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Impact on the structure of the air transport industry liberalization in Italy

Abstract

This study aims to analyze the development of the air transport industry in Europe after deregulation. The strength of competition and the ways it works represent the main subject of the study. We show what the European air transport network looks like eight years at the conclusion of the deregulation process. In the first section, the intensity of direct competition is analyzed. Data, collected from OAG, about all the scheduled flights departing from European airports show that only a few routes are being served by two or more airlines. About 70% of the routes are still monopolies. It is therefore important to understand the role played by indirect forms of competition as well as the presence of alternative routes. Indeed the recent development of secondary airports increases the chance for competition among airports. In the second part of the work it emerges that the actual geographical distribution of airports in Europe can withstand a high degree of potential competition among them. Looking at intra-European routes we found that about 40% of them can be considered as under pressure from at least one alternative route. Nevertheless a preliminary analysis of the level of fares on intra-European routes, developed in the third part of the study, shows little evidence of the role played by the presence of alternative routes. This may be due to a time gap between the emergence of direct and indirect competitors and the changing structure of the market.

Keywords: air transport, deregulation, competition forms.
JEL Classification: L93.

Introduction

For a long time, the air transport industry has been characterized by the dominance of domestic carriers and bilateral agreements between States which tend to eliminate every form of competition among carriers. Public support and normative protectionism have been justified by a series of socio-economic, political and military considerations (Thornton, 1972).

All the same, technological progress and industrial growth have helped to increase, over the time, the pressure towards forms of markets able to promote carrier efficiency, price decreases and improvement in the service offered. The need to reform air transport regulation comes as a response to wider recognition that has been granted to airlines (both public and private ones) to operate on a free market. Therefore, it is crucial to adopt some targeted measures to assure suitable competitive conditions, which guarantee equal potential accessibility to all carriers and safeguard the end-consumer.

From an international point of view, the opening to more competitive forms can be achieved with the revision of bilateral agreements. In Europe the first stage of liberalization began in 1987, when the first of the three "*deregulation packages*" became effective; these packages have led to the creation of a *Common Aviation Area* through a process which took almost ten years. In this area all the UE carriers have in theory free access to domestic and intra-European routes, with no limitations on fares and on the capacity offered. The first two "deregulation packages" can be defined as a homogenization of current bilateral agreements (Williams, 1993); the third "deregulation package," introduced in 1993, represents the most important step towards creating a single European market with no limitations on fares, capacity and frequency. The reform gives the right to enter onto the intra-European routes to every airline which has a permit obtained by one of the States members (EEC Council, n. 2408/92 July 23rd 1992, concerning the accessibility of the Community air carriers to the intra-European routes) and substitutes the nationality requirement with the idea of "community" (50% of the carrier must be owned by members of the European Economic Community). Deregulation actually ended in 1997 with the abolition of the double assent[1] on fares, which were temporarily in force from 1993 to 1997, and the concession of cabotage rights, meaning that a carrier, which has a permission obtained by another European State, has the right to serve a state inter-route; it is not necessary that this route represents the continuation of an intra-European route.

There has been a lot of literature which has dealt extensively with the liberalization of the air transport industry. Attention to the efficiency of deregulation and the growth of the air transport industry is also justified by the unquestionable forward boost, which the aviation industry has given to the overall economy of the area (ACI, 2004; Graham, 2003); research carried out by the *Federal Aviation Authority* (Fisher, 2003) estimates that for every 100 jobs and US$100 produced by the aviation industry, 717 jobs are generated due to "indirect" and

[1] The double assent process provides that the airline fare must be approved by both the States linked by the route.

"catalytic"[1] effect. In global market economies, air transport is part and parcel of transport systems and as this, like other *utilities*, is used by many industrial sectors and such effects influence their performance and their potential for growth.

The deregulation of the US domestic market (1978) enabled researchers to analyze strategic/behavioral reactions of a whole sector, characterized by strict regulations and then sudden entry into a free market. The liberalization of US market, as widely expected, promoted the efficiency of the system and brought a reduction in average profits. At the same time, documented research shows other effects, such as a huge development of *hub & spoke* strategies, waste and increases in the complexity of the fare system and the presence of price differentials due to the hub dominance (Borenstein, 1989). This research basically agrees that the development of the US market after deregulation has made it less competitive, underlining the need for a re-regulation of the industry (Gesell, 1990).

The deregulation process in Europe, as described, has been more gradual and presents some differences compared with the American process (Nijkamp, 1996). The following are the most important differences: the role of national interests, limited distance (which makes it impossible, from an economic point of view, to use the *hub & spoke* system for intra-European routes), limited number of routes with a volume sufficient to guarantee competition, the different link between airlines and airports. Doganis, for example, has widely analyzed economic and strategic aspects of the industry (Doganis, 2001, 2002): among the most significant factors in the development of the European market after liberalization is the birth and spread of *low cost* airlines, a proliferation of strategic alliances, limits imposed by international bilateral agreements which make it impossible for the industry to establish itself and a different proprietorial and competitive structure of national flag carriers. The complex link between changes inside the industry and the impact of foreign events, such as the crisis after September 11th 2001, make it more difficult to evaluate the positive aspects of new regulation and of the current competitive dynamics.

To conclude, it is neither evident which kind of market and airport network the system is turning into, nor it is clear which measures *policy makers* had to adopt to guarantee the maximization of efficiency goals and social welfare. The forms of competition developed after deregulation are complicated, traditional *business* model and the *low cost* model have different *targets* with the market and they only partially overlap; competition is now coming also from high speed train, especially on short range dense route (e.g., all flights between Frankfurt and Cologne have been replaced by train/ground transportation). This situation has led to a market structure which is fundamentally not really clear cut. There are evident advantages for the consumer in terms of volumes and fares offered on some routes, those which are characterized by the entry of aggressive *low cost* carriers (Williams and Mason, 2003) but, even in this case, liberalization fostered the process rather than created it: although low cost carriers appeared mainly after the liberalization, special (low) fares had been applied practically from the beginning of "mass tourism" (for Germany see Neckermann, Hapag-Lloyd).

