Airlines and their Focus on Cost Control and Productivity

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Airline deregulation is an issue which has been attracting more attention, especially from the media, in recent years. In this paper, we analyze how the deregulation in the European Union has affected the behaviour of carriers, especially regarding the entrance of new Low Cost Carriers. Subsequently, we analyze how the former legacy carriers have reacted to this entrance studying issues such as the new focus on airline costs and productivity. We also present some evidence about the potential role which can be played by other sectors of the industry like airports, Air Traffic Management firms and aircraft manufacturers.

Keywords: Airlines' industry, Full legacy airlines, Low cost airlines, Airlines' competition

1. Introduction

The deregulation of air transportation in the U.S. in 1978 had a demonstrative effect for other regions of the world, and since then, the air transportation market has become more competitive and airlines are subject to important challenges with respect to their operational performance. Since the air transport deregulation of the US, many domestic markets have been totally deregulated or substantially liberalized. Other paradigmatic example of air transport deregulation was the gradual approach of the EU, in which the final phase of April 1st, 1997 proposed a single internal market within the 15 European member States, Finland and Norway. Following this process, in Europe, the former flag carriers have seen how the total number of competitors has been increasing during the last decade. For example, the total number of domestic airlines and routes has grown considerably in the last ten years, after the completion of the European Air

Transport Deregulation. Some of the former legacy carriers or fully service carriers (FSCs) have faced financial problems and were forced to disappear or merged as a result. With such fierce competition in the air transportation market, airlines cannot have any other primary strategy than being cost leaders in the industry. The survival of an airline is directly influenced by its operational and financial performance. Thus, airlines' short-term liquidation, return on assets and long-term solvency are based on current ratio, productivity of assets and debt ratio as in any other business.

Airlines operational performance is based on a set of indicators which can be characterized by three different aspects of airlines operations, namely: resource input (labour; capital; fuel; materials), service output (aircraft-hours; aircraft-km; seat-km), and service consumption (passengers emplanements, cargo; passenger-km; operating revenue), which constitute the three corners of an operational triangle. These three sides represent different efficiency concepts: resource-efficiency (measuring service output against resource input), resource-effectiveness (measuring service consumed against resource input), and service-effectiveness (measuring service consumed against service output), respectively.

As Oum and Yu (1998) pointed out an airline is cost competitive "if its unit costs are consistently lower than those of competitors. An airline may have lower unit costs than its competitors because it is more efficient, pays less for inputs or both. That is, airline cost differentials are determined by differences in input prices and productivity efficiency. Knowledge about existing levels and sources of cost differentials are essential for analyzing public policies and strategies designed to enhance airline competitive positions." (p. 1).

An increasing competition and other important drawbacks, such as the terrorist attacks of September 11th, 2001 or the severe acute respiratory syndrome (SARS), have led airlines to face unprecedented and severe financial turbulences. So many airline managers have been forced to undertake cost reduction programmes which allow airlines to survive in this global industry.

The rest of the paper is structured as follows: A review of the European air transport deregulation is presented in Section 2; Section 3 reviews the different business models of the airlines. In particular, we will focus our attention to the development of low cost carriers' (LCCs) competition; The different legacy carriers' strategies with respect to the new threats introduced by the competition of low-cost carriers will be analyzed in section 4; In Section 5, we will study the role of other sectors such as airports, air traffic control and regulators, and how these sectors affect the competitive result of air transport markets. Section 6 concludes.

2. The European air transport deregulation

Until the US air transport deregulation, market forces did not play any role in the provision of air services. Air transport was closely regulated according to the principles of the International Air Transport Association (IATA) which recognized that "every state has complete and sovereignty over the airspace above its territory". Some over-fly and technical stops were recorded in the case of international services but the commercial rights were left to bilateral agreements to be negotiated between the countries involved. The International Civil Aviation Organization (ICAO) is an inter-governmental agency which provides a forum for discussion of key aviation

issues and the basis for world-wide coordination of technical and operational standards and practices.[1]

In recent years and in most parts of the world air transport has become liberalized as institutional setting of fares, market entry, and capacity agreements have been abolished allowing market forces take place instead. The 1978 US Airline Deregulation Act began the process and the positive results and the favourable opinion of the media provoked subsequent developments such as the liberalization of the internal European market and the spread of Open Skies bilateral air service agreements between different areas and countries.

The changes in the EU followed a more gradual approach in comparison with the air transport deregulation process where a 'Big Bang" approach was favoured. Here, we do not further discuss why this process was slower, but is clear that the demonstration effects of the US helped European regulators to promote a regulation of the same kin in Europe to the one imposed in the US. In Europe, the different institutional structures and the ingent number of agents involved provoked this slow and gradual approach because of a lack of unique governance. Changes in regulatory regimes are also not costless, and especially given prevailing knowledge about the details of the ultimate losers, many countries which were involved in the provision of air services needed a temporal phase in order to accommodate the significant effects in these public airlines. In summary, they need time to make a profound industrial reconversion regarding the internal air transport before being prepared to compete in the new situation.

The first aviation package, adopted by the European Community in 1987 (Vincent and Stasinopoulos, 1990), introduced a degree of flexibility in the air transport industry and set up a mechanism for a gradual liberalisation. The second package, adopted in June 1990, took a further stage and made it possible for the EC Transport Ministers to commit themselves to full liberalization after December 1991.

When the European Community Transport Ministers adopt the second package of measures in June 1990, they took again a cautious step towards the definitive EU air transport liberalization. The governments compromised to loose the rigid schemes of the past regarding the fixing of tariffs and the rights of airlines to determine what services and routes to offer in the territories of other Member States.

Without any doubt, the most important premise of this package was the promise to fully liberalize the air transport by 1 January 1993, with measure to ensure:

- Freedom for airlines to fix their own fares;
- New opportunities to operate in and between other EC countries under common rules for the certification of air carriers;
- The ending of capacity-sharing arrangements between governments, which hitherto have guaranteed to each country a given share of traffic on a particular route.

