and various sources.

⁹² The final decision on the construction of this new terminal is still awaited and subject to fierce negotiations, in particular with the traditional airlines which are not supposed to use it in the future, and therefore will not benefit from its very attractive fees policy. Hence the delay in comparison with its initial planning (summer 2009).

current problem lies mainly in the difficulty of recruiting staff willing to work flexible hours and offering multiple language skills. Despite all the efforts made (Brussels Job Day Airport Region, multiple joint schemes with Actiris, VDAB, etc.), there are still long lists of requests for job applicants. Brussels Airport points out on its website that it still has 500 vacancies. That tends to demonstrate the ACI / York formula which states that, in a high density airport such as Brussels, every million passengers carried generates 1000 direct jobs. The same applies to a volume of 100,000 tonnes of cargo. The calculations for 2006 indicate that Brussels Airport offers potential employment totalling around 24,000 jobs, or 21,600 FTEs. Brussels Airport's attractivity is a fact, as it is the second logistics hotspot of the country.

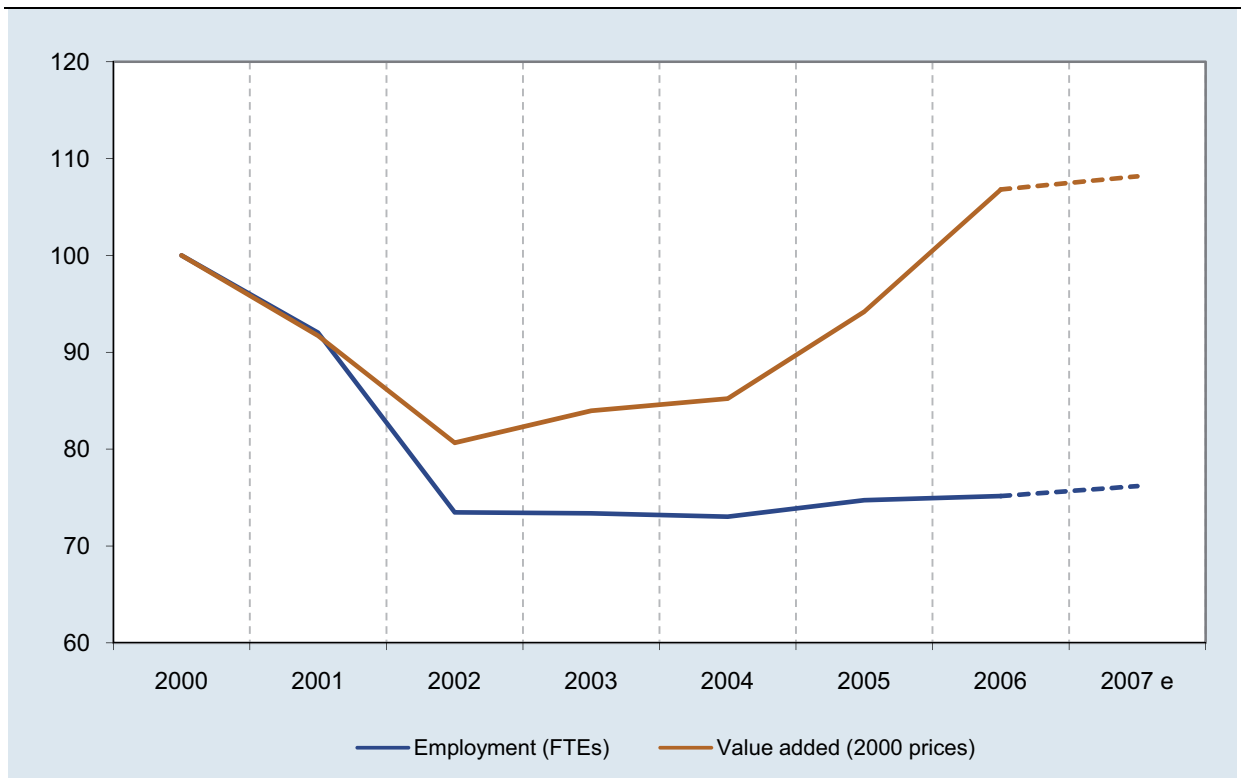
2.5.2.3 Trends in activity at Brussels Airport from 2000 to 2007

This section, which is confined to studying the direct effects, is based on the trends seen in the Brussels Airport top 20 which, in 2006, represented around 80 p.c. of the airport's economic activity in terms of value added and employment. Starting with the 2006 top 20, it was possible to look back at 2000 and analyse the growth in 2007. For the preceding years the data are exhaustive, whereas for 2007 that was true of 95 p.c.: for that year, the figures are therefore estimated. It is notable that the top 20 is fairly stable over time, since it contains the same firms throughout the period, in good years and in bad, except for some adjustments for mergers and acquisitions, particularly in the air transport sector (Sabena, Virgin, Brussels Airlines, etc.).

The employment data relating to the activity of firms located at Brussels Airport between 2000 and 2007 were supplied by the operator, Brussels Airport Company, and were used, via certain calculations, to quantify the changes in the variables employment in FTEs and value added during that period (chart 12).

- Index 2000 = 100

CHART 12 BRUSSELS AIRPORT: COMPARISON OF CHANGES IN VA AND EMPLOYMENT FROM 2000 TO 2007
(index 2000 = 100)



Source: NBB (Central Balance Sheet Office, own calculations).

Chart 13 reveals the scale of the crisis confronting Brussels Airport and, more generally, the air transport sector in Belgium. On the basis of these curves, it is possible to estimate that employment slumped from almost 23,500 FTEs in 2000 to 17,200 two years later. VA dropped from 1.35 to 1.08 billion euro over the same period, at 2006 prices.

There were two key events in 2001: the collapse of Sabena and the terrorist attacks in the United States. The former struck at the heart of the activities of Zaventem airport, since no less than 5000 FTEs, or almost 6000 jobs, were lost as a result of that bankruptcy. Founded in 1923, Sabena was one of the oldest European airlines, but also the first national airline to disappear in the history of air transport in the EU. A victim of unfortunate alliances, the latest of which – with SwissAir – precipitated its collapse, the Belgian airline was in serious financial difficulties, and had been since practically 1958, with debts of 2.5 billion euro by 2000. Altogether, the air transport branch went on to lose a total of more than 7700 FTEs at national level (cf. point 2.2.2.1). The terrorist attacks in September 2001 did not only target the symbols of American power, they also had a major impact on the air transport sector. In particular, they raised fundamental questions about the security standards prevailing at airports throughout the world, and in airlines serving the United States – and before long, the five continents. These events also plunged the aviation sector into unprecedented gloom: a widespread decline in traffic, financial problems for American and European airlines, a growing number of bankruptcies, restructuring and, more indirectly, fiercer competition with Asian airlines and airports, and the mushrooming of low-cost airlines.

While the branches comprising air transport and building and repairing of aircraft recorded a slump in employment in 2001, that was not true of other air transport supporting activities, forwarding offices and courier companies, where employment remained stable and in some cases even expanded. There was also a sharp drop in value added at constant prices, the wage component having been hard hit and corporate results often going into the red. But here, too, the decline was concentrated in the air transport cluster, while the above sectors generally escaped the decline.

As for the remainder of the period, by 2006 value added had risen to exceed the 2000 level (108.2 p.c. in 2007), while employment struggled to recover from the 2001 shock, barely reaching three-quarters of its 2000 level (76.2 p.c. in 2007). Between 2005 and 2006, VA and employment grew at constant prices by +13.4 p.c. and +0.6 p.c. respectively. The next year, these percentages amounted respectively to +1.4 and +1.3 p.c. (figures in table 31 obtained by retropolation). Over the whole 2000 - 2007 period, VA has recovered from the dramatic drop of 2001 and 2002, while the average number of jobs never has, as its average annual decline amounts to 3.8 p.c.

TABLE 31 ESTIMATED CHANGES IN TERMS OF VALUE ADDED AND EMPLOYMENT AT BRUSSELS AIRPORT

	2000	2001	2002	2003	2004	2005	2006	2007	2006-2007 change (in p.c.)	2000-2007 average change (in p.c.)
VA (in million euro)	1344.2	1232.9	1084.2	1128.7	1145.4	1266.1	1435.6	1455.1	+1.4	+1.1
Employment (in FTEs)	23443	21573	17222	17201	17119	17519	17618	17842.5	+1.3	-3.8

Source: NBB (Central Balance Sheet Office, own calculations).

2.5.3 Economic activity in the five regional airports in 2006

2.5.3.1 Antwerp Airport

Introduction⁹³

o Background

The first signs of aviation in Deurne, near Antwerp, can be traced back to the foundation of the Aéro-Club d'Anvers in 1909. However, the first airfield was not opened until 15 May 1923 and was at first only reserved for military use. In 1929, the first stone for the current airport building was laid and the first scheduled flights started out of the airport. They were nevertheless suspended ten years later at the beginning of World War II. During the German occupation, the airport was mainly used as a base to supply nearby Messerschmitt maintenance factories. During this time, the airport was expanded considerably, a concrete runway was built and hangars constructed. With the introduction of the jet-propelled aeroplane, however, the runway was beginning to show its limits, as most of the new aircraft were in need of a landing and takeoff strip of at least 2500m long.

In the 1980s, Antwerp gained in importance as a freight centre. However, about 80 p.c. of the cargo in Antwerp today is shipped under air way-bill via road. Furthermore, there are also only a limited number of full cargo flights. The few full cargo flights from Antwerp Airport mostly carry large machinery parts. As Antwerp is an important Diamond center, prior to 1 March 2006, a daily cargo flight carrying diamonds used to be operated out of Antwerp Airport. In recent years, however, the diamond transport shifted to bigger airports like Brussels and Amsterdam.

In general, Antwerp Airport can be described as an airport focusing on business travel. In recent years, it has seen a growth in business flights. The success of the airport is furthermore closely linked to the airline VLM, which was founded in 1993. With its most important route from Antwerp to London City Airport, it is especially popular with business travellers. In addition, other companies such as Flying Group and Aviation Factory provide the means for business travel.

o Facts and figures

- Surface area: 167 ha
- Traffic in 2006: 148,000 passengers and 7,000 tonnes of cargo
- Number of active companies in 2006: 77
- Main projects: Public Private Partnership project for the extension of the runway with a safety stroke; diversion of the Krijgsbaan and development of a company zone at the airport
- Airport operator: Region of Flanders

Value added

• Direct VA

Direct VA at Antwerp Airport came to 41.7 million euro in 2006. The air transport cluster is decidedly dominant in activity at Antwerp Airport, representing 63.3 p.c., or a total of 26.4 million euro in 2006. The air transport sector alone accounts for 42.3 p.c., led by VLM Airlines. This branch is followed by other services, other air transport supporting activities, the airport operator, other industries, public services, trade, forwarding offices and courier and post activities (table 32).

⁹³ Sources: Interview with K. Pittevels, www.antwerp-airport.be and Pittevels et al (2008)

TABLE 32 ANTWERP AIRPORT: DETAILED DATA ON DIRECT VALUE ADDED PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Value added (in million euro)	Share (in p.c.)
Air transport cluster	26.4	63.3
Air transport.....	17.6	42.3
Travel agencies and tour operators.....	0.4	0.9
Forwarding offices.....	1.1	2.7
Airport operator	3.2	7.8
Airport handling	0.5	1.1
Other air transport supporting activities.....	3.4	8.1
Building and repairing of aircraft.....	0.2	0.5
Other airport-related activities	15.3	36.7
Passenger land transport	0.2	0.4
Cargo handling and storage.....	0.0	0.0
Freight transport by road.....	0.2	0.4
Courier and post activities.....	0.9	2.3
Public services	1.2	2.9
Security and industrial cleaning.....	0.2	0.4
Trade.....	1.2	2.8
Hotels, restaurants and catering	0.5	1.2
Other services	8.1	19.5
Other industries.....	2.9	6.9
TOTAL	41.7	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

• **VA top 10**

TABLE 33 ANTWERP AIRPORT VALUE ADDED TOP 10 IN 2006

Name of company or organisation	Sector	Value added (in million euro)
1 VLM Airlines	Air transport	17.5
2 Ministerie v/d Vl.Gem.	Airport operator	3.2
3 Belgocontrol	Other air transport supporting activities	3.0
4 Alg. Bouwonderneming Smits	Other industries	2.4
5 Mass Invest (Antwerp Airport Company)	Other services	1.8
6 Flying Group-Service	Other services	1.3
7 De Post	Courier and post activities	1.0
8 FOS&S	Other services	0.9
9 Aërodata	Other services	0.8
10 Federale Politie	Public services	0.7
TOTAL		32.5
Share in total Antwerp Airport		77.9 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

The fact that activity is heavily concentrated at Antwerp Airport is hardly surprising, given its modest size. The ten firms generating the most value added in 2006 on their own represented almost 80 p.c. of the airport's direct VA (table 33). VLM Airlines alone produced value added equivalent to 41.8 p.c. of that total. This means that its presence at Antwerp is crucial to the airport. A long way behind come the airport operator, i.e. the Flemish Region, Belgocontrol, the construction company Smits, a large number of other services, the Post Office and, to end this top 10, the Federal Police.