At the same time, international alliances and bankruptcies of newcomers foster market concentration processes, causing perplexity about its real competitiveness (Morrell, 1998) and about the efficiency of the current structure. Thompson (Thompson, 2002) underlines how liberalization in France increased the predominance of *Air France* in the domestic market, damaging the level of the service in minor airports. The survey carried out by the Italian Competition Authority (AGCM) and by Bacelli and Senn (Bacelli and Senn, 2004) analyzes the situation in Italy, pointing out the presence of routes which took advantage of the increase in competition but, at the same time, there are others on which the effects of liberalization are not really clear. The research edited by Padoa Schioppa Kostoris (Padoa Schioppa Kostoris, 1995) shows how the peculiarity of the industry makes the evaluation more difficult: it is in fact an oligopoly characterized by substitute and complementary goods and services.

Therefore, the study of the effects of liberalization can not set aside the consideration of indirect competition generated by partially substitute goods and services, as for example alternative routes. This study aims to show what the European air transport competition looks like eight years at the conclusion of the deregulation process. In the first part we outline briefly the main features of the air transport industry and the general European background; the empirical research is made of three sections which analyze the structure of direct competition, the forms of indirect competition and the main causes of fare structure in relation to the intensity of competition respectively.

The first section of the study analyzes the level of market concentration, defined as a link between two specific airports. The market share is the result of the percentage of passenger seats offered by every

[1] The catalytic effect can be, for example, an increase in commercial or industrial activities in the neighbouring area (see Graham (2003) for further information).

airline in comparison with the overall number of passenger seats available for sale on the route (Carlsson, 2002). The study considers the number of monopolistic routes, as research commissioned by CAA (Common Aviation Area) and by the EU (E.C., 2003), in order to evaluate the possible presence of factors which contribute to create such a market configuration. The analysis of the single route market structure is not enough to understand the development of strategic choices and of carriers' market power. Indeed, as addressed in the second part of the paper, monopolistic routes can certainly be maintained if the economies-of-scale do not allow more than one flight/carrier per day (or in a given period of the day/week). Moreover, an airline, even though it has the monopoly of a route, can not be able to use its market power for the presence of an alternative route, for example, or if the monopolistic route represents a "*feeder route*"[1], through which it is possible to converge more passengers on a main route characterized by a competitive system. In other words, the industry is characterized by network economies and by the presence of many imperfect substitutes. The outcomes of the study point out that liberalization effects characterize only a limited part of the *network* in a direct competition form.

The second section of the paper analyzes the presence of alternative routes. The basic idea is that airports user networks are not separate, meaning that passengers not only choose the nearest airport, but also between all the airports which serve the region (Ashford and Benchman, 1987). Fewings (1999) examines the presence of European airports with user networks which overlap each other and are potentially in competition, pointing out the presence of a high number of airports within less than an hour distance. This is partially due to the development of secondary airport, often economically sustained by local authorities in order to attract business (in all form) within their area.

In this study we aim to evaluate the presence of airports potentially in competition and the existence of routes with the same destination inside them. Furthermore, we analyze the routes to hubs, underlining the situations in which it is possible to reach particular intercontinental destinations, departing from a minor airport and through the use of different *hubs.* The results show a large number of alternatives as for the routes departing from minor Italian airports.

Finally, the third section provides an evaluation of the competition effects on the fare system. Domestic and intra-European routes, which depart or arrive in Italy, represent the reference fare sample. The studies carried out by Alderighi et al. (2004) and by Carlsson (2002) already point out the mutual relation between the competitive structure of the route and fares. Our study is part of this context and aims to analyze the main causes of the overall level and the dynamics of fares, including the effect of indirect competition.

1. Some features of the air transport industry

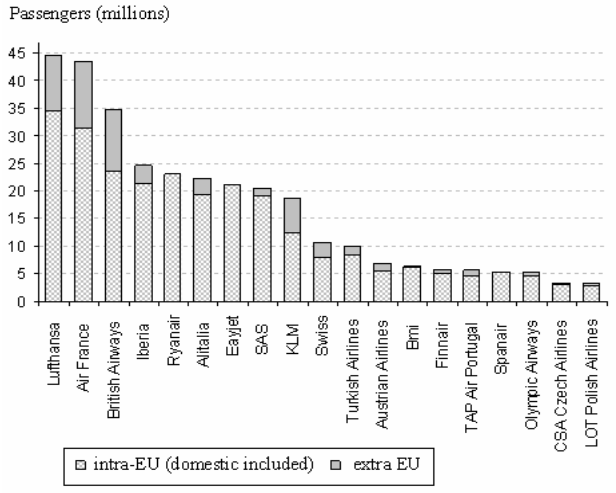
The air transport industry provides a service characterized by the presence of a network system and by an inelastic supply in the short term. Flight frequency and capacity of the aircrafts used determine the size of the supply on scheduled flights. Unlike *charter flights*, scheduled flights aim to provide a definite and non-stop service, with a specific flight scheduling. Aircraft capacity depends on fleet composition, which can not be easily modified in the short-medium term. Therefore, after flight scheduling fixing and communication, both the supply level and a large part of the overall costs become evident; that's why within the capacity limits imposed, the incremental cost of an additional passenger is not very important. Airlines' pricing policies, in a free market system, therefore tend to maximize profits, discriminating between passengers on grounds of their willingness to pay and considering advance booking as a reference criteria.