[1] In the period 1950-1980, in general, air transport was highly dependant on the involvement of the State. It was a national interest sector, and for this reason, it was highly regulated and in most cases, airlines, airports, air traffic control and air navigation systems were directly provided by public companies. Since, the deregulation of the US in 1978, the air transport has gradually changed its status as an industry requiring special treatment. Governments began to be apart from direct provision of air services and liberalization was promoted as the best way to protect the society's general interest.

Stasinopolous (1992) explained how the main motivation for these two packages was the belief that a flexible and liberal framework for air transport will benefit passengers, because the airlines are obliged to increase their efficiency and performance in order to survive in the market. However, these benefits could be hindered by two interrelated factors, namely, the corporate restructuring of the airline industry which could be based on collusive agreements and the shortage of adequate capacity at congested airports. In fact, as Keeler (1989) argued, the reasons for concentration in the industry of the US experience are not easy to identify. Nevertheless, the undesirable results of a lessened competition can be mitigated by regulatory action, but solving problems caused by inadequate capacity is more difficult as rationing or better pricing policies only resolve partially the problem under a short-term perspective, but important scarcity costs can still be present.

Finally, on 22 and 23 June 1991, the Council adopted the third package of air transport liberalization consisting of:

- A Council regulation on the licensing of air carriers.
- A Council regulation on access for air carriers to intra-Community air routes.
- A Council regulation on air fares and rates for air services.

The intention of the package was to open up the twelve national markets creating a unique interior market in which airlines can compete freely.

Stasinipoulos (1993) remarked that if the Community seeks to maximize social welfare from the introduction of the third package, it is necessary to introduce additional measures beyond the opening-up of market access and the freeing-up of price setting. In fact, he established different measures (p. 326).

- Short term
    - Monitoring anti-competitive practices.
    - Spreading the demand and reducing the incentive for carriers to resort to hubbing.
    - Improving administrative procedures of the slot allocation systems.
    - Looking at the feasibility of using under-utilised military airfields to relieve peak-time saturation.
- Long term
    - Creating a central authority for flight planning in Europe.
    - Expanding investment in airport infrastructure.

He also argued how the air transport industry is global, so it is necessary to go beyond the traditional framework of bilateral agreements and to orient the industry towards a system of multilateral agreements. With this perspective, the role of the Community becomes a necessity to prevent a third country from exploiting the fragmentation of the bilateral system to its advantage obtaining better conditions in Europe which cannot be enjoyed by the EC carriers under provisions of reciprocity. Therefore EC initiatives are a sine qua non condition for the success of the internal aviation market.

Stasinopoulos was completely right and he was anticipating some problems that we are actually seeing with the signature of Open Skies agreement between the US and the EU and the so-called restructuring of the EU airline industry. In fact, as many international routes are still based on bilateral agreements between different countries, there is a magical threshold foreign ownership value which cannot be exceeded in order to maintain these privileges. A carrier to be designated

by a signatory government under the bilateral to serve the international route, it must be at least 50% owned by nationals of the designator state. Therefore, if control of the carrier shifted the national status, it would lose the right to service routes under all the bilateral agreements for which it is designated, so the EU internal market is affected by all the overlapping routes between the EU and other countries not included in the area, such as the US, Canada, South America, Africa, Asia and Australia. This has been and is a difficult obstacle for some airlines to take over other domestic airlines. This is also a barrier to real competition in the European arena, because for carriers serving EU destinations only (e.g. some European LCCs like Ryanair or Air Berlin), national ownership need only be at least 50% by EU nationals rather than Irish or German nationals. However, Ryanair or Air Berlin could not start to serve Madrid-Buenos Aires, without changing their ownership to Argentine or Spain (a highly unlikely scenario). So, the international airline industry creates important peculiarities which affect the internal competition in the area.

The European Commission (EC) was given a mandate to negotiate a transatlantic deal with the United States (US), and a final agreement was signed in May 2007. It is likely to take a long time for the EC and the US to discuss the issues of foreign ownership restrictions and cabotage. Notwithstanding these difficulties, the agreement has achieved something that was demanded from the EU side, as provided in Article 22 of this new agreement, all the bilateral agreements between the United States and Member States have been be suspended or superseded by this new agreement. After multiple formal rounds of talks and countless informal exchanges, the two sides finally signed a preliminary agreement. However, the largest and most important specific objective of the EU-US talks, the European Commission's need to eliminate the nationality clauses from the framework for air services agreements and cabotage in the US domestic market, has not been totally achieved and must jeopardize the success of the agreement.[2]

3. Airlines' business models

Porter (1985) suggests there are three strategies a company or organization can adopt to achieve competitive advantage: through cost leadership, differentiation or focus.

A firm sets out to become the low cost producer in the industry when it follows a cost leadership strategy. To do so it must find and exploit all sources at cost advantage. Low cost producers typically sell a standard, or no frills, product and place considerable emphasis on reaping scale or absolute cost advantages from all sources. This strategy has been used by LCCs.

A company seeks to be unique in its industry along some dimensions that are extremely valued by passengers. It is usually rewarded for its uniqueness with a premium price. A firm that can achieve and sustain differentiation will be an above average performer in its industry, if its price premium exceeds the extra costs incurred in being unique. The logic of the differentiation

[2] According to Chang and Williams (2001), nationality clauses lie at the heart of bilateral Air Services Agreements. Without them, the value of such agreements is questionable. A key reason why foreign ownership rules remain in place is that they protect national airlines, and the US is reluctant to relax the ownership rules in a short time. Other obstacle to go beyond this is the treatment in form of aids that governments give to airlines in special circumstances like terrorist attacks or bankruptcy clauses.

strategy requires that a firm chooses attributes in which to differentiate itself that are different from its rival. This is the logic of the overall strategy of legacy carriers.