- **Indirect VA**

The indirect VA generated upstream of the firms based at Antwerp Airport came to 71.5 million euro in 2006⁹⁴. Comparison with the figures for direct VA gives a multiplier of 2.71. This is a fairly high ratio, owing both to the modest size of the population used to study Antwerp Airport and to the dominance of branches generating proportionately abundant activity upstream, namely air transport and other services.

Employment

- **Direct employment**

Direct employment at Antwerp Airport totalled 520 FTEs in 2006. The air transport cluster also dominates employment at Antwerp Airport, at 56.7 p.c., or almost 300 FTEs in 2006 (table 34). However, this percentage is lower than that for the VA of the same category of activities. The main reason lies in the productivity differential generally found between the two clusters, and already noted at Brussels Airport (see above). However, the air transport sector is still the top employer at Antwerp Airport, since on its own it represents 32.7 p.c. of the labour employed there. This branch is followed by other industries, the airport operator, other services, other air transport supporting activities, public services, courier and post activities, forwarding offices, hotels and restaurants and trade.

- **Employment top 10**

Still headed by the Flemish airline, VLM Airlines, the employment top 10 at Antwerp Airport (table 35) concerns practically the same sectors as those in the value added top 10, except that Belair appears in sixth place, customs in ninth place and the Post Office and the Federal Police are ranked higher in the employment top 10. Together, these ten firms represented 77.4 p.c. of the airport's workforce in 2006, VLM alone accounting for 32 p.c.

- **Indirect employment**

At no less than 848 FTEs in 2006, indirect employment – which concerns the suppliers of firms based at Antwerp Airport – is added to the 520 direct FTEs already recorded, putting the total employment generated at almost 1370 FTEs. The multiplier – the ratio between this total and direct employment, is 2.63. Among the six airports examined, this is the second highest ratio, for the reasons stated above which are still valid in the case of employment.

⁹⁴ As stipulated in 1.2.5 the reader should be very careful in interpreting the indirect effects.

TABLE 34 ANTWERP AIRPORT: DETAILED DATA ON DIRECT EMPLOYMENT PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Employment (in FTEs)	Share (in p.c.)
Air transport cluster	294	56.7
Air transport.....	170	32.7
Travel agencies and tour operators.....	5	0.9
Forwarding offices.....	19	3.6
Airport operator	62	12.0
Airport handling	9	1.7
Other air transport supporting activities.....	29	5.5
Building and repairing of aircraft.....	2	0.3
Other airport-related activities	225	43.3
Passenger land transport	10	1.8
Cargo handling and storage.....	0	0.0
Freight transport by road.....	3	0.5
Courier and post activities.....	20	3.8
Public services	23	4.5
Security and industrial cleaning.....	3	0.5
Trade.....	15	2.9
Hotels, restaurants and catering	15	2.9
Other services	62	11.9
Other industries.....	75	14.4
TOTAL	519	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

TABLE 35 ANTWERP AIRPORT EMPLOYMENT TOP 10 IN 2006

Name of company or organisation	Sector	Employment (in FTEs)
1 VLM Airlines	Air transport	166
2 Alg. Bouwonderneming Smits	Other industries	72
3 Ministerie v/d Vl.Gem.	Airport operator	62
4 Belgocontrol	Other air transport supporting activities	23
5 De Post	Courier and post activities	20
6 Belair	Hotels, restaurants and catering	14
7 Federale Politie	Public services	13
8 Mentor Worldwide Security Services	Other services	13
9 Douane	Public services	11
10 FOS&S	Other services	10
TOTAL		402
Share in total Antwerp Airport		77.4 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

Prospects⁹⁵

One of Antwerp Airport's most important routes is between Antwerp and London, a link that will remain of great importance for the airport in the future. To guarantee a good service in the future and comply with international airport safety rules, an extension of the runway is planned. However, the extension of the runway will consist of building a safety stroke but will not include an extension of the runway actually used. The project will be financed by a Public Private Partnership, for which the general agreement between the partners was signed on 18 May 2004. On 8 June 2007, the Flemish Government opted to divert and deepen the Krijgsbaan instead of building a tunnel under the runway in the first phase of the extension. If a change in the regulations means that an even longer safety strip is required in the future, the Krijgsbaan could be fitted with a roof in a second phase. To make the project profitable, there are plans for a commercial zone at the airport next to the extension of the runway, via the PPP formula. The total capital to be invested in this project comes to 17.5 million euro.

2.5.3.2 Charleroi Airport

Introduction⁹⁶

o Background

Back in the 1920s, Gosselies was just a small airfield equipped with a flying school, and it was not until the end of the Second World War that it was put in the public aerodrome category, since it was operated by RVA. In 1954, the Haren-based SABCA set up a second factory at Gosselies. Then in 1978, SONACA⁹⁷ was established. But very few initiatives to start civil aviation flights out of Charleroi came to fruition.

It was not until 1 January 1992, when the Belgian State effectively transferred to the Regions powers to manage and operate the regional airports, that Brussels South Charleroi Airport could get up and running, six months after establishing itself under the name BSCA sa. The Walloon Region decided to partly hand management of its two airports, Charleroi and Liège, over to the private sector. Much to the delight of the regional authorities and BSCA itself, the gradual introduction of computerised management tools made it possible to take on, in 1997, the first airline offering scheduled flights - Ryanair. The then tiny Irish budget airline was to make Charleroi Airport one of the centres of its growth in continental Europe, by boosting exponentially passenger transport business there. Low-cost air travel was thus gaining a permanent foothold on our territory, making this type of transport quite routine for many Belgians and even travellers from northern France, southern parts of the Netherlands, etc.

Then, in the year 2001, the Walloon Region set up the *Société wallonne des Aéroports* (SOWAER, Walloon Airport Authority), which took a stake in the capital of the two Walloon airport companies. In the same year, Ryanair established its first continental base on BSCA's premises, a move that coincided with a threefold increase in passenger traffic. Bolstered by the arrival of new budget airlines like Wizzair, Jetairfly, Jet4you and Onair too, the rise in passenger traffic continued, justifying the entry into service, in January 2008, of a new 30,000 m² terminal capable of handling a total of 5 million passengers a year, even though this extra capacity was already seen by some observers as inadequate. The aim of handling 3 million passengers in 2008 has been achieved and 4 million are expected in 2009. This new terminal could reach its saturation point as early as 2010, when the extended runway will be in service. The airport also attracts a lot of logistics business and industrial activities, both in the zonings that were already there before BSCA was set up, and in more recently created structures like the Aeropole.

⁹⁵ Sources: www.antwerp-airport.be and Luchthaven Antwerpen (2008, pp.5, 11).

⁹⁶ Sources: www.charleroi-airport.com, Ciriec (2006), interviews with BSCA officials and various other sources.

⁹⁷ Sonaca is established just outside Charleroi Airport's borders and is therefore not recorded in this chapter (see Sonaca's figures at section 2.2.1).

o Facts and figures

- Surface area: 300 ha
- Traffic in 2006: 2.2 million passengers
- Number of active companies in 2006: 31
- Main projects: Installation as of 2008 of a new ILS cat. 3 system making it possible to land in conditions of poor visibility; construction of a new control tower; extension of the runway on the eastern side from 2010 (from 2550 to 3200m); and, in the medium term, plans for building a rail link cutting the journey time between Brussels and BSCA to less than 45 minutes (project currently under study)
- Airport operator's shareholdership: Sowaer (48.9 p.c.), Sogepa (27.7 p.c.), Sambrinvest (19.2 p.c.), Igretec-Koeckelberg-Sabca-Sonaca-Carolo Parking (4.2 p.c.). Privatisation is underway.

Value added

• **Direct VA**

In 2006 the direct VA of Charleroi Airport totalled 67.2 million euro. The air transport cluster is by far the principal source of value added at this airport, accounting for 71.7 p.c. of the total (table 36). That is due to the important position held by building and repairing of aircraft (30 p.c.), the airport operator BSCA⁹⁸ (22 p.c.) and the airlines (air transport, 12.7 p.c.). These sectors dominate over all other airport-related activities and other air transport supporting activities.

TABLE 36 CHARLEROI AIRPORT: DETAILED DATA ON DIRECT VALUE ADDED PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Value added (in million euro)	Share (in p.c.)
Air transport cluster	48.2	71.7
Air transport	8.5	12.7
Travel agencies and tour operators	0.2	0.3
Forwarding offices	0.0	0.0
Airport operator	14.7	21.9
Airport handling	0.0	0.0
Other air transport supporting activities	4.6	6.9
Building and repairing of aircraft	20.1	29.9
Other airport-related activities	19.0	28.3
Passenger land transport	2.9	4.3
Cargo handling and storage	0.1	0.1
Freight transport by road	0.5	0.7
Courier and post activities	0.0	0.0
Public services	7.6	11.3
Security and industrial cleaning	2.7	4.1
Trade	1.0	1.5
Hotels, restaurants and catering	1.1	1.6
Other services	3.2	4.7
Other industries	0.0	0.0
TOTAL	67.2	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

⁹⁸ Brussels South Charleroi Airport.

- **VA top 10**

Illustrating the dominance of the building and repairing of aircraft branch, SABCA – though recording only 28 p.c. of its activity at Charleroi Airport – heads this top 10 in 2006, with value added of 20 million euro, on its own accounting for 29.7 p.c. of the VA produced at the airport site (table 37). Another sign of the concentration of activity, these ten firms which generate the most value added represented over 90 p.c. of the same total amounting to 60.8 million euro. Next in this ranking after SABCA come the airport operator BSCA, then Ryanair, by far the biggest airline operating at Charleroi, the Walloon Ministry of Equipment and Transport (MET), and Belgocontrol. The rest of the top 10 consists of Securair, City Parking, customs, the Federal Police and L'Envol Cafet.

TABLE 37 CHARLEROI AIRPORT VALUE ADDED TOP 10 IN 2006

	Name of company or organisation	Sector	Value added (in million euro)
1	Société anonyme belge de Constructions aéronautique (SABCA)	Building and repairing of aircraft	20.0
2	BSCA	Airport operator	14.7
3	Ryanair	Air transport	8.5
4	MET statutaires	Public services	4.2
5	Belgocontrol	Other air transport supporting activities	4.2
6	Securair	Security and industrial cleaning	2.7
7	City Parking	Passenger land transport	2.0
8	Douanes	Public services	1.8
9	Police fédérale	Public services	1.6
10	L'Envol cafet	Hotels, restaurants and catering	1.1
TOTAL			60.8
Share in total Charleroi Airport			90.5 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

- **Indirect VA**

In the same year, indirect VA came to 87.3 million euro⁹⁹, putting the multiplier at 2.30. That ratio is slightly higher than the average for the six airports, mainly because of the position at Charleroi Airport of certain other services, such as car hire, which generate substantial indirect effects. The indirect VA generated by branches with a strong presence at Charleroi, such as building and repairing of aircraft, but also the airport operator, is quite considerable although proportionately less important than that generated by other services.