The presence of economies of scale, density and network, which can create market entry barriers, represents one of the main economic features, which is useful to consider the need for a regulation of the air transport industry. Economies of scale come mainly from the use of bigger aircrafts, while economies of density from better resource and facilities allocation as frequency increases. Furthermore, we can see an over proportional increase in the demand when frequency rises: this is the *Mohring effect.* Network economies are mainly characterized by an increase in the average number of passengers on a route, in virtue of minor links supplied by arrival and departure airports of the route; such mechanism represents the basis for the *hub & spoke* strategy, which aims to concentrate minor air traffic on the main airports (hub), among which it is possible to establish high frequency and density links. Network and density economies can influence price strategies on single routes. An airline which tries to maximize the overall return can, for example, adopt different profit margins for each route. This aspect makes the competitive evaluation more difficult; in fact, the evaluation of the strategic/competitive background has to take the capacity and the overlapping level of single *competitor* network into account.

[1] "Feeder routes" link hubs with minor destinations and enable passengers coming from suburban areas to reach intercontinental destinations.

2. Picture of the carriers operating in Europe and in Italy

2.1. European carriers. National flag carriers are the main European operators, recently followed by low cost carriers. Regional carriers represent a third type of the category; they operate on minor routes, using aircraft with less than 100 passenger seats and often carrying out feeder activities to the hubs, meaning that they transfer to the main airports passengers with an intercontinental destination, within hub & spoke strategies. The main traditional European carriers are Air France-KLM, Lufthansa and British Airways, while low cost industry is dominated by Ryanair and Easyjet. Figure 1 shows the number of passengers carried by some of the main European carriers. Three world alliances (Skyteam, Star and One World) made of quite all the world traditional scheduled carriers dominate the air transport industry. The three big traditional European carriers are in competition since they belong to different alliances.

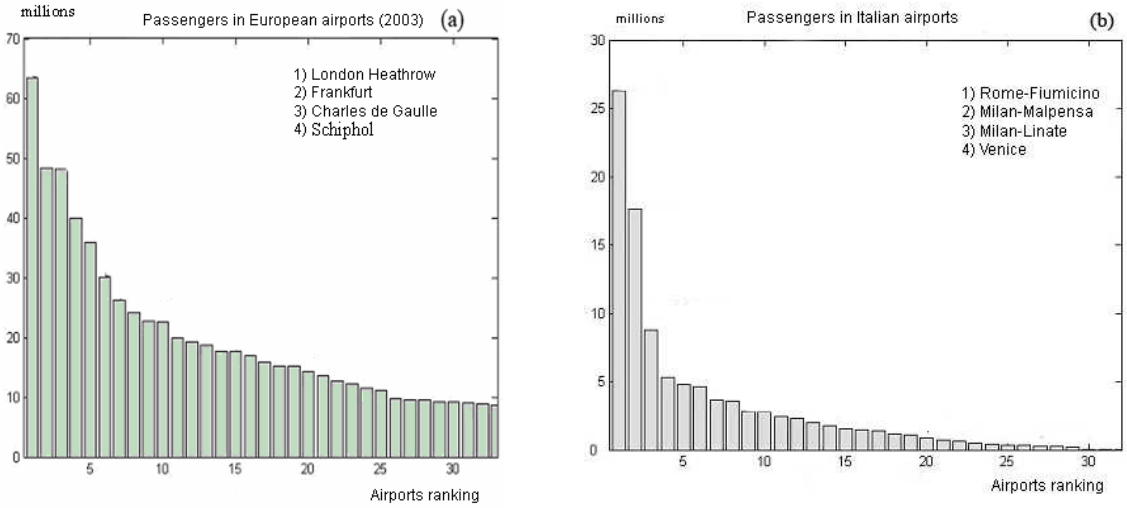


Source: own elaboration on company Report.

Fig. 1. Annual number of passengers carried by the main European carriers (2003)

The development of world alliances encourages concentration processes of traffic flow towards the hubs; ideally there could be three hubs, one for each alliance, if there weren't problems of congestion and capacity development of such airports. From this point of view there is no promotion of competition for the routes, on the contrary the consideration of the opportunity to choose between different hubs becomes important. Low cost carriers use point to point strategies for intra-European routes and serve minor airports as well (especially Ryanair), fostering direct competition for the routes and in particular the development of alternative routes.

2.2. European airports. In the European airport network there are few big hubs, which manage most of intercontinental traffics. More than 20% of passengers of all European airports pass in the first four airports: London Heathrow, Frankfurt/Main, Paris Charles de Gaulle and Amsterdam Schiphol. Figure 2 shows the traffic volume in the main European and Italian airports. Every country generally developed a main airport, which actually represented the (ex) national flag carrier's hub, as well as few national airports and a series of minor airports. The Italian network, as the German ones, has two hubs: Rome Fiumicino and Milan Malpensa. In 2003, 47 Italian airports registered the presence of scheduled flights; 32 airports recorded an annual traffic of over 100.000 passengers and over a million in 19 airports. The spread of low cost carriers fostered the development of minor airports with growth rates higher than the average in the last five-year period.



Source: own elaboration on ACI Europe and Air Transport Intelligence database.