Focus involves adding value to the product or service and targeting it carefully at a niche segment of the market. Such a strategy does not apply to legacy and LCCs' current strategy, but corporate jet service providers could fall into this category.

The terminology used to describe 'traditional, full-service or legacy' carriers is not unique and exact. In general, they operate extensive networks which inherit in part from the previous routes operated under strict regulatory provisions, thus the expression 'legacy carrier' has gained more adepts in the academia. The definition of what we understand by a LCC is not unambiguous[3] as we will see below there are numerous strategies to differentiate the product within the low-cost sector. However, all the airlines commit to a common premise: the 'cult of cost reduction' (Lawton, 2002). The low-cost model was pioneered by Southwest Airlines in the USA and has been widely emulated by other North American carriers such as AirTran, JetBlue and WestJet and in Europe by Ryanair, Easyjet and Air Berlin. The air transport deregulation in many areas of the world, principally the US and the EU, has allowed the entrance of new carriers in some markets which were previously protected and under the control of former legacy carriers. Table 1 shows the basic characteristics of the LCC business model.

Table 1. Original Low-cost carrier business model

Item	Atribute	Characteristics
Product	Fare	Low, simple and unrestricted
	Frequency	High
	Network	Point to point
	Connections	No
	Distribution	Call centres, internet, ticketless
	Class	Single class
	Seat Comfort	High-density seating
	Food	No meals or free alcoholic drinks. Snacks and soda can be purchased
	Seat Assignment	No
Operations	Aircraft Fleet	Single type
	Aircraft Use	High capital productivity >12 hours
	Airports	Secondary and uncongested
	Airports Turnaround	20-30 minutes
	Sector Length	Short 400 miles
	Staff	High labour productivity. Competitive salaries

Source: Adapted from Alamdari and Fagan (2005)

[3] Alamdari and Fagan (2005) showed how the LCC business model is nowadays more differentiated and it is not longer based on the cost leadership as it used to be on the original model. They concluded that in pursuit of their differentiation strategy, the LCC deviated slightly more from the product features of the original model (40%) than from the operational features (36%). The evidence also suggests that European carriers tend to adhere to the original model more than their counterparts in the US. However, this could be the consequence of the number of years in which the air industry has been operating deregulated, and this change in the future may be less notorious.

The LCC business model is based on simplicity. This helped carriers to be cost leaders in the industry.[4] They also present higher load factors and labour productivity, thus they have been competing in fares (with important price reductions with respect to the fares charged by legacy carriers), promoting air traffic growth and creating new air transport markets. The growth of LCCs has produced more multi contact markets with the networks of legacy carriers, and this trend has not ended. After ten years of the European air transport deregulation, many of the former legacy carriers have began to feel the level of competition of the LCCs, and it is not clear that the industry is now in equilibrium. Given the large number of aircraft that Easyjet and Ryanair have on order, and the last news about the re-structuring of legacy carriers[5], it is not difficult to affirm that carriers will definitely have more battles to fight.

European LCCs are growing and increasing their share of the market, especially in recent years. Figure 1 shows the evolution of the number of routes of LCC network in Germany for the period 2002-2005. It can be seen, looking at the numbers, that the growth is really spectacular. In a single decade, LCCs have transformed the European air transport scene beyond recognition. Europeans' leisure and travel habits have changed dramatically because new direct services between EU city pairs that were not serviced through the legacy carriers are now available. New regional airports have become popular, and some cities have benefited from the routes opened up by LCC. Perhaps though, the most significant achievement for the LCCs, especially in the EU, is that they have allowed access to air transport to all the segments of society. Who could have predicted, 10 years ago, that Ryanair would carry more passengers in Europe per month than British Airways? (OAG, 2006), and this trend is predicted to continue in the next years, so legacy carriers need to react in order to survive.

Competition between LCCs and FSCs has been analyzed by different authors who tried to find out factors on influencing business travellers' behaviour in selecting flights between different carriers (Mason, 1999, 2000, 2001; Franke, 2004). Mason (1999) shows, in a previous research, that the decision-making behaviour of business travellers in influenced by the company they work for. Mason (2000) indicates that low-cost airlines are more likely to be successful in attracting business travellers from small and medium sized companies. Mason (2001) shows that business passengers using LCCs do not form a separate market segment from those using FSCs. In fact, short-haul business passengers are, en masse, becoming increasingly more price elastic, and corporate influence in purchase decision making is more evident in passengers choosing FSCs and this is partly a function of the size of the company, with larger companies favouring such carriers. Franke (2004) found that on continental travel routes, LCCs are able to deliver 80% of the service quality at less than 50% of the cost of network carriers.

Barbot (2005) studies how LCCs and FSCs compete in two markets (London-Berlin and London-Amsterdam), using daily collected web-based prices to estimate the reaction function on these two established low-cost carrier routes. In the first market, Air Berlin, Ryanair and Easyjet compete with British Airways, and regarding the second market, Easyjet and Transavia compete with British Airways and KLM. It was found that there is a separation of markets with the low-cost carriers competing with each other and the legacy carriers competing with each other.

[4] Doganis (2001) showed how the costs of these carriers are 40-50% lower than those of the legacy carriers.

[5] There are some indicions which point out that some airlines like Iberia, Alitalia and Olympic will be taken over by BA or Lufthansa.