Employment

- **Direct employment**

Direct employment at Charleroi Airport came to 922 FTEs in 2006. In the sectoral ranking of activities at Charleroi Airport in 2006, building and repairing of aircraft is on an equal footing with the airport operator BSCA, at 26.4 p.c. A long way behind come public services, airlines (air transport), security and industrial cleaning, passenger land transport, other air transport supporting activities, other services and hotels, restaurants and catering, to mention only the main activities (table 38). 922 FTEs, or around 1024 jobs, bring the ratio of jobs per million passengers to 417. Charleroi Airport is therefore what can be called a low density airport, comparable to Barcelona or Milan.¹⁰⁰

⁹⁹ As stipulated in 1.2.5 the reader should be very careful in interpreting the indirect effects.

¹⁰⁰ See Sleuwaegen (2003). Source: York Consulting.

TABLE 38 CHARLEROI AIRPORT: DETAILED DATA ON DIRECT EMPLOYMENT PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Employment (in FTEs)	Share (in p.c.)
Air transport cluster	599	65.0
Air transport.....	70	7.6
Travel agencies and tour operators.....	3	0.3
Forwarding offices.....	0	0.0
Airport operator	244	26.4
Airport handling	0	0.0
Other air transport supporting activities.....	38	4.2
Building and repairing of aircraft.....	244	26.4
Other airport-related activities	323	35.0
Passenger land transport	40	4.4
Cargo handling and storage.....	1	0.1
Freight transport by road.....	9	0.9
Courier and post activities.....	0	0.0
Public services	145	15.7
Security and industrial cleaning.....	66	7.2
Trade	15	1.7
Hotels, restaurants and catering	22	2.3
Other services	25	2.7
Other industries.....	0	0.0
TOTAL	922	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

- **Employment top 10**

This time it is BSCA that is the dominant employer at Charleroi Airport, with 244 FTEs, or over a quarter of the airport's total workforce (table 39). Next, leading by one FTE, comes SABCA, followed by the MET, Ryanair, Securair, customs, Belgocontrol, the Federal Police, L'Envol Cafet and City Parking. This top 10 with its 841 FTEs represents over 91 p.c. of the direct employment recorded at the airport, confirming that activity there is highly concentrated.

- **Indirect employment**

At 1065 FTEs, indirect employment at Charleroi Airport brings the total employment generated by firms located there to almost 1990 FTEs. The multiplier is therefore 2.16, close to the average for Belgian airports, with the other services branch being less important for employment than it is for value added.

TABLE 39 CHARLEROI AIRPORT EMPLOYMENT TOP 10 IN 2006

	Name of company or organisation	Sector	Employment (in FTEs)
1	BSCA	Airport operator	244
2	Société anonyme belge de Constructions aéronautique (SABCA)	Building and repairing of aircraft	243
3	MET	Public services	81
4	Ryanair	Air transport	70
5	Securair (Securitas)	Security and industrial cleaning	66
6	Douanes statutaires	Public services	34
7	Belgocontrol	Other air transport supporting activities	32
8	Police Fédérale	Public services	30
9	L'Envol cafet	Hotels, restaurants and catering	22
10	City Parking	Passenger land transport	20
TOTAL			841
Share in total Charleroi Airport			91.3 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

Prospects¹⁰¹

The growth of air traffic in Belgium is clearly originating in Wallonia. At Charleroi Airport, the two-digit growth is expected to continue in the years ahead. The expansion is such that there is already talk of extending the new terminal by 2011, while the figure of 5 million passengers looks likely to be exceeded by 2010. That extension will make it possible to cater for 8 million passengers, the airport's theoretical maximum capacity being 15 million by 2015. The BSCA managers estimate that the potential customers for the facilities at Charleroi total 26 million, with Walloons representing only 40 p.c. of the current clientele. This figure was calculated on the basis of the resident population living within two hours' drive of the airport. Up to now, the expansion of activity at Charleroi Airport has been heavily dependent on Ryanair, which carries 85 p.c. of BSCA customers. One of the management's aims is to cut that dependence to 70 p.c. in the medium term.

Charleroi Airport still has considerable scope for expansion in passenger traffic, and that appears to be the justification for the proposed rail link between Gosselies and Brussels Midi; this would cut the total journey time to less than 45 minutes, a station being scheduled for construction in ten years' time south of the E-42 motorway, close to the airport terminal. This policy reinforces the status of Charleroi Airport as the second national airport for passenger traffic. To ensure its growth and international attraction, there are plans for the partial privatisation of BSCA: the 27.7 p.c. of BSCA owned by the Region via Sogepa is likely to be sold off shortly to a private investor. Three bids have been submitted in December 2008 to the office of the minister, André Antoine: the Italian company Save in association with the Holding Communal company (Dexia), Belgian Sky Shops CNP (Frère group) and China's Hainan Airlines (HNA). The first bid - Save's - is favoured by the Walloon executive while the parliament is still debating on the matter.

¹⁰¹ Sources: www.charleroi-airport.com, Ciriec (2006), interviews with BSCA officials and various sources.

2.5.3.3 Kortrijk Airport

Introduction¹⁰²

○ Background

Kortrijk-Wevelgem Airport is by far the smallest airport known in Belgium. Since 1995, it has been recognised as an international airport and since 2006 as one of the regional airports of Flanders. Built as an airfield in 1916 by the Germans, it was later expanded in the direction of the municipality of Wevelgem. At the end of World War II, the airport was recaptured by the Allies, used by the English air force and after the war returned to Belgium. Especially used as an airfield for gliding and pleasure flights, the airport was divided into three zones in 1963: the runway with control towers, a zone north of the runway to be managed by the "Intercommunale Leiedal" and a zone south of the runway rented by the German army as military depot. In 1969, the management of the airport was handed over to the intercommunal where private companies were also involved. The zone to the north of the runway was given to the city of Leiedal for companies that have direct links with air transport. In 1972, a concession contract was signed handing over the management of the airport to the Westvlaamse Intercommunale Vliegveld Wevelgem-Bissegem (WIV). Because of the construction of the E403 motorway, a tunnel under the runway had to be built in 1977. Then in 1991, an Instrument Landing System was installed. The current airport building was opened in 1994.

The airport specialises mainly in niche-markets such as small freight with high added value, medical flights and business flights and does not offer any scheduled flights. For security reasons, since 1999 also gliders are not allowed to use the airport. Business flights are offered mostly by Abelag that generates about 60 p.c. of Kortrijk-Wevelgem's turnover.

○ Facts and figures

- Surface area: 50 ha
- Traffic in 2006: 65,000 passengers
- Number of active companies in 2006: 34
- Main projects: Renovation of airport premises and privatisation through the introduction of a new management structure (LEM - LOM¹⁰³).
- Airport operator: Westvlaamse Intercommunale Vliegveld Wevelgem-Bissegem, which is in the hands of 13 municipalities, the province of West Flanders, the intercommunal Leiedal and the distribution company of energy and television of West Flanders.

Value added

● **Direct VA**

Direct VA at Kortrijk Airport came to 9.8 million euro in 2006. The smallest airport considered in this study is heavily dependent on air transport activity, as the air transport cluster represents over three-quarters of the direct value added, and the air transport sector alone accounts for 42 p.c. of that total. Quite a long way behind this branch come the building and repairing of aircraft, other services, the airport operator, trade and other air transport supporting activities. The other activities make a much more modest contribution to the economic impact of Kortrijk Airport (table 40).

¹⁰² Sources: Interview with S. Van Eeckhoutte and various newspaper articles.

¹⁰³ Under the new system, the airport will be divided into an Air Transport Development Company (LOM, for *Luchthaven-Ontwikkelings-Maatschappij*) and an Airport Operating Company (LEM, for *Luchthaven-Exploitatie-Maatschappij*). The LOM will be responsible for the infrastructure, such as the runway, customs and the fire brigade, while the LEM will manage the airport's commercial operations. Under this structure, the government will be responsible for the work of the LOM, and the LEM will be assigned to a private partner.

TABLE 40 KORTRIJK AIRPORT: DETAILED DATA ON DIRECT VALUE ADDED PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Value added (in million euro)	Share (in p.c.)
Air transport cluster	7.42	75.5
Air transport	4.13	42.0
Travel agencies and tour operators	0.00	0.0
Forwarding offices	0.00	0.0
Airport operator	1.35	13.7
Airport handling	0.00	0.0
Other air transport supporting activities	0.42	4.3
Building and repairing of aircraft	1.53	15.5
Other airport-related activities	2.40	24.5
Passenger land transport	0.00	0.0
Cargo handling and storage	0.02	0.2
Freight transport by road	0.00	0.0
Courier and post activities	0.00	0.0
Public services	0.29	2.9
Security and industrial cleaning	0.01	0.2
Trade	0.62	6.3
Hotels, restaurants and catering	0.08	0.9
Other services	1.37	14.0
Other industries	0.00	0.0
TOTAL	9.82	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

- **VA top 10**

By far the most important economic player at Kortrijk Airport is the airline, Abelag, with value added equal to 3.4 million euro in 2006, representing almost 35 p.c. of the income generated by this airport (table 41). The airport operator is in second place, followed by APM (Aircraft Power Maintenance), General Air Service, Air Technology, FIA (Flanders International Airport), the air jet charter service company, Gill Aviation Service, and the Federal Police; the top 10 ends with two airlines, Capital Aircraft Group and ASL. Altogether, this list accounts for practically 80 p.c. of the direct VA of Kortrijk Airport.

- **Indirect VA**

At 18.7 million euro, the indirect VA of Kortrijk Airport is the highest in proportion to the direct VA among the airports considered¹⁰⁴. The multiplier is 2.91, the highest ratio recorded in 2006. Once again, there are two factors at work: the smaller the population studied, the stronger the link between the indirect and direct effects; moreover, activity at Kortrijk is dominated by air transport and other services, and these are known to generate substantial upstream activity, if all proportions remain the same. The flying schools are also well represented at Kortrijk-Wevelgem, and they generate substantial indirect VA.

¹⁰⁴ As stipulated in 1.2.5 the reader should be very careful in interpreting the indirect effects.

TABLE 41 KORTRIJK AIRPORT VALUE ADDED TOP 10 IN 2006

Name of company or organisation	Sector	Value added (in million euro)
1 Abelag	Air transport	3.4
2 W.I.V. airport operator	Airport operator	1.4
3 A.P.M.	Building and repairing of aircraft	1.2
4 General Air Service	Trade	0.5
5 Air Technology	Building and repairing of aircraft	0.3
6 F.I.A.	Other air transport supporting activities	0.2
7 Gill Aviation Service	Trade	0.2
8 Federale politie	Public services	0.2
9 Capital Aircraft Group	Air transport	0.2
10 ASL	Air transport	0.2
TOTAL		7.8
Share in total Kortrijk Airport		79.6 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

Employment

- **Direct employment**

Direct employment at Kortrijk Airport came to 146 FTEs in 2006. Jobs at Kortrijk-Wevelgem are also found mainly in the air transport cluster, which employs 70 p.c. of this small airport's workforce (table 42). The air transport sector alone represents 34.2 p.c. of that total. Some way behind this branch are building and repairing of aircraft and other services, equal in second place (14.6 p.c.), followed by the airport operator, trade and other air transport supporting activities. Other activities make a much more modest contribution to the economic impact of Kortrijk Airport.

- **Employment top 10**

This ranking of the ten leading employers at Kortrijk Airport (table 43) is very similar to the one for value added in the same year. The only significant difference is that FIA and ASL are replaced by the flying school, Alfako (Alfa Flight Academy Kortrijk) and Lambert Aircraft Engineering, a company belonging to NACE branch 74, i.e. other services. There are no other major changes: Abelag, with its 40 FTEs, or over a quarter of the total workforce in 2006, dominates Kortrijk Airport. These ten firms account for almost 72 p.c. of direct employment at Kortrijk-Wevelgem.

- **Indirect employment**

The indirect employment generated among suppliers of firms in the population totalled 222.8 FTEs. Comparison with the direct employment indicates a multiplier of 2.52. Taking account of the intersectoral links between branches active in this airport and the economy of the rest of the country, one direct job at Kortrijk-Wevelgem implies a total of 2.52 jobs, including all the labour needed by firms supplying businesses at the airport. This is higher than the average ratio for all airports, but lower than in the case of VA, given the lesser relative importance of the air transport sector.