Fig. 2. Distribution of the passenger number on the European (a) and Italian (b) airport network (2003)

3. Description of the sample

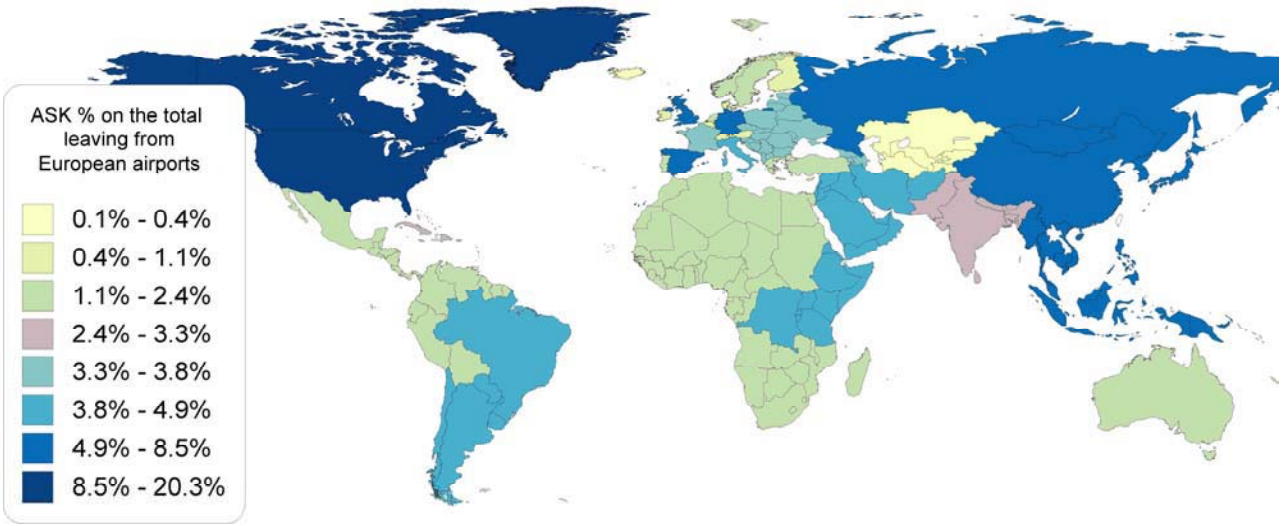
The empirical research is made in three stages: the analysis of the single route competitive structure, the identification of alternative routes[1], and the study of fare levels, which characterize the routes in relation to the competition forms.

Data collected at the first two stages of the research show the weekly number of passenger seats available for sale on scheduled flights in July 2005, as indicated in the OAG (*Official Airlines Guide*) database. Thanks to these data we can identify flight frequency and the number of seats and ASKs[2] supplied by different airlines on each route. Level of ASKs and seats are output indicators used both in literature (Burghouwt, 2003) and in international statistics. Data actually describe the output produced. On the contrary, the output sold can be identified only using the full flight coefficient. Furthermore, data only refer to scheduled flights; it is not therefore possible to analyze the role played by *charter flights*.

The analysis of the market structure of each route was carried out on every flight departing or landing in Western Europe airports. Figure 3 shows the distribution of traffic flows leaving from European airports: the high number of routes and operating airlines is evident; this fact confirms the central role of Europe in the East-West routes. The same reference sample has been used to identify intercontinental destinations, which can be reached leaving from minor airports and using alternative hubs.

The geographical location of the airports is necessary to analyze the presence of alternative routes and it is obtained out of *Aviasolution*'s cartographies; the analysis has been carried out only referring to those flights which leave and land in Europe. Table 1 shows descriptive statistics of intra-European routes: they include 491 airports. Italy is the fourth country as for the volume of seats supplied and has a number of operating airlines higher than the average.

The third stage of the empirical research compares previous stage data to the fare levels of a sample of routes. Price data collected show the minimum daily value available on domestic and intra-European routes leaving from Italian airports. Data were collected from web sites and include 162 routes. The survey registered the available prices online in July 2005 for each route (recording booking prices of flights leaving the day after and on all days until 35 days from the survey date); the overall number of surveys is equal to 62,424. We are aware that July, even it still represents an enough time windows, may be not necessarily very representative, since business travel is relatively low, while holiday travel is higher. So some conclusion needs to be interpreted, likewise the effect of GDP which may be distorted because of the lower than average presence of business traveller.



Source: own elaboration on OAG flight scheduling as of July 2005.

Fig. 3. Distribution of traffic flows leaving from European airports

[1] Including the possibility to use alternative hubs in order to reach intercontinental destinations, even departing from minor airports

[2] ASK (Available Seat Kilometres) is a measure of airline passenger capacity. It is calculated by multiplying the number of passenger seats available for sale on each flight stage by the stage distance.

Table 1. Intra-European and domestic traffic data

Geographical area	Total routes	Total weekly flights	Total seats supplied	Number operating airlines	Number of airports*
Austria	154	2,272	205,476	36	6
Belgium	92	1,773	189,248	31	3
Cyprus	57	406	67,054	19	3
Denmark	132	2,956	292,422	39	9
Finland	114	2,243	215,687	16	22
France	670	12,943	1,298,529	85	56
Germany	1,062	16,623	2,045,952	79	41
Greece	399	3,272	383,727	36	37
Iceland	43	441	33,405	7	13
Italy	713	11,037	1,361,657	86	43
Luxembourg	50	400	28,225	10	1
Malta	40	314	27,340	12	2
Netherlands	155	3,194	364,660	45	6
Norway	389	7,534	655,196	32	50
Portugal	205	2,442	297,089	45	14
Republic of Ireland	175	2,183	283,251	34	9
Spain	932	15,259	2,024,564	73	41
Sweden	231	4,718	426,011	42	39
Switzerland	167	3,252	329,858	49	6
Turkey	216	2,641	419,689	26	29
UK	1,149	19,274	2,116,767	82	61

Note: * Airports which operated scheduled flights in July 2005.
Source: own elaboration on OAG flight scheduling as of July 2005.

4. Analysis of the competition forms

4.1. Direct competition. The analysis takes the level of direct competition on each route into account and it was carried out on every national and international route departing or landing in Europe. Data point out that 68.7% of the routes are served in a monopoly system. The study is an updating of the surveys carried out periodically by the CAA and the European Commission (E.C., 2003). The outcome of this preliminary analysis generally leads to support the free market "failure", making the re-regulation necessary; the same need emerged from the conclusions of many studies about American deregulation (Gesell, 1990). Table 2 shows a higher number of domestic routes served in a monopoly system and a great indifference among the other types of routes.