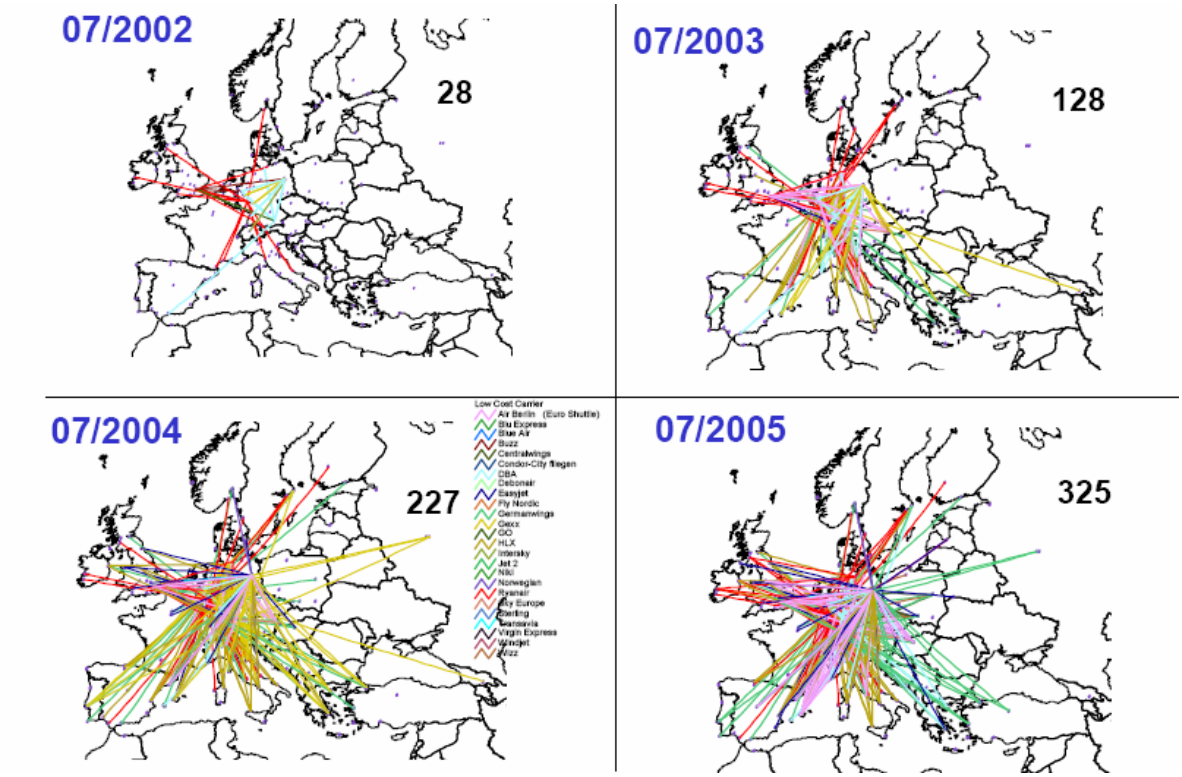

Figure 1. Development of LCC network in Germany for the period 2002-2005

4. Legacy Carriers' strategies in competitive markets

The short-haul domestic operations of former legacy carriers such as British Airways, Air France, Iberia, Alitalia and Lufthansa have come under increasing pressure from the growth of low-cost carriers. In this section, we examine how these carriers have reacted to these new entrants. We eventually show that reductions in labour costs, greater use of regional aircraft and network reconfiguration, and more flexibility on minimum stay requirements on cheap fares have been introduced in many markets. Other important strategies with respect to the on-board service and direct distribution channels shrink the gap between former legacy and low-cost carrier products.

4.1 Focusing on costs and productivity

The strategies to reduce labour costs or increase labour productivity are the two faces of the same coin. Doganis (2001) argued that as a consequence of air transport deregulation and the entrance of new LCCs, a profound change in the nature of the airline industry since about 1990 has come to the operational arena because, no longer, cost reduction is a short-term response to declining

yields or falling load factors, but it is a continued and permanent strategy when carriers want to survive in this competitive environment.

When airlines face a strong opposition from well organized labour unions, airline managers have always the possibility of transferring services to regional partners, franchises or alliances and even setting up a low-cost carrier subsidiary. These subsidiary carriers were created to compete fiercely with the new low-cost carriers and followed a similar business model.[6] However this last strategy has been in many cases unsuccessful[7] (Morrell, 2005; Graham and Vowles, 2006).

BA set up Go to fly from some secondary airports located in the UK. However this initiative failed and eventually sold off to a consortium involving the management, and it was subsequently taken over by Easyjet. Buzz was a subsidiary created in 1999 by KLM Royal Dutch Airlines from the remnants of KLM UK, an early casualty of the expansion of LCCs at London Stansted. This company was always condemned to be a failure by its lack of vision: high-cost airports mixed with low-density routes. Its years of existence were certainly tormentous until 2003 when it was bought out by Ryanair. Lindstadt and Fauser (2004) analyzed the case of Lufthansa, which owns a minority stake in Eurowings, a regional carrier serving low-dense destinations in Europe. In addition, Germanwings, which is a subsidiary of Eurowings, is a typical low-cost carrier founded in 2002. This example shows how legacy carriers can own equity stakes in LCCs which operate with separate brands, staff, fleets and management. This has also been observed in other industries in which the cross ownership is always an object of debate. SAS set up Snowflake to take-over low-yield/leisure type routes, but this was again the story of a failure. In fact, Snowflake is an example of an unsustainable strategy of high costs/low yields, with aircraft and crews mimicking the costs from the parent company. The company did not achieve much cost saving but yields were low because feeder traffic to the SAS network disappeared and large numbers of seats were simply transferred from the parent company by increasing the point-to-point markets. This was a clear example of cannibalism, and was a painful lesson that legacy carriers had to learn in order to succeed. The cost leadership is well established in the LCCs and the most viable strategy for a separate production platform is a ring-fenced leisure airline flying point-to-point routes without any substantive high-yield component and with substantially lower labour costs than the mainline operation (Graham and Vowles, 2006). This strategy has been followed by BA with its subsidiary GB Airways which operates mostly between Gatwick and holiday destinations in southern Europe. GB has lower cost levels than its parent and can operate viably on lower yields and compete more closely on price with the low-cost carriers. GB uses A320 and A321 aircraft which are used in destinations that were not in the BA network at all in recent times.