TABLE 42 KORTRIJK AIRPORT: DETAILED DATA ON DIRECT EMPLOYMENT PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Employment (in FTEs)	Share (in p.c.)
Air transport cluster	102	69.8
Air transport	50	34.2
Travel agencies and tour operators	0	0.0
Forwarding offices	0	0.0
Airport operator	19	12.6
Airport handling	0	0.0
Other air transport supporting activities	12	8.3
Building and repairing of aircraft	21	14.6
Other airport-related activities	44	30.2
Passenger land transport	0	0.0
Cargo handling and storage	1	0.7
Freight transport by road	0	0.0
Courier and post activities	0	0.0
Public services	6	3.8
Security and industrial cleaning	1	0.7
Trade	13	9.1
Hotels, restaurants and catering	2	1.4
Other services	21	14.6
Other industries	0	0.0
TOTAL	146	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

TABLE 43 KORTRIJK AIRPORT EMPLOYMENT TOP 10 IN 2006

Name of company or organisation	Sector	Employment (in FTEs)
1 Abelag	Air transport	40
2 W.I.V. airport operator	Airport operator	19
3 A.P.M.	Building and repairing of aircraft	14
4 General Air Service	Trade	9
5 Air Technology	Building and repairing of aircraft	5
6 Federale politie	Public services	4
7 Alfako	Other air transport supporting activities	4
8 Gill Aviation Service	Trade	4
9 Capital Aircraft Group	Air transport	3
10 Lambert Aircraft Engineering	Other services	3
TOTAL		105
Share in total Kortrijk Airport		71.6 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

Prospects¹⁰⁵

As a small airport, the future of Kortrijk Airport will remain in niche markets, and especially business travel. When applying the right strategies, Kortrijk Airport could even play a bigger role as an international airport for the city and its international exhibition centre. Promoting a direct link to the Innovation, Design & Creation concept of the area's exhibition centre could enhance the attraction as well as the name of the airport.

In the future, Kortrijk Airport will also be privatised and restructured under a new management system. Under the new system, the airport will be divided into an Air Transport Development Company (LOM) and an Airport Operating Company (LEM). The LOM will be responsible for the infrastructure, such as the runway, customs and the fire brigade, while the LEM will manage the airport's commercial operations. Under this structure, the government will be responsible for the work of the LOM, and the LEM will be assigned to a private partner. However, before this structure is applied, the Flemish government will finance a renovation of the airport costing around 5.5 million euro. This money will be used to reconfigure and improve the airport's taxiways and aprons.

2.5.3.4 Liège Airport

Introduction¹⁰⁶

○ Background

Back in 1914, an airfield was built at Bierset and later turned into an aerodrome during the Second World War. It was to see a gradual expansion in the following years, notably with the arrival of the military aeronautics industry, the construction of an air terminal, the start-up of a scheduled service by Sabena and the extension of the runway.

It was not until 1976 that the civil air terminal at Bierset and a route linking Liège and London were opened. After control over the regional airports was handed over to the Regions, the SAB (*Société de Développement et de Promotion de l'Aéroport de Liège-Bierset*) was born in 1990 and took charge of the management and promotion of Liège Airport. Both freight and passenger transport have developed considerably since 1994. In 1998, the TNT Express Worldwide sorting centre started operations and a new control tower was inaugurated. Two years later, TNT Airways set up shop at Liège Airport. To accommodate the growing number of passengers using the charter companies flying out of Liège, a new passenger terminal opened in 2005. It has the capacity to handle up to a million passengers a year. New car parking areas were built on the other side of the motorway by 2006, with a capacity of 3,000 parking spaces on four levels. In 2007, construction work started on a freight-handling hall in the north zone with a surface area of 12,500m², which will be built in two phases. In 2008, work began on lengthening the main runway¹⁰⁷ by 423 metres, bringing it up to 3700m upon completion.

Located quite close to the E40 - E42 motorway interchange, Liège Airport is largely freight-orientated (mail, express, specials, biologistics, etc.) and boasts a multi-modal rail-road platform for this purpose, with high-speed freight train links in the pipeline too. The nearby Liège Logistics business zone adds to the supply-side economics of a region where Liège Airport acts as a real magnet for attracting business. The area they form together accounts for the largest supply of transport logistics services in Wallonia¹⁰⁸. Liège Airport sa (ex-SAB since December 2007) is nevertheless not neglecting the passenger traffic side of the equation and is hoping to reach a target of one million passengers a year, thanks mainly to the partnership that it has with the tour operators, including the two market leaders JetAir and Thomas Cook.

¹⁰⁵ Sources : Interview with S. Van Eeckhoutte, Vlaamse Overheid (2007).

¹⁰⁶ Sources: www.liegeairport.com, Logistics in Wallonia (clusters.wallonie.be), Ciriec (2006), interviews with SAB officials and various other sources.

¹⁰⁷ Liège Airport has two runways.

¹⁰⁸ Cf. Lagneaux (2008).

- Facts and figures

- Surface area: 399 ha
- Traffic in 2006: 311,000 passengers and 407,000 tonnes
- Number of active companies in 2006: 44
- Main projects: Introduction of a high-speed rail freight link (*TGV Fret*) between Paris - Charles de Gaulle and Liège Airport; conversion work continuing on the north zone reserved for freight handling; continuation of work on noise plans by Sowaer, in cooperation with Liège Airport¹⁰⁹.
- Airport operator's shareholdership: 50 p.c. of Liège Airport's share capital is held by SLF (*Société de Leasing de Financement*). In March 1999, SAB signed an agreement with ADP Management (subsidiary of *Aéroports de Paris*), which currently holds 26 p.c. of the capital of Liège Airport sa. The remaining 24 p.c. falls to Sowaer.

Value added

- **Direct VA**

Direct VA at Liège Airport totalled 138.7 million euro in 2006. By far the most important sector at Liège Airport is courier and post activities, at over 43 p.c. of the direct value added produced by Liège Airport in 2006 (table 44). That explains why, in contrast to the other five airports, it is the cluster comprising other airport-related sectors that dominates, at 52.4 p.c., despite the relative importance of the air transport sector (31.6 p.c.). Next in the ranking, but a long way behind, come the following sectors: the airport operator SAB, public services, other air transport supporting activities, forwarding offices, airport handling and security and industrial cleaning.

- **VA top 10**

To illustrate the above comments, it is useful to focus on the top 10 comprising the ten firms which produced the most value added in 2006 (table 45). Not surprisingly, the TNT group easily dominates activity at Liège Airport. Taking all activities together, it accounts on its own for almost three-quarters of the VA recorded at Liège Airport. The postal service company, TNT Express tops the list, followed by the airline TNT Airways. A long way behind come the airport operator SAB,¹¹⁰ Belgocontrol, the customs, the MET, Avia Partner, Agusta, SRWT (Walloon Regional Transport Company) and finally Securair. In view of the importance of the TNT group, the concentration of activity at Liège Airport is highest in terms of value added, the top 10 representing over 95 p.c. of the VA produced directly at the airport.

- **Indirect VA**

With indirect value added totalling 255.8 million euro¹¹¹, Liège Airport is close to another record, a few points behind Kortrijk, with a VA multiplier of 2.84. That is a very high figure, attributable primarily to the relative importance of the air transport sector, which generates substantial indirect VA.

¹⁰⁹ PEB (noise exposure plan) and PDLT (long-term development plan).

¹¹⁰ Liège-Bierset Airport Development and Promotion Company. Bierset is the municipality where the Liège Airport facilities are located.

¹¹¹ As stipulated in 1.2.5 the reader should be very careful in interpreting the indirect effects.

TABLE 44 LIÈGE AIRPORT: DETAILED DATA ON DIRECT VALUE ADDED PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Value added (in million euro)	Share (in p.c.)
Air transport cluster	66.0	47.6
Air transport	43.9	31.6
Travel agencies and tour operators	0.4	0.3
Forwarding offices	2.8	2.0
Airport operator	10.7	7.7
Airport handling	1.7	1.3
Other air transport supporting activities	5.0	3.6
Building and repairing of aircraft	1.5	1.1
Other airport-related activities	72.7	52.4
Passenger land transport	1.3	0.9
Cargo handling and storage	0.6	0.4
Freight transport by road	0.0	0.0
Courier and post activities	60.1	43.4
Public services	8.0	5.8
Security and industrial cleaning	1.6	1.2
Trade	0.4	0.3
Hotels, restaurants and catering	0.2	0.1
Other services	0.4	0.3
Other industries	0.0	0.0
TOTAL	138.7	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

TABLE 45 LIÈGE AIRPORT VALUE ADDED TOP 10 IN 2006

Name of company or organisation	Sector	Value added (in million euro)
1 TNT Express Worldwide	Courier and post activities	60.1
2 TNT Airways	Air transport	43.5
3 SAB	Airport operator	10.7
4 Belgocontrol	Other air transport supporting activities	5.0
5 Inspection des Douanes	Public services	4.1
6 MET statutaires	Public services	3.1
7 Avia Partner Liège	Airport handling	1.5
8 Agusta	Building and repairing of aircraft	1.5
9 SRWT	Passenger land transport	1.3
10 Securair (Securitas)	Security and industrial cleaning	1.2
TOTAL		131.9
Share in total Liège Airport		95.1 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

Employment

- **Direct employment**

Direct employment at Liège Airport came to 1,755 FTEs in 2006. Where jobs are concerned, the second of the two clusters - other airport-related activities - is even more important. At over 900 FTEs, courier and post activities represented over half of the workforce employed at Liège Airport in 2006. It is therefore no surprise that the cluster comprising other airport-related activities accounts for almost 65 p.c. of the same total (table 46). That sector is followed in order of importance by air transport and, far behind, public services, the airport operator, forwarding offices, security and industrial cleaning and other air transport supporting activities, to mention only the most important.

TABLE 46 LIÈGE AIRPORT: DETAILED DATA ON DIRECT EMPLOYMENT PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Employment (in FTEs)	Share (in p.c.)
Air transport cluster	625	35.6
Air transport.....	360	20.5
Travel agencies and tour operators.....	6	0.4
Forwarding offices.....	55	3.1
Airport operator.....	124	7.1
Airport handling.....	21	1.2
Other air transport supporting activities.....	37	2.1
Building and repairing of aircraft.....	22	1.2
Other airport-related activities	1,130	64.4
Passenger land transport.....	5	0.3
Cargo handling and storage.....	12	0.7
Freight transport by road.....	1	0.0
Courier and post activities.....	905	51.5
Public services.....	153	8.7
Security and industrial cleaning.....	41	2.3
Trade.....	6	0.3
Hotels, restaurants and catering.....	1	0.1
Other services.....	7	0.4
Other industries.....	0	0.0
TOTAL	1,755	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

- **Employment top 10**

The TNT group employs over 1,260 FTEs at Liège Airport, or 72 p.c. of the workforce recorded there. TNT Express Worldwide alone accounts for 51.5 p.c. of that total. Further down the top 10 (table 47), come the airport operator SAB, customs, the MET, Belgocontrol, Securair, Swissport Cargo Services, Agusta and Avia Partner. This ranking also demonstrates the strong concentration at this airport, since its ten leading employers represent 94.3 p.c. of its workforce.

TABLE 47 LIÈGE AIRPORT EMPLOYMENT TOP 10 IN 2006

Name of company or organisation	Sector	Employment (in FTEs)
1 TNT Express Worldwide	Courier and post activities	905
2 TNT Airways	Air transport	357
3 SAB	Airport operator	124
4 Inspection des Douanes	Public services	78
5 MET	Public services	59
6 Belgocontrol	Other air transport supporting activities	37
7 Securair (Securitas)	Security and industrial cleaning	30
8 Swissport Cargo Services	Forwarding offices	27
9 Agusta	Building and repairing of aircraft	21
10 Avia Partner Liège	Airport handling	17
TOTAL		1,656
Share in total Liège Airport		94.3 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

- **Indirect employment**

In 2006, indirect employment totalled almost 3,000 FTEs, or 2,946 to be precise. By comparing that figure with direct employment we can determine the overall impact of one direct FTE, taking account of the labour employed upstream of Liège Airport. This gives a multiplier of 2.68, the highest of the employment coefficients calculated for the six airports (cf. point 2.3.2.1). This is attributable mainly to the relative importance of the air transport sector.

Prospects¹¹²

In 2006 Liège Airport moved up to eighth place in the European ranking of cargo airports, and the growth of passenger traffic there is also steady, thanks to the stronger partnership with tour operators such as JetAir and Thomas-Cook.