Table 2. Destination and market structure of the routes departing or leaving in the European airports

Number of airlines that serve the route	All routes	Extra-European routes	Intra-European routes	Domestic routes
1 Route in a monopoly system	68.7%	66.8%	69.9%	76.0%
2 Duopoly	22.3%	25.6%	2.,3%	17.7%
3	6.6%	6.1%	7.0%	4.5%
>3	2.4%	1.5%	2.8%	1.7%

Source: own elaboration on OAG flight scheduling as of July 2005.

All the analyses have been carried out taking the competitive structure into account, both through the number of carriers in competition and by using the Herfindahl-Hirschman Index (HHI), in order to calculate the market shares as a percentage of passenger seats supplied compared with the overall number of seats available on the route. The outcomes are similar and they show that the number of competitors on the route is a good proxy for the market structure. The multiplication of the passenger number (*Mohring effect*), a feature of those airlines which offer a higher flight frequency (frequency is the main factor that determines the difference in passenger seats supplied, since in more than 90% of the cases competitor airlines serve the route using aircrafts with almost the same capacity), is such as to determine a gradual decrease in passengers for those airlines with less frequent flight scheduling; this situation can drive the airline out of the market. That's why airlines generally offer similar number of passenger seats. Therefore, in this case, the "competitor number" is easy to understand as a criterion and it does not distort the evaluation of the competitive structure. Table 3 illustrates the analysis carried out in Table 2 using the HHI index as market value.

Table 3. Analysis of the market structure using the HHI index

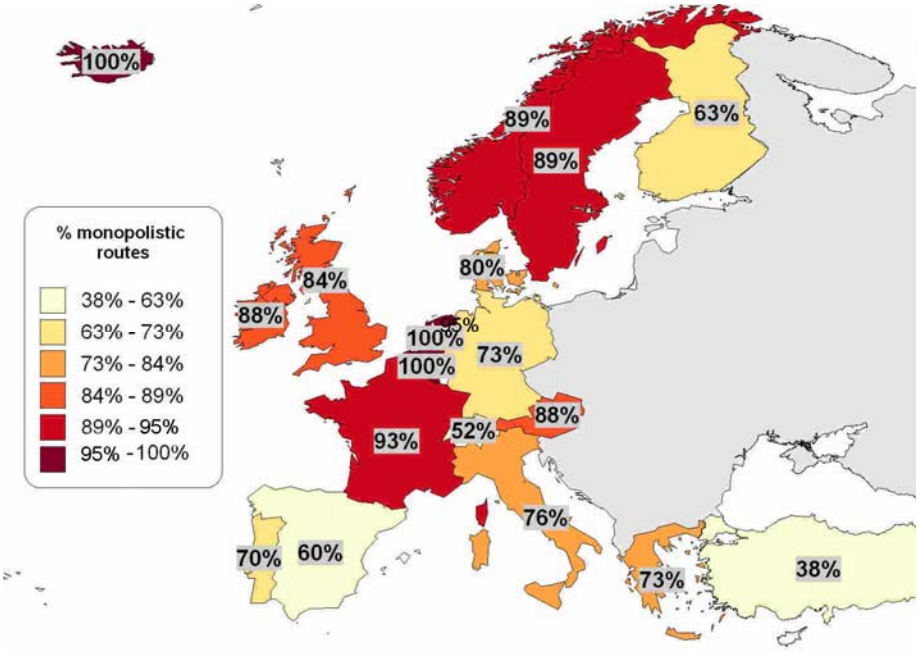
HHI range	Concentration referring to a market structure like:	All routes	Extra-European routes	Intra-European routes	Domestic routes
1	monopoly	68.68%	66.82%	69.86%	76.01%
0.68-1	2 companies with 80%-20% market shares*	2.68%	1.21%	3.38%	4.78%
0.5- 0.68	2 companies with 50%-50% market shares*	20.10%	25.02%	17.37%	14.09%
0.33-0.5	3 companies with 33%-33%-33% market shares*	7.01%	6.00%	7.56%	4.01%
0-0.33	More than three companies	1.53%	0.96%	1.84%	1.11%

Note: * The example refers to an HHI equal to the lower limit of the range.
Source: own elaboration on OAG flight scheduling as of July 2005.

Data do not show that market structures are consistent with the different normative systems of intra and extra-European markets, while they seem to suggest a diversification of national and international routes; this kind of diversification ended with the concession of cabotage rights in 1997. In fact, liberalization removed barriers in the European market, while some restrictions on routes with countries not belonging to the *European Common Aviation Area* remain, as for example limitations of airlines' property[1]. Therefore, we should generally expect a great indifference between national and intra-European routes and less competition in intercontinental flights, which present a higher degree of difficulty in terms of accessibility for the airlines.

The discrepancy towards expectations is probably due to a higher profitability of big intercontinental routes, which generates greater pressure to enter onto such markets; this situation is offset by the presence of higher market entry barriers.

A reason for lower competition in domestic markets is that foreign airlines could have to face market entry barriers, which present different kinds of obstacles in respect of directives. Domestic network structure can represent another reason: national routes as a whole are characterized by a higher incidence of low traffic volume routes, which could be unattractive. Such two reasons can have a different impact as for the *policy*. In the first case, market entry barriers are linked neither to the route structure costs nor to the carrier efficiency which serve them at the present time; these barriers represent a restriction on the possibility to obtain more efficiency incentives. Figure 4, that shows the percentage of domestic routes served in a monopoly system, points out the high French value, while there is nothing surprising, for geographical features of the regions, about the high degree of monopoly in Scandinavian countries.



Source: own elaboration on OAG flight scheduling as of July 2005.