Distribution channels have also come under a more serious cost scrutiny, and many operations have been brought closer to the low-cost carrier model by reducing or overriding commission

[6] In the US, Continental Airlines became the first US carrier to create a low-cost subsidiary with Continental Lite. This subsidiary carrier eliminated meals and first-class service, increased departure frequency, lowered fares and shortened turnaround time at the gate (Lawton, 2002).

[7] Morrell (2005) discussed, looking at the US legacy carriers, the reasons behind this failure. The significant cost differences between legacy and LCCs are identified, and it is shown that full service carriers have made some sacrifices but are still far from closing the cost differentials. Some other reasons for the failure are suggested by examining operating differences: mixed fleets, keeping interlining and two class cabins and the lack of progress on reducing labour costs. Labour Union restrictions and the lack of separation from the main airline were also crucial.

payments to travel agents. Many legacy carriers have revised their fare structures to become more aggressive and compete with the low-cost carriers. They have increased the fare differentiation being more flexible with respect to minimum stays on the cheaper tickets for most European sectors. Legacy carriers have also started a downward trend regarding catering in economy class, and nowadays it is generally frequent that passengers pay for refreshments and food. The separation between different business models – charter, low-cost and legacy carriers - is more blurred than ever. In many domestic European routes there is a strong competition between these three apparently different carriers, and some web portals offer different fares from all the carriers that serve the market independently of their business model.

One area where the low-cost airlines outperform the legacy carriers is in terms of labour costs and productivity.[8] Under the new competitive environment, the former legacy carriers need to revise their labour costs downwards through various measures which include increasing productivity, freezing or reducing nominal wages[9], hiring new labour with lower wages and outsourcing more non-core activities, such as catering, ground handling and aircraft cleaning and maintenance. In some cases, some airlines have sold or transferred to third parties some subsidiary firms which were in charge of those types of activities.

4.2 Network reconfiguration

Low-cost carriers have eroded many of the former well protected legacy carriers' markets.[10] Under these circumstances, legacy carriers need to revise their strategy in some of these markets. In some cases, they can simply transfer many short-haul routes to regional partner airlines. This strategy has been followed by Iberia for some short-haul domestic routes which are operated by Air Nostrum and Binter Canarias using regional propeller planes.[11] Thus, Iberia could maintain its frequency[12], its network associated with the value of frequent flier programme at a lower cost,

[8] Easyjet and Ryanair, two of the most representative low-cost carriers present a leadership in low unit operating costs and high labour productivity. They base their flights on local home basis for the crews and reduce the turnover traffic time to a minimum in each of the airports. Thus they can use more efficiently their capital assets (planes) and save many overnight costs incurred by other legacy carriers, where some domestic sectors are based on crews who need to spend at least one night outside their home.

[9] Dennis (2007) argued that employment with the major legacy carriers was historically a comfortable existence. However, once low-cost carriers like Easyjet, Ryanair and Air Berlin show there were employees willing to work in the airline industry with fewer privileges, it became difficult for the trade unions to justify maintaining these generous conditions.

[10] Ryanair wants to be within five years the biggest airline in Spain. According to O'Leary, Ryanair will carry over 20 million people to and from Spain within five years. At this time, Iberia is the biggest airline in Spain and O'Leary expects that his airline will get ahead of Iberia in the future. Nowadays, Ryanair serves different Spanish airports like Barcelona-Gerona, Barcelona-Reus, Madrid, Valencia and Malaga.

[11] On short-haul markets, up to about 300 miles, turbo-prop aircraft remain an alternative option for providing the optimal frequency and aircraft size, as they retain lower fuel and capital costs than the regional jets and their disadvantages of low speed and high internal noise levels are less apparent. Significant numbers of new turbo-props are still being ordered (Aviation Strategy, 2000).

[12] Wei and Hansen (2005), using a nested logit model to study the roles of different variables in airlines market share and total air travel demand in competitive non-stop duopoly markets, found that airlines can obtain higher returns in market share from increasing service frequency than from increasing aircraft size. Therefore, they

without reducing the willingness to pay of passengers. Dennis (2007, p. 3) argued that "in Europe, there has been much less shift to regional jets due to capacity constraints at the major hub airports. The opportunity cost of using a precious slot for a 50 seats aircraft is enough to tip the balance in favour of the larger jets". However, this is the inherent cause of the search of secondary airports made by low-cost carriers. As Graham (2001) recognises the pressure on secondary and smaller airports, regarding relationships between LCCs and airports are getting tougher and tougher, especially at secondary and smaller airports[13], where aeronautically-related revenues represent typically more than 64% of the total revenues. But as traffic grows commercial revenue from expansion of retail, catering and car-parking facilities builds up forming an increasing share of total revenues. In other cases, legacy carriers have reduced their capacity abandoning some routes to the low-cost carriers.

In the EU, one of the most noticeable impacts of the increased competition faced by the 'legacy' carriers has been the network reconfiguration. The major European airlines have fortressed their main hub airports, where an increase in operations is more profitable[14], and they have reduced or abandoned secondary hubs and point-to-point services. This process was the consequence of the era before the deregulation in which hub domination make it difficult to compete with carriers flying from a hub at the other end of the route.[15] As hub domination has been artificially created by the previous European regulation, the low-cost carriers need to seek economic rents identifying market point-to-point niches in which entry can be more effective. Thus, some secondary hubs such as Munich, Dusseldorf, Hamburg, Berlin and Stuttgart (Lufthansa); Barcelona (Iberia); Glasgow, London Gatwick, Manchester (BA); Amsterdam (KLM); Milan, Venice (Alitalia); and even other primary hubs like Copenhagen (SAS) have been more exposed. However, other airlines like Air France have not faced a fierce competition on its secondary airports.