Launched in July 2007, the redevelopment of the northern zone "Cargo City North", dedicated to cargo handling, is continuing. This cargo terminal, under construction since 2007, will have a capacity of 12,500 m². Of the two new Liège Airport subsidiaries formed at the beginning of 2008, namely Liège Airport Security and Liège Handling Services, the latter is responsible among other things for running this new "North" cargo terminal. Since 1999 the airport has also been involved in the projects and research conducted by ADP (Aéroports de Paris) in connection with the creation of a network of airport capacity in Europe and the construction of a high-speed freight railway line between Paris - Charles de Gaulle and Liège Airport. This major project known as "Euro Carex", includes the high-speed rail freight link (*TGV Fret*) to Liège Airport, which will form part of the inner circle of the high-speed network, along with Paris, Amsterdam, Lyon and London. This link is scheduled for entry into operation at the beginning of the next decade. Regarding another, longer term project, Liège Airport is working with GRE and SPI+, under the Marshall Plan, on construction of Europe's first biologicistic hub. It is to be sited at Liège Airport, which has every advantage in terms of location and skilled workforce. Moreover, the area Liège Airport and Liège Logistics form together accounts for the largest supply of transport logistics services in Wallonia. With this renewed growth in tonnages of high value added cargo (medicinal products, vaccines, etc.), the cargo airport is likely to climb ever more rapidly to the top of the European league.

For some years now, Sowaer Environnement, in collaboration with Liège Airport, has been managing the noise plans¹¹³ designed for current and future local residents, taking account of the forthcoming

¹¹² Sources: www.liegeairport.com, Logistics in Wallonia (clusters.wallonie.be), Ciriec (2006), interviews with SAB officials and various sources.

developments at the airport and the improvement projects in its vicinity. These plans are attracting much interest in the Belgian airport sector.

2.5.3.5 Ostend Airport

Introduction¹¹⁴

○ Background

The origin of Ostend-Bruges International Airport can be found in the airfield at Stene. It is not known precisely when the first flights took place here but during the First World War a field in Stene was already being used as a runway, mainly for military but also for civil flights. Along with the establishment of Sabena in 1923, the first flight to England was carried out from Ostend. As the number of flights grew, during the Second World War the airport was moved to a better location near Ostend where after the war it was fitted out as an international airport. However, it was not until 1968 that an old refurbished farmhouse used as the airport building was actually replaced. Due to the needs of jet-propelled aircraft for longer runways, in 1975, the airport started an extension of the runway to today's length of 3200m which was completed only one year later.

In the first decades of its existence, Ostend Airport specialised in particular in carrying passengers to and from England. With the decline of "air coach" passengers, however, the airport began to focus more and more on freight transport. To be able to cope with the growing demand for freight transport, a new hangar of 4,000m² that facilitated the handling of cargo was built. Alongside general cargo, the airport also handles "perishables". Nowadays, perishable goods such as vegetables, fruit from Egypt, fish from Uganda and Tanzania and flowers from South Africa make up the main incoming cargo for Ostend Airport. That is why the new Aerofresh Perishable Center, which can handle 300 tonnes of perishable goods, was opened on 6 October 2003. In 2004, the procedure for building the hangars on Apron 1 was started. The first hangar was put into use in 2006 and the second is planned to be finished in 2010. The new hangars are supposed to stimulate new business on the airport area. However, Ostend Airport still has a competitive disadvantage because it does not have a direct pipeline that can supply the airport with fuel, unlike Brussels Airport and Liège Airport.

However, to also promote passenger traffic at Ostend, the airport attracted Ryanair in 2003. On 1 May 2003, the airline opened a route between Ostend and London-Stansted which was soon suspended in December 2003. With this short-lived route, the airport also got its present name: Ostend-Bruges International Airport.

○ Facts and figures

- Surface area: 350 ha
- Traffic in 2006: 146,000 passengers and 99,000 tonnes of cargo
- Number of active companies in 2006: 35
- Main projects: Privatisation via the introduction of a new management structure (LEM - LOM).
- Airport operator: Region of Flanders

¹¹³ PEB (noise exposure plan) and PDLT (long-term development plan). The first involves traffic estimates for 2013 and specifies accompanying measures. The second is based on traffic estimates for 2020: it sets the limits for the airport's development and defines the town planning rules.

¹¹⁴ Sources: www.ost.aero, Van de Voorde, Eddy et al. -VIL- (2006).

Value added

• Direct VA

Direct VA at Ostend Airport came to 31.3 million euro in 2006. Despite its modest size, Ostend Airport has a fairly balanced sectoral breakdown of activity, though still dominated by the air transport cluster, which generates three-quarters of the direct VA (table 48). It is in fact the airport operator that tops the ranking, at 26.1 p.c., followed by air transport, other air transport supporting activities, airport handling, while the branches in the second cluster, cargo handling and storage, public services and trade lag behind, to mention only the significant figures.

TABLE 48 OSTEND AIRPORT: DETAILED DATA ON DIRECT VALUE ADDED PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Value added (in million euro)	Share (in p.c.)
Air transport cluster	23.5	75.0
Air transport.....	6.7	21.5
Travel agencies and tour operators.....	0.4	1.2
Forwarding offices.....	0.3	0.8
Airport operator.....	8.2	26.1
Airport handling.....	3.4	10.9
Other air transport supporting activities.....	3.7	11.9
Building and repairing of aircraft.....	0.8	2.4
Other airport-related activities	7.8	25.0
Passenger land transport.....	0.2	0.7
Cargo handling and storage.....	2.4	7.7
Freight transport by road.....	0.0	0.0
Courier and post activities.....	0.0	0.0
Public services.....	2.2	7.0
Security and industrial cleaning.....	0.0	0.0
Trade.....	1.8	5.9
Hotels, restaurants and catering.....	0.9	3.0
Other services.....	0.2	0.8
Other industries.....	0.0	0.0
TOTAL	31.3	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

• VA top 10

It is the airport operator, the Flemish Region, which heads the list of the value added top 10 (table 49). On its own it represents over a quarter of the activity at Ostend-Bruges Airport. Next come the airline NHV, Belgocontrol, Aviapartner, MK Airlines, Race Cargo, customs, the Federal Police, Lufthansa Technics and Belair. These ten firms represent 84 p.c. of the direct VA at Ostend Airport.

TABLE 49 OSTEND AIRPORT VALUE ADDED TOP 10 IN 2006

Name of company or organisation	Sector	Value added (in million euro)
1 Vlaamse Overheid	Airport operator	8.2
2 NHV	Air transport	3.7
3 Belgocontrol - meteo	Other air transport supporting activities	3.7
4 Aviapartner	Airport handling	3.1
5 MK Airlines	Air transport	2.3
6 Race Cargo	Cargo handling and storage	1.9
7 Douane	Public services	1.1
8 Fed. Politie	Public services	0.9
9 Lufthansa Technics	Building and repairing of aircraft	0.8
10 Belair	Hotels, restaurants and catering	0.6
TOTAL		26.3
Share in total Ostend Airport		84.0 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

- **Indirect VA**

Indirect VA totalled 39.3 million euro in 2006¹¹⁵, putting the multiplier at 2.26, slightly higher than the airport average, owing partly to the small size of Ostend-Bruges Airport, but also the relative importance of the air transport sector plus the flying schools. However, the minor position of the other branches generating indirect VA, such as other services, is a factor limiting the airport's indirect impact.

Employment

- **Direct employment**

In 2006, direct employment at Ostend Airport represented 441 FTEs. The employment situation is rather different from that for value added, as there is a better balance between the two clusters, although the air transport cluster is still dominant (table 50). The airport operator remains the leading sector at Ostend Airport, and its position is even stronger in regard to VA, since it accounts for almost 28 p.c. of the total workforce. Next, but some way behind, come airport handling, air transport, public services, trade, other air transport supporting activities, side by side with cargo handling and storage and hotels, restaurants and catering, to mention only the most important ones.

- **Employment top 10**

The Flemish Region, which manages Ostend Airport, employs 122 FTEs there, or almost 28 p.c. of the total workforce recorded in 2006. Next in this top 10 (table 51) come Aviapartner, Belgocontrol, MK Airlines, Race Cargo, NHV (Noordzee Helikopter Vlaanderen), customs, Belair, the Federal Police, and finally Lufthansa Technics. Together, with their 357 FTEs, these ten firms represent 81 p.c. of direct employment at Ostend.

- **Indirect employment**

In 2006, indirect employment stood at 465 FTEs, putting the multiplier at 2.06. That is the lowest ratio seen in the airports considered. It is lower than the ratio calculated for value added. This differential is attributable to the fact that, in regard to employment, air transport represents a smaller percentage of the total than in the case of VA. But this sector generates substantial indirect effects.

¹¹⁵ As stipulated in 1.2.5 the reader should be very careful in interpreting the indirect effects.

TABLE 50 OSTEND AIRPORT: DETAILED DATA ON DIRECT EMPLOYMENT PER CLUSTER AND SECTOR IN 2006

Cluster and sector	Employment (in FTEs)	Share (in p.c.)
Air transport cluster	298	67.5
Air transport.....	60	13.7
Travel agencies and tour operators.....	3	0.7
Forwarding offices.....	4	0.8
Airport operator	122	27.8
Airport handling	64	14.5
Other air transport supporting activities.....	34	7.6
Building and repairing of aircraft.....	11	2.5
Other airport-related activities	143	32.5
Passenger land transport	2	0.5
Cargo handling and storage.....	33	7.6
Freight transport by road.....	0	0.0
Courier and post activities.....	0	0.0
Public services	42	9.6
Security and industrial cleaning.....	0	0.0
Trade	37	8.3
Hotels, restaurants and catering	25	5.6
Other services	4	0.8
Other industries.....	0	0.0
TOTAL	441	100.0

Source: NBB (Central Balance Sheet Office, own calculations).

TABLE 51 OSTEND AIRPORT EMPLOYMENT TOP 10 IN 2006

Name of company or organisation	Sector	Value added (in million euro)
1 Vlaamse Overheid	Airport operator	122
2 Aviapartner	Airport handling	59
3 Belgocontrol	Other air transport supporting activities	30
4 MK Airlines	Air transport	27
5 Race Cargo	Cargo handling and storage	26
6 NHV	Air transport	25
7 Douane	Public services	22
8 Belair	Hotels, restaurants and catering	18
9 Fed. Politie	Public services	17
10 Lufthansa Technics	Building and repairing of aircraft	11
TOTAL		357
Share in total Ostend Airport		81.0 p.c.

Source: NBB (Central Balance Sheet Office, own calculations).

Prospects¹¹⁶

As in the case of Kortrijk-Wevelgem Airport, the future of Ostend-Bruges International Airport lies in a new management system and in privatisation. Under the new system, the airport will be divided into an airport development company (LOM) and an airport operating company (LEM). The LOM will be responsible for the infrastructure, such as the runway, customs and the fire brigade, while the LEM will manage the airport's commercial operations. Under this structure, the government will be responsible for the work of the LOM, and the LEM will assigned to a private partner.

However, Ostend Airport still has a competitive disadvantage in fuelling compared to airports like Brussels Airport and Liège as it does not have a direct pipeline that can supply the airport with fuel. Furthermore, the airport depends mainly on one cargo airline (MK Airlines), which makes it vulnerable to decisions made by the company, as evidenced in the summer of 2008 when flights to Ostend were temporarily suspended.

¹¹⁶ Sources : www.ost.aero, Van de Voorde, Eddy et al. -VIL- (2006)

3 SUMMARY

The years 2005 to 2007 were years of all-round recovery for air transport and airport activities in Belgium. This followed a period of uncertainty which had a profound impact, transforming air transport throughout the world. Civil aviation has had a turbulent time since the beginning of the 2000s, with the terrorist attacks of 2001 and, in Belgium, the failure of Sabena representing turning points in the business. Air transport is currently in a consolidation phase, with only three major global alliances. At international level, competition between the primary hubs and the emergence of "sixth freedom" airports in the Middle East and in Asia is only just beginning, with secondary hubs such as Brussels Airport, and the national carrier Brussels Airlines, facing more intra-continental competition, in a context of ever more volatile energy costs, increasingly stringent environmental measures and the steady expansion of low-cost operators. With the decline seen at the beginning of this decade, it is no longer just a question of cyclical fluctuations, as the normal duration of the cycle since civil aviation began is estimated at about ten years¹¹⁷. Following a worldwide revival from 2003 on, the Belgian airports seem to have benefited from a global expansion of aviation activities, as Brussels and Charleroi Airports have seen stronger growth of passenger traffic in the last three years, and Liège has recorded a steady rise in cargo traffic.