Fig. 4. Percentage of domestic routes served in a monopoly system

[1] See Doganis (2001) for further information about the effects generated by restrictions on proprietorial structure of the airlines operating on the routes regulated by bilateral agreements.

In the second case, the presence of a single carrier on a route is due to economic-structural reasons: the presence of two carriers at the same time is not economically convenient because of the low volume level. In order to evaluate the importance of route "dimension" for the definition of the market structure, we analyzed the level of ASKs supplied every week on each route, leaving the type of route (national, intra or extra-European) out of consideration and we carried out a percentile analysis of market structures.

Table 4. Percentile analysis of the relation between market structure and ASK level supplied on a route (Flight scheduling: July 2005)

Quartile	Weekly supplied ASK range	Percentage of routes characterized by the presence of:			
		1 carrier	2 carriers	3 carriers	>3 carriers
1st	0- 419,646	95.1%	4.5%	0.2%	0.2%
2nd	419,646- 1,163,400	81.0%	17.4%	1.4%	0.2%
3rd	1,163,400- 3,427,958	58.2%	32.5%	8.0%	1.3%
4th	3,427,958- 288,964,753	40.5%	34.7%	16.8%	8.0%

Source: own elaboration on OAG flight scheduling as of July 2005.

Outcomes of the percentile analysis underline a strict correlation between route dimension and competitive structure: in the first quartile, which is made of routes with lower ASK levels, more than 95% of routes are served in a monopoly system; this figure falls by 40% in the last quartile. The presence of a high number of routes in which there is a lack of direct competition is therefore mainly due to structural features of the air transport industry. Such outcome suggests that a carrier will have a higher opportunity to enter in competitive minor routes, only if it is convinced that its efficiency towards the *incumbent* can help the carrier in driving it out of the market and if long-term benefits offset possible losses that can affect the carrier during a temporary period, in which both airlines serve the route.

In Italy the level of monopoly routes appear aligned with the Europe. If we apply the share of monopoly route by ASK range shown in Table 4 to the ASK distribution of Italian domestic routes we find a theoretical percentage of monopoly routes of 74% against the effective 76%.

4.2. Competition between alternative routes (indirect competition). In this section we aim to analyze alternative routes which both have the same origin and destination (the single route was considered the reference market in the direct competition analysis). Documented models analyze indirect competition considering the dynamics which determine the airport demand allocation in the same region (*Airport Demand Allocation Models*). Gosling, in his literature review (Gosling, 2003), points out that the passenger's choice depends on time and costs to reach the airport, flight frequency and fare level.

The interest towards competitive potential, coming from the presence of alternative routes, is high thanks to the choice of many low cost carriers, *Ryanair* in particular, to develop their network in minor airports. Such decision is changing the whole European airport *network* structure, stressing the importance of indirect competition. Competition efficiency between alternative routes could reduce the congestion in the main airports and, in general, partially avoid the slot allocation problem. Fewing's study (Fewings, 1999) points out the presence of 32, 34 and 28 airports within less than an hour distance, in France, UK and Germany respectively. Our study considers both the presence of airports potentially in competition and the presence of routes with the same destinations in such airports.

The identification of alternative routes and the evaluation of the degree in which they can be mutual substitutes represent the main crucial aspects of the analysis. Hardly ever does passenger's journey begin and end at the airport: the route is only a part of the journey which connects the origin and the final destination of the passenger. Passenger choice of an alternative airport depends on time and cost changes to the whole journey (Mandel, 1999, defines it as disutility degree); therefore it depends on a series of factors, among which:

- the origin and the final destination of the passenger;
- the distance between the airports;
- the introduction of the airport in transport facilities and in general on their development degree;
- the cost of other means of transport.

All these factors need an accurate evaluation in terms of time and costs of the means of transports in the geographical area considered. That's why most of the studies carry out the analysis in only one region: San Francisco Bay, for example, is one of the cases presenting the highest number of studies (Harvey, 1987; Pels, 2003). Mandel (1999) carried out one of the broad analyses of the German airport network in Europe.

In our analysis we set some general limits to identify an alternative airport. The *origin-distribution surveys* carried out by airports and national authorities (CAA for example) point out that, in general, the higher number of passengers comes from areas which are within 1-1.5 hour distance of the airport. Fuellhart (2003) shows the presence of competition among airports within 60-90 miles top distance.

Since we do not have time information, we used a distance limit between the airports equal to 100 kilometres, as agreed. The time needed to reach an airport seems to be increasingly important, so the presence of highways or jams may lead to alternative decisions; availability of more precise time accessibility measure on a broad scale may be used in future in order to overcome such limitation.

Using this kind of limit, there are 371 European airports (75%) with at least one potential *competitor*. The average distance is 48.1 kilometres. Furthermore, in 58.2% of the cases the alternative airport belongs to the same category, while there is a difference in one category in 26.2% of the cases: these data emerged from the airports classification according to traffic volume used by the European Commission[1]. Even though the airport *network* development, set by national planning, did not expect to foster competition between airports, data show that today there is much competitive potential; this is due to congestion problems in main airports and to low cost companies' choices. In Italy the percentage of airport with one potential airport competitor is greater than average due to a higher fragmentation of the airport network especially in the North of Italy.

Table 5. Number of airports with alternative airports (2005)

Potential competitor number within a 100 km range	% airport in Europe	% airport in Italy
0	24.6%	23.8%
1	22.4%	42.8%
2	20.9%	11.8%
3	16.9%	11.8%
4	15.2%	9.8%

Source: Aviasolution's cartographies processing.

Available data refer to European airports, therefore we only considered those routes that depart and land in European airports, while the direct competition analysis included all the routes from and to Europe.

We considered links between original route airports and all their alternative airports in order to identify those routes potentially in competition (Fig. 5).