4.3 Yield Management

The techniques that allow airlines to maximize revenues are known as "yield management" (YM), and were pioneered by American Airlines in the 1980s. The classical definition of YM, according to Smith et al. (1992), is the control and management of reservations inventory in a way that maximizes company profitability given the flight schedule and fare structure. It is based on market segmentation and real-time demand forecasting, with the final intention of establishing the best pricing policy for optimizing profits generated by the sale of a single seat

conclude that airlines have an economic incentive to use aircraft smaller than the least-cost aircraft, since for the same capacity provided in the market, an increase of frequency can attract more passengers.

[13] Francis et al. (2003) argued how LCCs offer the potential of commercial viability to some smaller airports because they frequently seek locations away from major, congested hubs, stimulating rapid growth at such airports, for example, Ryanair at Stansted, Prestwick, and Charleroi, Easyjet at Liverpool and Luton, and Bmibaby at EastMidlands.

[14] These practices have been criticized as they suppose an entry barrier which affects competition and an important driver to mark-up prices for hub passengers (Borenstein, 1989, 1991)

[15] This is the case of Madrid Barajas airport for Iberia. The airline enjoys a privilege position which comes before the air transport deregulation in Europe. In fact, the company, not only clearly enjoys a dominant position in the airport, but also can extract some monopolistic rents because some air transport markets, which are controlled by bilateral agreements (specially in routes to/from South America), are not subject to market forces.

for a certain flight. The application of this technique makes some additional requirements which fit perfectly well within the air transport industry, such as:

1. a perishable product (seats loses its value after departure);
2. a constrained capacity to satisfy a demand which is highly volatile;
3. the existence of reservation systems which permit the passenger can buy their tickets before departures;
4. multiple pricing structures (according to each segment);
5. and very low variable unit costs (airlines produce with high fixed costs due to the nature of the capital use).

Legacy carriers needed to redevelop new sophisticated systems of yield management that aimed to capture most of the consumer surplus using market segmentation according to different passengers' willingness to pay. Tretheway (2004) argued how carriers have been capable by offering a wide range of different fares for essentially the same product. The market segments were obtained according to different conditions. One of the most known has been so far the requirement to spend a Saturday night away to obtain a coach fare. The cheaper fares were normally sold only on a round-trip basis. This technique allows carriers to segment the market on the assumption that anyone returning before the weekend must be a business passenger who usually shows very low price-elasticity because their firms pay their flights. Coach fares were hence reserved for leisure passengers who present higher elasticity to price. Flexibility was also a requirement to segment both markets being only available in business class, again making coach fares unattractive to this segment in which travel plans may change frequently.

The low-cost airlines model is based on one-way fares, and their segmentation is done according to other factors such as the time of travel and the anticipation of the purchase of the ticket with respect to the departure date. Initially, the legacy carriers did not pay attention to the potential competition of low-cost carriers. They thought that business passengers would continue to buy expensive full-fare tickets to benefit from their differentiated product whose origin comes from a high frequency service from primary hub airports, frequent flyer programmes based on international alliances and premium quality services (food, in-flight entertainment, beverages and vip lounges at airports).

However, this idea was more an illusion than a fact, and all the legacy carriers have noticed the low-cost carriers' competition on most of its short haul network, and this could not be ignored any longer. Legacy carriers have been forced to recognize that, nowadays, passengers have changed their expectations and become more elastic to prices than to service especially in the short-haul routes. For this reason, yielding unit have simplified their fare structures, reduced ticket prices, increased the number of cheap fares availability and removed restrictions on lower fares. Recently, many legacy carriers have abandoned the minimum stay requirement for coach class fares on short-haul European routes, and it is even possible to find cheaper one-way fares directly on the internet web sites of the carriers or other some distribution channels like www.expedia.com or www.edreams.com.

In summary, all the legacy carriers have now adopted closer pricing strategies to the low-cost carrier counterparts, increasing this way the revenues from the leisure segment. Of course, pricing strategies depend more on market conditions of each individual route, in particular if

there is direct competition from low-cost or legacy carriers, or even inter-modal competition from high speed train (HST) services.[16]

4.4 No-frills service

In the old days, European passengers travelling within Europe have traditionally enjoyed a hot or cold meal, and business passengers received upgraded hot catering with a written menu, alcoholic beverages and fine cutlery. All legacy carriers provided a similar standard of catering so for competitive reasons, every carrier was forced to satisfy the European passengers' expectations.

However, in recent years, the fierce competition exerted by the growth of the low-cost carriers which offered no-frills service, has forced legacy carriers to make a serious assessment of the short-haul product regarding food and beverages.

Roman et al. (2007) analyze this topic in the routes connecting Madeira and Azores with Portugal mainland, and Canarias with Spain mainland. They find that the willingness to pay is different for each of the markets, because in the Portuguese markets, passengers see no price incentive for foregoing the food and drink. The authors conclude that the Portuguese value is higher than the Spanish counterpart because in the first case it can be seen as a willingness to accept for reducing the flight to a no-frills service, and in the Spanish market fares are lower and no-frills services are the norm of Iberia, Spanair and Air Europa. In this case, the carriers started a gradual drift to reducing provision in coach class. The argument is that no-one buys an air ticket because of the food, and therefore if the ticket price can be cut by x euros through cutting out the food (the cost of the service) and this frill is valued by less than x euros, then the strategy of no providing free catering will be profitable.

The danger for the legacy carriers, however, is that they can never match the cost levels of the low-cost carriers, so if inclusive economy class catering is eliminated, passengers may then see a more homogeneous product and find no reason for using these expensive carriers. In Europe, some legacy carriers provide no-inclusive catering tickets and sell food and beverages at reasonable prices. However, other legacy carriers still find more efficient to provide some small snack such as biscuits, cold sandwiches or a chocolate bar to all the coach passengers because the loss of image or reputation is not outweighed by the saving in costs.

5. The role of other sectors

The current situation of air transport can be explained by different issues, such as the potential unstable nature of providing pre-committed services in quasi-contestable markets to micro-studies of the management shortcomings of individual actors. However, as Button et al. (2007, p.