Taking account of these contextual elements, this study aims to record the economic results of the activities based at the six Belgian airports, Antwerp, Brussels, Charleroi, Kortrijk, Liège and Ostend, which comprise, within their perimeter, not only a range of sectors relating to air transport - air transport cluster -, but also many branches which do not, at first sight, have any connection with this mode of transport - other airport-related activities -. It was possible to conduct an exhaustive assessment for 2006, using the variables value added (VA) and employment. As far as possible, a study of the social balance sheet, investment, and financial health is also presented. But outside the airports there are many activities connected with the air transport cluster. They are subjected to the same analysis. Developments in value added and employment recorded between 2000 and 2006 in the air transport cluster are presented in the same way as for Brussels Airport, and can serve as a barometer for all activity in Belgium.

The main lessons of the study are as follows.

- The air transport cluster is present both inside and outside the airports, in relatively similar proportions, since the first group directly employs 11,400 FTEs and the second 10,300 FTEs. Inside the airports, the airline sector ("air transport") clearly dominates, while outside the dominant branch is "building and repairing of aircraft". The air transport cluster is structured around the air transport sector (airlines), with VA totalling 540 million euro and direct employment of around 5000 FTEs. Of these totals, 492 million euro and 4560 FTEs relate to passenger transport. In regard to activity which, in theory, has no direct link with air transport but is present at the airport sites, namely the cluster comprising other airport-related activities, employment totals around 10,000 FTEs and is dominated by the "courier and post activities" branch. In total, taking direct and indirect effects together, VA came to over 6 billion euro in 2006 for airport and air transport activities as a whole, or 2 p.c. of Belgium's GDP. The 78,000 FTEs employed by these activities and their suppliers are equivalent to 2 p.c. of Belgian domestic employment. The induced and catalytic effects are interesting concepts, but they overlap with the estimate of indirect effects offered in this report. However, they are mentioned as a guide.
- Having fallen steeply in 2001 and 2002 respectively, the employment and value added of activities intrinsically connected with air transport, i.e. the air transport cluster nationwide, recovered temporarily in the former case and permanently in the latter. Thus, employment picked up to just 75 p.c. of the level seen at the beginning of 2000 - 2006, while value added at constant prices regained its 2000 level in 2006. In the last year (2005 - 2006), employment in the air transport cluster continued falling (-0.8 p.c.), while VA recovered well (+2 p.c.). For comparison, during the same period employment at the six airports showed a small rise (+0.5 p.c.), supported by other airport-related activities, while VA at constant prices in the air transport cluster increased significantly (+5.3 p.c.), but here, too, the driving force was other airport-related activities. In 2006, the air transport cluster outside airports concerned VA totalling 840 million euro and 10,300 FTEs, multiplied

¹¹⁷ Doganis R. (2006), *The Airline Business*.

respectively by a factor of 2.75 and 3 if the indirect effects are added. These multipliers are particularly high, confirming the widespread finding that air transport, though modest in absolute terms, has a major influence on the economy as a whole.

- Of the six airports, it is naturally Brussels Airport which is dominant in both traffic volumes and VA and employment, as the national airport represents over four-fifths of the total activity of the six airports. In fact, it employs no fewer than 17,600 of the 21,400 FTEs and generates over 1.4 billion euro in VA, out of the 1.7 billion. Next comes Liège (8 p.c.), followed by Charleroi (4 p.c.), Antwerp (2.5 p.c.), Ostend (2 p.c.) and Kortrijk (< 1 p.c.). The VA and direct employment generated by the airports are dominated by the air transport cluster, with the notable exception of Liège Airport, where the "courier and post activities" sector predominates. The ratio between VA and employment recorded in the air transport cluster is higher than in relation to other airport-related activities. If indirect employment and VA are added to the direct figures, they increase them by a factor of 2.2. This multiplier is particularly high at Kortrijk in the case of VA, and at Liège in the case of employment. It was possible to analyse the movement in VA and employment for Brussels Airport. It emerged that the years 2001 and 2002 were particularly difficult, owing to the collapse of Sabena and a decidedly tricky international context, plus the ensuing decline in traffic. Naturally, this crisis was reflected in VA and employment, which both showed a very marked fall in 2001, making a modest recovery in 2003 in the case of VA and a clearer recovery from 2005, so that by 2007 VA was almost 10 p.c. above the 2000 level, whereas employment struggled back very slowly without ever regaining its 2000 level, reaching barely 75 p.c. of that figure by the end of the period.
- The indicators relating to the social balance sheet of the main firms based in the airports are fairly encouraging at the end of the period. In fact, the year 2006 brought an increase in the number of employees on the staff register, compared to the 2005 level. Employment in the airports is still dominated by men, more so than the national average and comparable to the air transport cluster outside airports. Airports have a high staff turnover, owing to the type of work under review. The modest concentration of employment by the end of the reviewed period in the airports in regard to what is seen in the air transport cluster in the rest of the country is accompanied by efforts to provide training in the companies established in airports. As is apparent at national level, the return on equity after tax has fallen, both in airports and in the air transport cluster in the rest of the country, with the former still doing better in terms of profitability. Conversely, the latter did much better in terms of liquidity in the broad sense, although the gap narrowed in 2006. The solvency of firms engaged in air transport outside airports remained stable, while it was down slightly in the airports. In both cases, solvency was well below the national average. Private investment, a highly volatile variable by definition, fell sharply over the period in the case of activities in the air transport cluster, the 2006 figure being barely 50 p.c. of the sums committed six years earlier. But a recovery seems to have set in since 2005 when the amounts reached a low point. 2006 was also a year of investment expansion in the airports, with an increase of 18.1 p.c. at constant prices compared to 2005.

These results seem at this stage to indicate that, by the end of the period, air transport and airport activity had regained its pre-2001 momentum. But we also know that this sector is very sensitive to the international economic situation. Since the autumn of 2008, the global economy has progressively entered recession. After a period of rising energy prices and inflation in everyday consumer goods, the Belgian economy, hard hit by the repercussions of the global financial crisis, entered a phase of uncertainty over the pace of its recovery. In this context domestic demand is likely to suffer in the coming months, as the consumer confidence continues to wane, and there could be a sharp slowdown in consumption. Even though a clear dip was first noted in October 2008 in terms of passenger traffic, it is too soon to predict the impact which the current economic situation will have on Belgian air transport, a sector which will be affected in 2011 - whatever else happens - by the introduction of new environmental measures at European level. The International Air Transport Association, IATA, which is in favour of accelerating the "Single European Sky" project, regularly publishes indices showing the price-sensitivity of demand, using various models of elasticity which are based on a large number of variables¹¹⁸ and are relatively complicated to handle. The uncertainty over the movement in prices per barrel of crude oil is also affecting investors' decisions and the financial health of the airlines. The consolidation of the aviation sector is therefore likely to continue in the years ahead. During that time, the low-cost airlines will continue expanding on the market in domestic and intra-continental flights, an economic model which is being increasingly copied by the traditional airlines. While the Open Sky

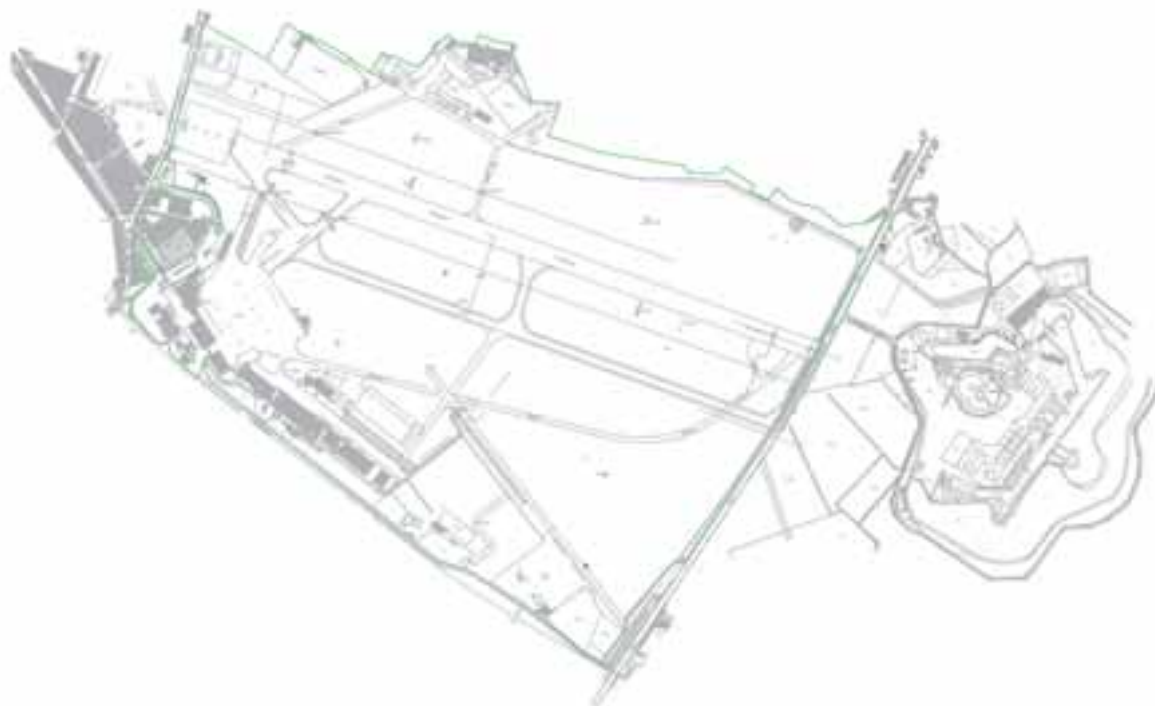
¹¹⁸ See IATA Economics Briefing 2008 / No. 9.

agreements concluded between the USA and the EU provide for the liberalisation of transatlantic services, the low-cost airlines will certainly be turning their attention to long-haul flights in the medium term.

Brussels Airport, a secondary hub and in 21st position among European airports in terms of passenger numbers, is not in direct competition with the primary hubs of Europe and Asia. But Belgium's leading airport has plenty of plans for securing a permanent place in the European passenger traffic top 20. However, the loss of part of DHL's activities is liable to cause at least a temporary setback for Brussels Airport in the European league table for cargo, where it is currently in sixth place. The other five airports face similar challenges, calling for practical, coordinated responses. Specialisation seems to be an approach which is yielding benefits. In any case, that is true in Wallonia: BSCA has specialised in passenger transport while Liège is continuing to expand in cargo and express courier services. In Flanders, the situation is more complex: Brussels Airport is still very much the country's main airport, while Kortrijk occupies the business travel segment, Ostend handles specialist cargo and Antwerp focuses on passengers travelling to and from the Antwerp conurbation. Doubtless a degree of rationalisation will be necessary in the future, because not all these airports are seeing the same growth prospects. Partial privatisation of the regional airports is an initial response here. The goal is still to achieve profitability for the existing facilities while safeguarding the future and ensuring sustainable growth for air transport, a sector whose major role in the Belgian economy this study has tried to demonstrate. The central position of air transport in the transport logistic chains, the attraction which airports exert on the location of service activities and logistics, and the essential link which they represent in terms of mobility, are in fact vital to a country such as Belgium which is international in outlook.