As previously said, the choice of a passenger to use an alternative airport depends on logistical problems in comparison with the original journey. We assumed a uniform distribution of passengers' origin and final destination in the areas nearby the airport; therefore the average extra journey, generated by the choice of using an alternative airport, is equal to the distance between the two airports.

[1] The European Commission suggests 5 passenger bands according to the annual traffic volume: <1 million, 1-5 mil, 5-10 mil, 10-25 mil, >25 mil.

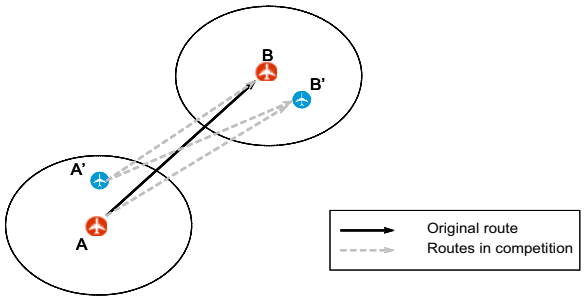


Fig. 5. Example of indirect competition among routes

It is plain that the importance of the extra journey is proportional to the route length; therefore we decided not to consider those links, which were 10% longer than the original route. Looking at the example in Figure 5, assume that the original route A-B is 1,000 kilometres in length and the broken line area of the range is equal to 100 kilometres, A'-B and A-B' are alternative routes, since A-A' and B-B' (the extra distances of the two routes respectively) are less than 100 kilometres in length (the top limit in which the airport would not be considered); A'-B' route could be a possible alternative route only if A-A'+B-B' is less than 100 kilometres in length.

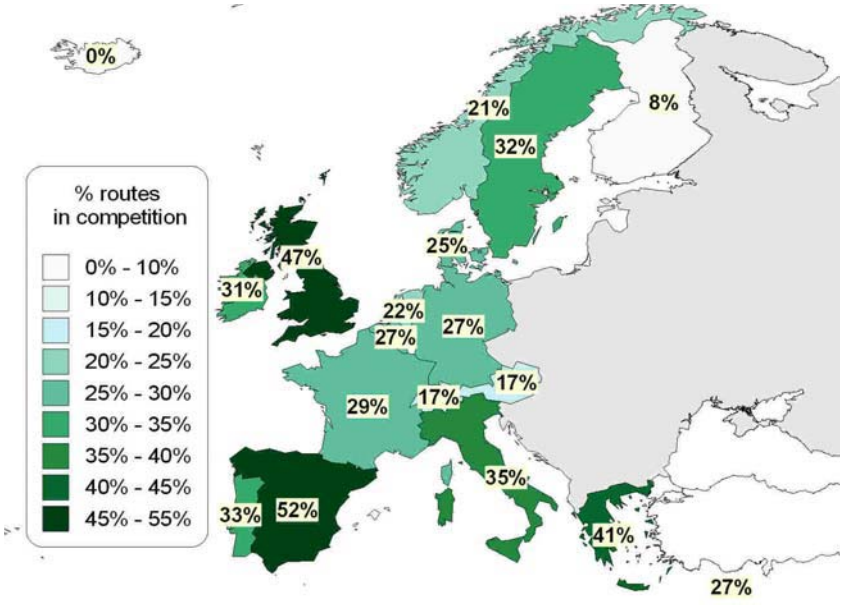
Using such limits, there are 1,061 routes that have an alternative one: they represent the 33.1% of the whole intra-European routes (Table 6). Furthermore, the routes with an alternative represent about 50% of the ASK supplied on intra-European routes. In some cases even alternative routes are served by the same airline. Considering all the alternative routes as a single market, the market share of the dominant airline noticeably decreases (Table 6) in comparison with the outcomes of direct competition.

Table 6. Features of the routes in case of indirect competition

Routes with alternative routes:	ASK % on the total	Routes % on the total	% of monopolistic routes*	Average ASK	ASK % dominant airline
0	49.37%	66.9%	78%	1,130,850	92%
1	26.36%	20.7%	18%	1,956,174	67%
2	13.62%	7.2%	7%	2,914,462	56%
>2	10.65%	5.2%	1%	3,119,687	47%

Note: * When both the original and the alternative route are served by the same company.
Source: own elaboration on OAG flight scheduling as of July 2005.

The geographical analysis in Figure 6 shows the percentage of routes with an alternative route, compared with the overall number of domestic and intra-European routes. In Spain, the high number of routes in competition refers in particularly to the routes to the islands. Italy is the fourth European country as share of route subjected to indirect competition. There are alternatives on domestic routes as well and they represent the 27% of the overall routes in case of indirect competition.



Source: own elaboration on OAG flight scheduling as of July 2005.

Fig. 6. Percentage of routes with at least one alternative route

4.3. Other forms of competition. A special analysis has been carried out for *feeder routes* towards the *hubs*. In Europe, the *hub & spoke* strategy can be used almost exclusively for intercontinental routes because of the limited geographical extent; therefore, *feeder routes* basically carry passengers coming from minor airports with intercontinental final destinations to the main hubs. In this case, competition is not among routes which end in airports of the same area, but among *feeder routes* which depart from the same airport and lead to different *hubs*, from which it is possible to reach specific intercontinental destinations. Let's make an example: leaving from the airport in Florence it is possible to reach Los Angeles making a stopover at the hub in Frankfurt (*Lufthansa*) or at *Charles de Gaulle* (*Air France*). The link with the hub can be in competition for more than one intercontinental destination (Table 7). To make the link actually possible, people do not have to wait too long in the hub. The analysis set 2 hours of interconnection as a limit.

There are 309 airports from which it is possible to reach intercontinental destinations only through a stopover in a hub. 25% of them (80 airports) enables to reach at least one international destination choosing among different hubs. There are 374 *feeder routes* in competition. In Italy this form of potential competition appears particularly high, there are 20 airports from which it is possible to reach at least one intercontinental destination through two different hubs.