[16] Pels and Rietveld (2004) analyzed the route Amsterdam-London, where low-cost carriers and conventional carriers are active and addressing whether carriers react to each other's price adjustment. They found that Easyjet closely follows the fares of British Midland and FSCs do not follow the price movements of the LCCs. Instead, some carriers seem to lower their fares when potential competitors raise their fares and all carriers increase their fares as the departure date gets closer.

15) point out "the fact that other players in the air transportation supply chain -airports, global distribution systems, airframe manufactures air traffic services, etc. - have often been earning higher and positive returns has also been noted" In fact, some of the sectors of the supply chain obtain important positive margins which are related to the degree of institutional and natural monopoly power that these elements enjoy.

5.1 Airports

So far, we have analyzed how airlines have reacted to a new era in which market forces prevail in the air transport industry as a consequence of the introduction of new economic and regulatory conditions. Carney and Mew (2003) discussed how these conditions, however, have changed for airports as well, and airport companies have been confronted with profound governance changes over the last decade. So, in this section we discuss different issues regarding the role of the airports with respect to the equilibrium of air transport sector.

Origin and destination airports may have some impact on the market differentiation of the routes. This is specially true when several airports serve a city or an area like in London, Paris and Barcelona, where heterogeneous products are to some extent being provided by LCCs and FSCs. In the case of Paris, for example, airlines can fly to Charles de Gaulle and/or Orly.[17] In the case of London, airlines can fly to Heathrow, Stansted, Luton, London City and Gatwick. For example, it can be seen that the route Porto-London is served by three carriers using different London terminals: British Airways and TAP to Gatwick, and Ryanair to Stansted.[18] In the case of Barcelona, Ryanair and other LCCs sell tickets to Girona and Reus, two secondary Spanish airports located in the area of Barcelona, as if their flights were landing at Barcelona.

Some analysts have commented how most of the busiest airports in Europe are congested and the considerable constraints on airport expansion has been cited as one of the most important obstacles which has impeded consumers to fully benefit from the European air transport deregulation. In particular, the issues of allocation of scarce capacity and the pricing policies of the airports are areas subject to an important debate in order to promote a more efficient equilibrium point.

It is possible to use prices to ration scarce airport capacity. Thus far, this has rarely been done, except occasionally to handle peaks.[19] Higher prices would ration demand to be closer to capacity, though the effects on actual demand would be less certain than slot limits.

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[17] Button et al. (2007) found analyzing the route Porto-Paris that the fare pattern that emerges is one of comparable fares for the FSCs until quite close to departure, but more volatility for Air Luxor that serves a different airport (Orly). In the Lisbon–Paris case, where the same three carriers compete, the pattern is in some ways similar, with the legacy carriers, although not keeping constant fares, largely mirroring the fares they offer with Air Luxor standing-off somewhat.

[18] Although Ryanair generally offers lower fares during the early phase of sales, there is still some degree of jockeying even before the immediate period before take-off when a more traditional pattern of yield management associated with the techniques of legacy US airlines emerges. Certainly, Ryanair does not stick to the textbook, low-cost model of continually raising fares until departure. Indeed, sometimes there seems to be somewhat perverse behaviour with Ryanair lowering fares at times when both TAP and British Airways raise theirs. The legacy carriers would seem to be engaging in a more traditional yield management dance over time (Button et al., 2007) (p.221)

[19] Martín and Betancor (2006) analyzed empirically this problem in the case of Madrid-Barajas airport, showing that social welfare from aeronautical services will increase by 6 per cent if a first-best pricing scheme (rather than the

However, the real difficulty with prices is that rationing prices could be very high, and airport profits would be correspondingly high (Forsyth, 2007). Most airports are required by government owners or regulators to keep revenues close to costs. A slot system enables capacity to be rationed tolerably efficiently, while at the same time keeping prices down. If there is to be regulation which seeks to keep prices close to costs, there has to also be slot rationing, or delays.
The primary criticism of slots is that there is no guarantee that they will be allocated efficiently, to the airlines with the greatest willingness to pay for them (Starkie, 1998; Lu and Pagliari, 2004). It is difficult for new airlines to obtain slots at busy airports even if they are prepared to pay for them. The slot-controlled airports have become an important weapon and anti-competitive barrier used by the legacy carriers. In fact, LCCs have difficulties in accessing the primary busiest airports of Europe, even when they would be willing to pay the price. Legacy carriers usually favour the slot system, since they possess most of the slots at busy airports. Thus, they can prevent the new entry of LCCs to the airports, and secondly, gain assets of considerable value. The access to slots is an important competitive advantage they have over LCCs, and they can charge a premium for using these preferred airports.

5.2 Aircraft manufacturers

There are only two major manufacturers of aircraft for large planes (Boeing and Airbus) and only three manufacturers of large jet engines. The number of regional jet manufacturers is only slightly larger. The main manufacturers of airframes have the advantage of being (or becoming) involved in military supply. This offers them a significant buffer to the adverse effects of downturns in the business cycle suggesting that their returns may need to be lower than normal market rates to attract necessary capital.
Vertical integration has taken a variety of forms in the air transport and we remark here that, in the early days of aviation, airlines were often vertically integrated with aircraft manufactures (Boeing and United Airlines being an example).
Aircraft characteristics have an important role on airport planning and airlines competition. Regarding airport planning, both the airport airside and landside planning are based on operating characteristics of the aircraft. On the airside, the runway length and width, the minimum separation between runways and taxiways, the geometric project of taxiways, and the pavement strength determine which type of aircraft can be served. Additionally, environmental issues such as noise and air pollution are also based on the aircraft which will make use of the airport. On the terminal area, aircraft characteristics will influence the number and size of gates, and consequently the terminal configuration. Finally, the aircraft passenger capacity will influence the size of facilities within the terminal – such as passenger lounges and passenger processing systems –, and the size and type of the baggage handling system.
On the other hand, modern aircraft are also projected taking into account the constraints of actual airports. The costs of adapting an airport to changes in aircraft characteristics – for example, runway stretching to accommodate a larger aircraft – has become so high in the last decades that

present pricing policy) is applied, where aeronautical demand usually exceeds capacity for most part of the day during all the weekdays. They also showed that a policy pursuing a higher level of capacity use does not provide a higher social welfare and for this reason such a policy must not be encouraged.

manufacturers are now concerned of fitting new development to existing airports. For instance, the new strategies of Boeing and Airbus to develop a new large aircraft with 500 to 800 seats and a new-generation supersonic aircraft are being carried such that the runway requirements of these new products should not be excessive and preferably inferior to 3500 metres (David, 1995; Boeing, 1994, 1996).