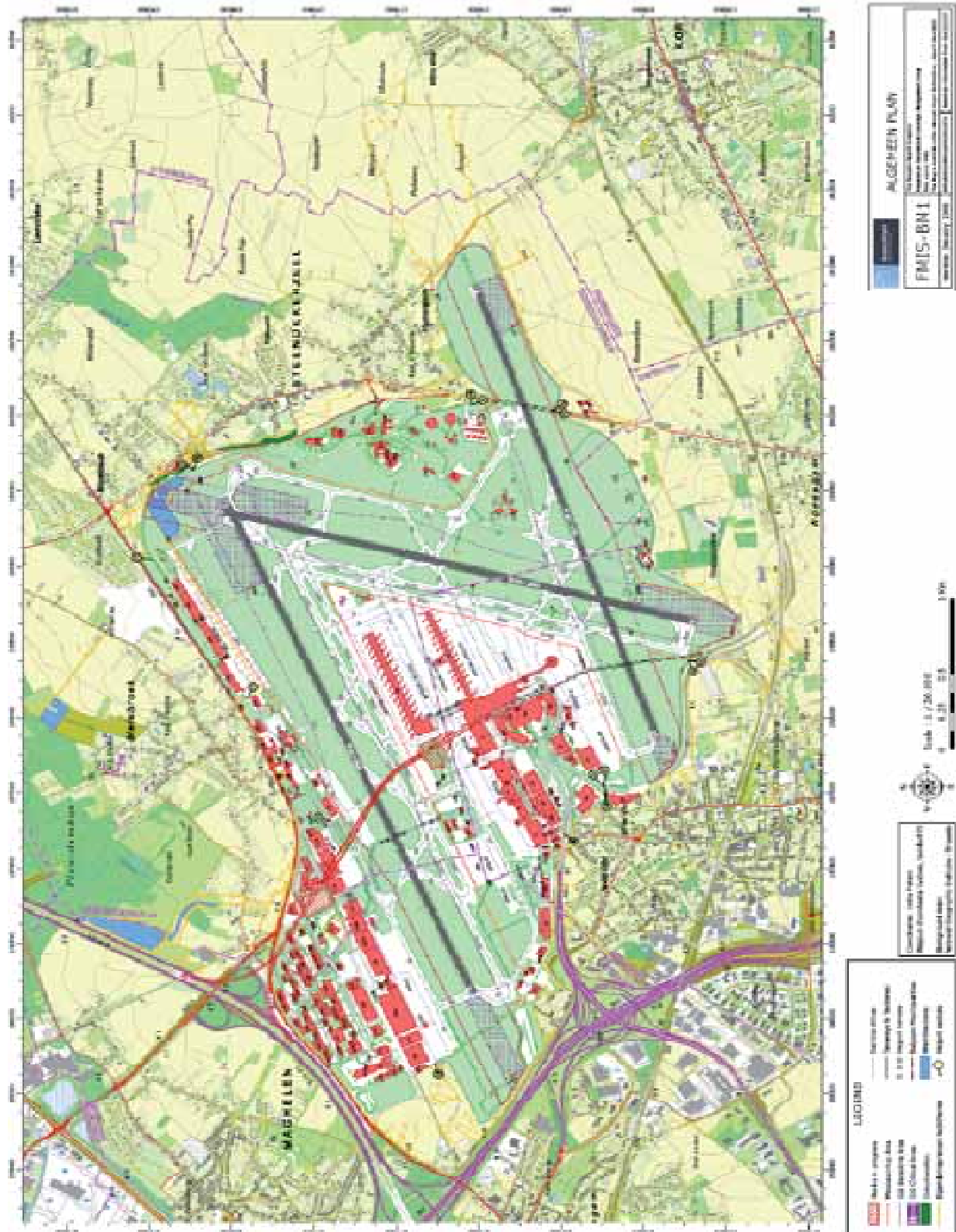
ANNEX 1: AIRPORT ZONES

ANTWERP AIRPORT



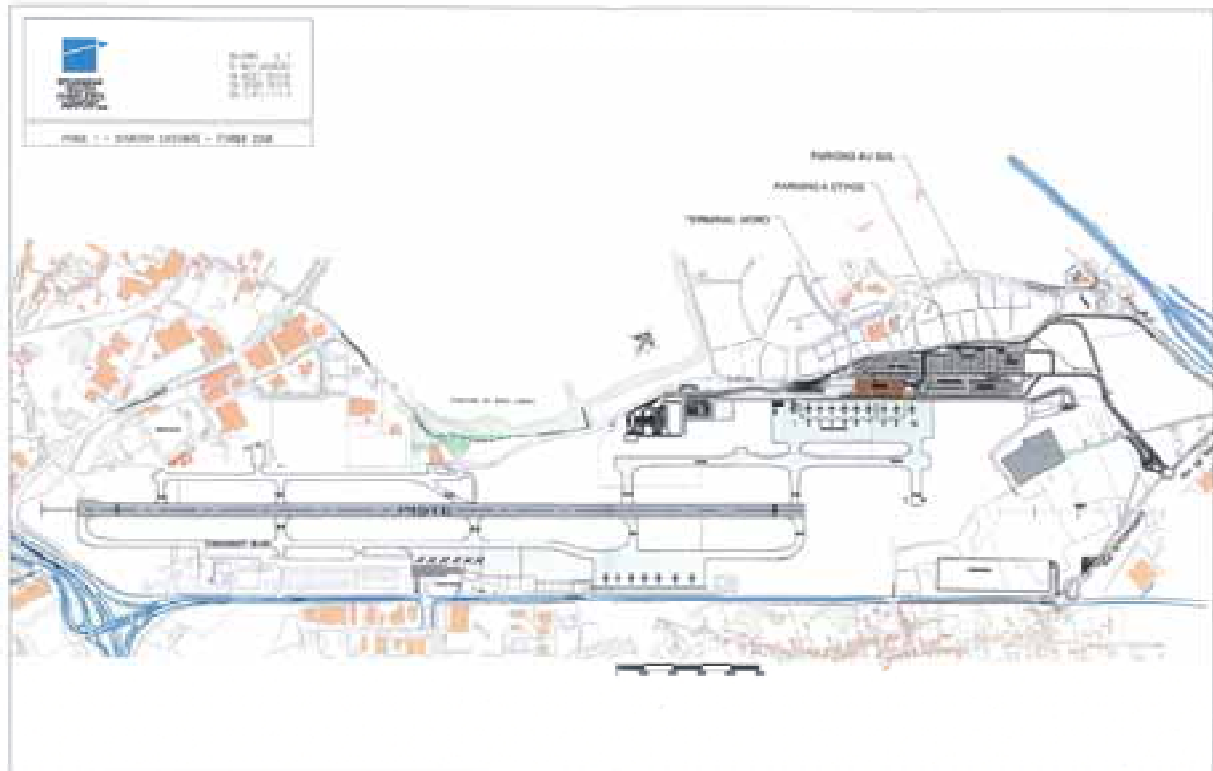
Source: Antwerp Airport.

BRUSSELS AIRPORT



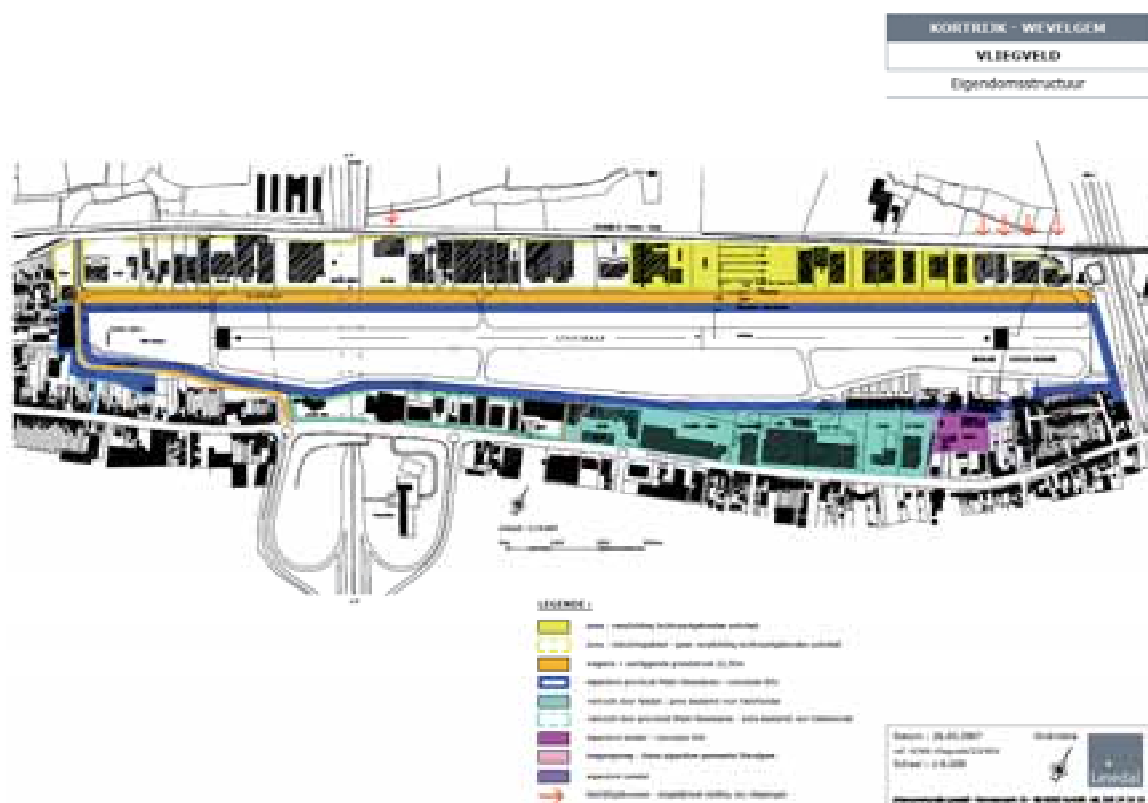
Source: Brussels Airport.

CHARLEROI AIRPORT



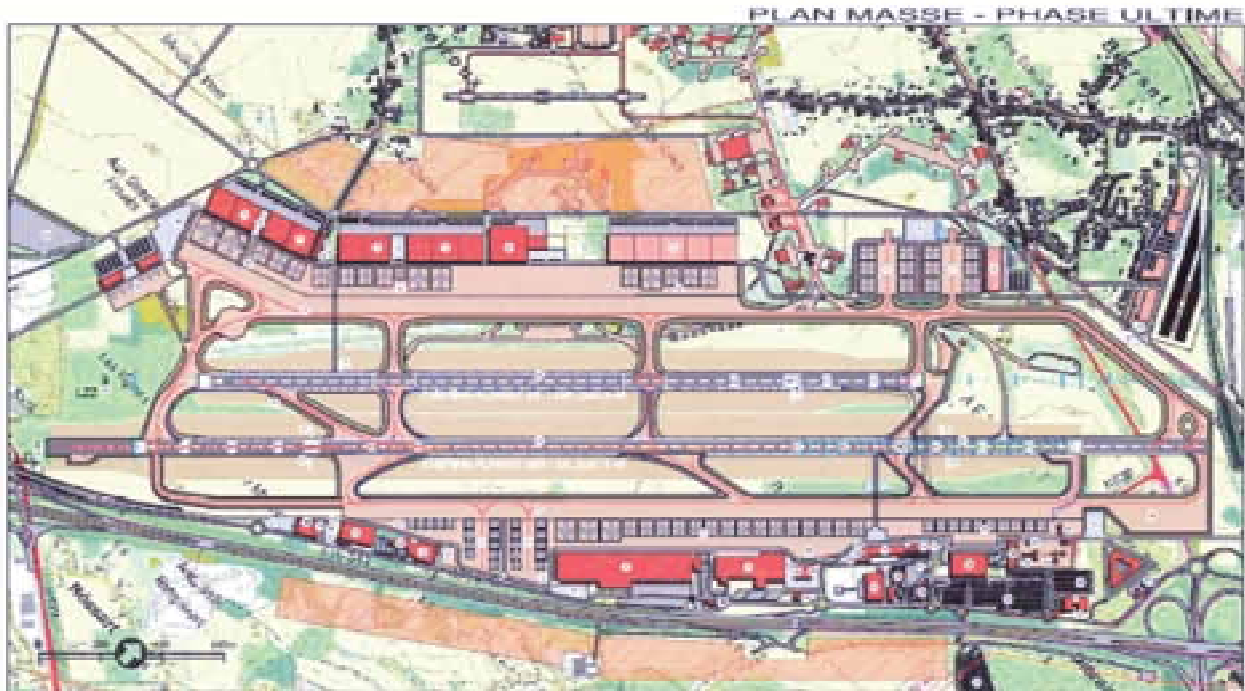
Source: Brussels South Charleroi Airport.

KORTRIJK AIRPORT



Source: Kortrijk-Wevelgem Airport.

LIEGE AIRPORT



Source: Liège Airport.

OSTEND AIRPORT



Source: Ostend-Bruges Airport.

ANNEX 2: INDIRECT EFFECTS THEORY ¹¹⁹

Indirect effects are presented here according to two frameworks: backward linkages and forward linkages. The former, according to the Leontief model, concentrates on the links between the sectors studied and their suppliers, and is used to estimate indirect value added and employment, while the latter, according to the Ghosh model, makes it possible to measure the impact of a logistics sector on its customers in terms of prices. Both can be considered in order to quantify the upstream and downstream relationship between the sectors under review and the rest of the economy. Table 52 provides the basic model for an input-output table. The methodology below will be based on this table. The theoretical basis underlying the IOT is set out in the national accounts methodology.¹²⁰

TABLE 52 INPUT-OUTPUT TABLE

	1	2	...	n	f	x
1	x_{11}	x_{12}	...	x_{1n}	f_1	x_1
2	x_{21}	x_{22}	...	x_{2n}	f_2	x_2
...
n	x_{n1}	x_{n2}	...	x_{nn}	f_n	x_n
m	m_1	m_2	...	m_n	m_f	
va	va_1	va_2	...	va_n		
x	x_1	x_2	...	x_n		

Source: NBB.

Legend:

- n number of industries in economy
- x_{ij} output of industry i delivered to industry j
- va value added
- m import
- f final demand: it may contain only the output to final consumers but, if we restrict our analysis to the matrix made up of the sectors studied, then f_i may also contain all the output of sector i falling outside the sectors studied.

On that basis, technical backward and forward coefficients can be calculated. They in turn make it possible to measure the linkages through the so-called Leontief L and Ghosh G matrices, respectively used to quantify the impact of one sector on the others in terms of necessary inputs (goods and services, production factors) and outputs (cost structure). Table 53 presents a few formula used to depict these linkages. Key sectors (Oosterhaven and Stelder net multiplier¹²¹) are those whose impact on the other sectors is greater than vice versa.

Links between the sectors

The relationships between the logistics sectors and other sectors are measured by technical input and output coefficients - which measure the direct effects of changes in demand and prices - and also by backward and forward linkages, which measure the links with suppliers and customers.

Input-output analysis¹²² subdivides an economy into a certain number n industries and final demand sectors. The final demand sectors are households and government expenditure, investment and exports. The output of an industry i , for instance the forwarders, (represented by x_i) equals the sum of

its supplies to other industries and its supplies to final demand or $x_i = \sum_{j=1}^n x_{ij} + f_i$. Defining technical

¹¹⁹ See also Coppens F. (2005); Coppens F. (2006) and Coppens F., F. Lagneaux, H. Meersman, N. Sellekaerts, E. Van de Voorde, G. van Gastel, Th. Vanelslender and A. Verhetsel (2007).

¹²⁰ See also the explanation provided by http://www.nbb.be/doc/dq/N_pdf_dq/NNDE99.pdf (Dutch version) and http://www.nbb.be/doc/dq/F_pdf_dq/NFDE99.pdf (French version).

¹²¹ Oosterhaven J. and D. Stelder (2002). Interpretation of the net multiplier by Dietzenbacher E. (2005).

¹²² For more details see Miller R.E. and P.D. Blair (1985).

input coefficients as $a_{ij} = x_{ij} / x_j$, with x_{ij} the supply of sector i (e.g. the forwarders) to sector j (e.g. the agencies) and x_j the total output of sector j , this can be rewritten as $x_i = \sum_{j=1}^n a_{ij} x_j + f_i$ or in matrix notation $x = Ax + f$, in which A is a square matrix of technical coefficients, x a column vector of industry outputs and f a column vector of final demands.

TABLE 53 CALCULATION OF LINKAGES: FORMULAE

Technical coefficients (first level)	backward	$TIC_{ij} = a_{ij}$	linkage of industry j to its first-tier supplier i	in relation to the output of industry j
	forward	$TOC_{ij} = b_{ij}$	linkage of industry i to its first-tier customer j	in relation to the output of industry i
Cai and Leung linkages (all levels)	backward	$BL_j = \frac{\sum_{i=1}^n l_{ij}}{l_{jj}}$	linkage of industry j to all its suppliers	in relation to the output of industry j
	forward	$FL_i = \frac{\sum_{j=1}^n g_{ij}}{g_{ii}}$	linkage of industry i to all its customers	in relation to the output of industry i
Decomposed linkages (all levels)	backward	$BDec_{ij} = \frac{g_{ij}}{g_{jj}}$	linkage of industry j to its supplier i	in relation to the output of industry i
	forward	$FDec_{ij} = \frac{l_{ij}}{l_{ii}}$	linkage of industry i to its customer j	in relation to the output of industry j
Oosterhaven and Stelder net multipliers	<u>Leontief multiplier of $j \times$ final demand of j</u> output of j		if net multiplier > 1 , then sector j is more important for the other sectors than vice versa and is said to be a key sector	

Source: NBB.

Legend:

TIC_{ij} : Technical input coefficients
 TOC_{ij} : Technical output coefficients
 BL_j : Cai and Leung backward linkages
 FL_i : Cai and Leung forward linkages
 BDec_{ij} : Decomposed backward linkages
 FDec_{ij} : Decomposed forward linkages
 l_{ij} : element of matrix L -Leontief-, on row i and column j (see below); $\sum_i l_{ij}$ = Leontief multiplier of sector j
 l_{jj} : diagonal element of matrix L (see below)
 g_{ij} : element of matrix G -Ghosh-, on row i and column j (see below)
 g_{ii} : diagonal element of matrix G (see below)

o Backward linkages

This matrix equation is the base equation of the Leontief model, also referred to as a demand-driven input-output model. It enables us to compute the total effect of an industry on the economy. Indeed, a change in final demand for products of industry i has two kinds of effects:

1. a 'direct' effect that is induced by the second term in the equation $x = Ax + f$, i.e. a change in the output of sector i . It can be seen that this direct effect is provided by $\Delta x_i = \Delta f_i$;
2. a series of indirect effects that are caused by this direct effect. The sector i has to increase its output and, in order to do so, it has to increase its intermediate purchases. There is thus a 'first level' indirect effect provided by the first term of the equation $\Delta x^{(1)} = A\Delta x^{(0)}$. These purchases, for their part, generate higher level indirect effects, $\Delta x^{(2)} = A^2\Delta x^{(0)}$, ...

The total effect is provided by $\Delta x = (I + A + A^2 + A^3 + \dots)\Delta f = (I - A)^{-1}\Delta f$. The matrix $L = (I - A)^{-1}$ is called the Leontief inverse. Its column sums are the Leontief multipliers and, according to the above reasoning, they provide the total effect of a unit of change in final demand for a sector. If the demand of sector j rises, the suppliers of sector j will have to produce more.

These Leontief multipliers show the impact of one industry on the rest of the economy via its supply chain. As such, they are a measure of the 'linkage' of an industry to its suppliers. This is called 'backward linkage' and the Leontief multipliers are a measure of backward linkage. As explained in Cai J., Leung P. (2004)¹²³, this backward linkage measure is not pure, because of intrasectoral and cyclical deliveries. If the Leontief multiplier is considered as a measure for backward linkage, it also deals with the effects of purchases by sector i at sector j and by sector j at sector k , sector k at sector l ,... and finally sector m at sector i . Therefore, this measure also contains some forward linkage. It can be 'purified' by dividing each Leontief multiplier by the diagonal element in the same column of the Leontief inverse. The total (direct and indirect) linkage of an industry with all its suppliers can thus be measured by the Leontief multiplier divided by the diagonal elements l_{jj} (Cai and Leung):

$$BL_j = \frac{\sum_{i=1}^n l_{ij}}{l_{jj}} \quad (\text{IO1})$$

where l_{ij} is the (i,j) element of the Leontief inverse.

CALCULATION OF INDIRECT VALUE ADDED AND EMPLOYMENT:

The algorithm used for the calculation of indirect value added and employment is based on the above-mentioned formulae.

Indirect employment can be calculated on the basis of the following operations:

National input-output table (or IOT) X: (x_{ij}) , $n \times n$ matrix, x_{ij} representing the deliveries from branch i to branch j

Population under review P: (p_j) , $n \times 1$ matrix, p_j being the percentage of national branch j represented by the population under review

Employment E: (e_i) , $n \times 1$ matrix, e_i being the employment of branch i at national level

Technical input coefficient A: $(a_{ij}) = x_{ij} / x_j$, x_j being the $n \times 1$ matrix of the outputs j

Knowing that $\Delta x^{(k)} = A^{(k)} \cdot \Delta f$ (see above) and $\Delta E = \hat{E} \cdot \Delta X$ then:

Indirect employment at level k =

$$\Delta e_i^{(k)} = e_i / x_i \cdot \Delta x_i = a_{ij}^{(k)} \Delta f_j$$

If $k = \infty$ then $\Delta e_i^{(\infty)} = e_i / x_i \cdot (1 - a_{ij})^{-1} \cdot \Delta f_j = e_i / x_i \cdot l_{ij} \cdot \Delta f_j$ [$L(l_{ij})$ being the "Leontief inverse"]

Indirect employment is derived from Δe_i . The correction factor P is applied.

We can in fact work out what volume of employment is created upstream, at the first level ($k = 1$), but also the second ($k = 2$), third ($k = 3$), etc. until the infinite level ($k = \infty$). This is what is presented in this report, in order to give the fullest possible picture of the overall economic impact that the sectors studied have on the national economy as a whole.

¹²³ Cai J. and P. Leung (2004).

The same logic applies to the calculation of the indirect value added. Then "E" only needs to be replaced by "VA".

○ Forward linkages

Ghosh¹²⁴ developed an alternative input-output model, i.e. a supply-driven input-output model. The output of a sector j is equal to its purchases plus its imports plus value added. The two last terms are called the 'primary inputs' and will be noted as pi . The base equation of the Ghosh model is thus derived from $x_j = \sum_{i=1}^n x_{ij} + pi_j$ by defining technical output coefficients $b_{ij} = x_{ij}/x_i$. The base equation is provided by $x = B'x + pi$ ¹²⁵.

This Ghosh model can be used to analyse how costs are propagated through the economy¹²⁶. When an industry i increases its prices, this has an impact on the costs of all its customers, i.e. the cost of their purchases increases. In order to maintain their value added at the same level, they will also raise their prices, entailing higher costs for their customers. These effects are provided by the column sums of the transposed Ghosh inverse $G = (I - B)^{-1}$. This means that the column sums of the transposed Ghosh inverse - and therefore the row sums of the Ghosh inverse - are a measure of linkage to the customers, i.e. forward linkage. Again, this is not a pure measure. Dividing the row sums of the Ghosh inverse by the diagonal element in the same row yields a pure measure. Thus forward linkage is measured by:

$$FL_i = \frac{\sum_{j=1}^n g_{ij}}{g_{ii}} \quad (102)$$

in which g_{ij} is the (i,j) element of the Ghosh inverse.

○ Decomposed linkages

It should be pointed out that the measures (IO1) and (IO2) measure linkage of an industry in relation to its own size. They do not provide any information about the absolute impact of an industry. In order to analyse the absolute impact these measures must be decomposed. As such, the absolute (purified) total backward impact of an industry j on another industry i is provided by $(l_{ij}/l_{jj})x_j$, in relation to the size of industry i , yields a measure of dependence of i with respect to j ¹²⁷:

$$BDec_{ij} = \frac{l_{ij} x_j}{l_{jj} x_i} \quad (103)$$

It can be shown that this is equal to

$$BDec_{ij} = \frac{g_{ij}}{g_{jj}} \quad (103')$$

and measures the share of output from industry i that is (directly or indirectly) related to industry j .

Similarly, the decomposed forward linkage measure can be found:

$$FDec_{ij} = \frac{l_{ij}}{l_{ii}} \quad (104)$$

is a measure of the payments of i that are attributable to j . It is a measure of cost dependence of i with respect to j .

¹²⁴ See Ghosh A. (1958).

¹²⁵ The apostrophe of B' denotes the transposition of matrix B.

¹²⁶ See Dietzenbacher E. (1997), Coppens F. (2006)

¹²⁷ See Coppens F. (2006)

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