5.3 Air Traffic Control and National Airspace System

Airport capacity not only depends on the number of runways and the space of terminal passengers, but on the capacity of the Air Traffic Management (ATM) system which is usually divided in two different subsystems: Air Traffic Control (ATC) and National Airspace System (NAS). This is part of the air transport supply chain which needs to be analyzed in order to understand and quantify the benefits of public and private investments in the system. Normally, the performance of the system is based on the quantification and monetization benefits and costs to the maximum extent possible taking into consideration a multiple stakeholder perspective.

While the need for studies on performance analysis of these systems is growing, industry stakeholders are also recognizing that their performance is multi-dimensional, and therefore not adequately captured by traditional delay-based metrics. For example, items such as predictability, flexibility and access can be also important for some level of service measured by the total delayed time. These items can be elements of value to the scheduled airline business passengers. Hansen et al. (2001) developed a cost model incorporating multiple dimensions of NAS performance.[20] They included in the model of costs some measures of NAS performance which are derived from the operational experience of carriers using the NAS, as captured by such metrics as average delay, variability of delay, and flight cancellation rates. As noted by the authors, these measures not only reflect the quality of service provided by the public aviation infrastructure, but also the carriers' ability to plan and manage their operations. They showed that poor NAS performance is, as expected, associated with increased airline operating cost. More surprisingly, one specific dimension of performance "disruption" emerges as the key cost driver. This challenges the traditional view that delay is the critical economic factor. So, the results may indicate that operational strategies that emphasize maintaining flights even when there are high delays are more efficient than cancelling flights to avoid such delays.

Many governments around the world have started a new era regarding ATM, leading to deregulation of some of these activities looking at other industrial sectors like telecommunications, passenger air transport and other transport activities which started this path previously. In this sense, the Single European Sky initiative was launched in 2004 by the European Commission aiming to set out regulatory principles with a view to restructure the airspace according to traffic flows rather than national boundaries, create additional capacity and improve the overall efficiency of the system.

[20] The authors, even when industry stakeholders recognize that NAS performance has many aspects, argued that only delay is routinely monetized, and even in this case, however, there is ample room for scepticism about the procedures. They commented that "virtually all delay cost calculations involve nothing more than the application of a cost factor based on reported values for the average direct aircraft operating cost per block hour to quantities of delay measured in time units. For air transport aircraft, the cost factor is in the range $ 20-25 per min". (p. 3)

Some steps have been done, however there is still too much to do. The United States has less than half of the number of air traffic control centres and a standardized mainframe computer. Air space in Europe has remained a national responsibility. It is controlled by different national centres, with different equipment, different operating standards and different management regimes. A pilot is transferred between fifty control centres, each with its unique computer system and equipment. Until the Europeans will be able to impose solutions on the different national authorities that Eurocontrol attempts to co-ordinate the system of 'corridors' grouped into national route-maps will continue to be less than optimal.
At the end of last year, Eurocontrol and the European Commission signed a Memorandum of Cooperation to enhance their synergy in five areas of cooperation: Implementation of the Single European Sky; Research and development; Global navigation satellite systems, including Galileo; Data collection and analysis in the areas of air traffic and environmental issues; and International cooperation in the field of aviation.

6. Conclusions

The entry of LCCs in the EU has dramatically changed the aviation market in recent years. The development of LCCs in Europe was different from the one occurred in the US, as the informal sector of charter carriers, integrated vertically in the tourist industry, was a reality before the liberalization of the air transport in the EU. So, the LCC business model in the EU made a slow and late appearance in the air transport scene, but since then its importance is increasing day by day. The competition exerted by the entry of LCCs has provoked that the former legacy carriers need to readapt their business model to the new situation. But not only airlines have adapted their behaviour, airport managers are also thinking about developing new terminals dedicated to the LCCs; passengers of different economic status can think about flying; other third parties, such as information technology providers are developing new software programmes to make consumers buy their flight tickets in internet.
The implementation of the three packages of the EU air transport deregulation produced different effects on the European countries and their airlines. As a result of deregulation, some airlines like Sabena and Swissair which disappear in 2001, although both airlines have resurrected under different names. We have seen how FSCs have reacted to the new era of competition, adapting their pricing policies and route structure. The route structures have put more emphasis on the operations through hubs, rather than along linear routes, as occurred before deregulation. It is difficult to evaluate if such 'hubbing' has enhanced or not passenger convenience. We have seen how it is difficult to extract a definitive conclusion if nowadays the business models are more close or not, because FSCs have followed some patterns of LCCs, but they still differentiate their product in the long-haul segments which is not open to competition.
We have also dedicated a section to treat the problems associated with other sectors which affect the final equilibrium point of the industry. In particular, we have provided a thoughtful discussion of some important issues, including airport provision, aircraft manufacturers and Eurocontrol.

In summary, we can say that airline deregulation has been only a partial success, and that the benefits of air deregulation to passengers will continue to grow as LCCs could expand and as the rest of the sectors adjust to the new environment. In particular, regulators need to concentrate their efforts in enlarging more common aviation markets without considering the issues of foreign ownership and cabotage restrictions.

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