Table 7. Competition features among routes with alternative hubs

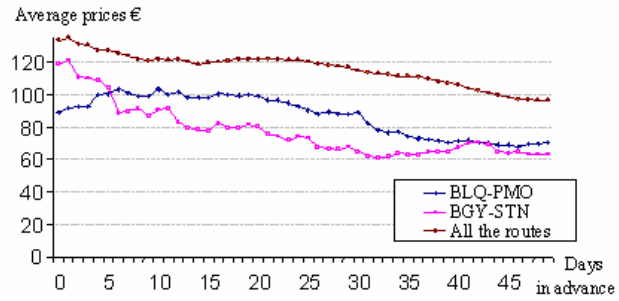
Number of airports	Feeding routes in competition	Routes average ASK	ASK (median)	Average number of alternative routes	Average number of final destination which can be reached through both the hubs in competition
80	374	27,763,598	2,574,804	2.8	4.6

Source: own elaboration on OAG flight scheduling as of July 2005.

5. Price analysis

Previous paragraphs analyzed the intensity of the main competition forms in the air transport industry. This section aims to analyze those factors which determine the fare structure, paying particular attention to the competition forms previously described.

Fares are difficult to analyze, since there is not a single value of reference for each route; price changes, for example, according to the class (*first, business, economy*), to the flight day and to the days in advance of the ticket booking. The fares registered in the sample of this study, the lowest supplied on each route, referred to *low cost carriers* in almost all the cases. The latter differ from the traditional model in *pricing policy* as well: there is only one fare class which generally increases as departure date nears. The use of a single average fare class for each flight, which does not take the advance booking into account, often seems not very significant (Fig. 7).



Source: companies web site collected in July 2005.

Fig. 7. Average prices time trend of some of the analyzed routes

We can represent the fare dynamics in a more proper way using a three-dimensional space. The single route fare (dimension 1) increases as departure date changes (dimension 2) and according to the days in advance of the ticket booking (dimension 3).

The analysis model is composed of panel data (route – flight date) in which the advance booking degree is defined by the use of specific *dummies*. In practice, the analysis relates to the typical structure of panel data (1) using a fictitious temporal variable composed of flight date and days in advance of ticket booking[1].

$$y_{it} = u_i + \alpha \cdot x'_{it} + \varepsilon_{it}. \quad (1)$$

Many of the features we want to test are specific for each route; their analysis is made in two steps. The first step carried out the panel analysis.

The Hausman-Taylor specification test shows the presence of the fixed-effects panel data. The fixed-effects panel analysis enables the consideration of variable time parameters effects (the flight day for example) and the evaluation of single route specificity in a single parameter (u_i). Table 8 shows the outcomes of the analysis. Independent variables used represent the days in advance of the ticket booking and the flight day. Data processing confirms that low cost carriers' price strategy provides an average increase in prices; in fact, *dummy* coefficients of the days in advance are important and have a plus sign. More detailed, there are significant fluctuations in price during the week before the departure date, while important changes over the next period can be registered only with weekly time intervals. Tuesday, Wednesday and Thursday seem to be the cheapest day, while Saturday and Sunday have the highest fares.

The second step analyzed the role played by route features on the u_i parameter, obtained thanks to the panel analysis, which shows the overall effect on prices caused by specific features of the single route. The first step can also represent a way to sterilize prices from the influence of variable time factors.

Table 8. Fixed-effects panel analysis of the very low available prices on the route sample in hand

Fixed-effects (within) regression		
Panel with gaps: Number of obs. = 62424 Number of groups = 162	Obs per group: min = 27 Avg = 385.3 Max = 871	
R-sq: within = 0.1075 between = 0.0112 overall = 0.0514	F(1562247) = 49.77	
Variables	Coeff.	t
Independent variable: Route price		
Const.	82.97	147.43***
Day of the week Dummy:		
Sunday	28.11	55.30***
Monday	15.50	30.77***
Tuesday	2.66	5.24***
Thursday	3.56	7.38***
Friday	11.82	22.73***
Saturday	25.11	48.83***
Dummy of the days in advance:		
1 day	23.43	25.30***
2 days	20.68	22.95***
3 days	16.81	19.15***
4 days	13.07	15.20***
5 days	10.89	13.01***
6 days	8.13	9.93***
2nd week (7-14 days)	4.44	8.26***
3rd week	3.30	6.08***
4th week	0.98	1.70*

The route specificity registered is divided into three types: competitive structure, demand and cost level. We analyzed direct competition with the HHI index (Carlsson, 2002) and the effects of indirect competition introducing the number of potential alternative routes. The criterion used to define an alternative route is consistent with the analyses carried out in previous paragraphs (distance between airports: less than 100 kilometres; extra route compared to the flight length: less than 10%). Furthermore, since the intensity of the competitive pressure is certainly linked to the *competitor* dimension, we chose not to consider potential alternative routes as actually influential according to previous criteria, but irrelevant as for dimension. In particular, we did not include routes with a 20% lower offer (in ASK) than the supply level of the route analyzed.

Flight length and weekly frequency are the parameters taken as proxy of cost levels bore. As for the economies of scale and of density expected, we awaited a correlation with a minus sign for the latter. Furthermore, we introduced a *dummy* for the carrier which serves the route, in order to verify the

[1] For example: t = 200507101 (flight date: 10th July; days in advance of ticket booking: 1); t = 200507102 (flight date: 10th July; days in advance of ticket booking: 2); etc….

presence of effects linked not only to the carrier type (all *low cost*), but also to the specific airline. We finally evaluated the importance of the route taking the GDP of the region into account, consistently with the studies that show a link between GDP and passenger number (Morrell, 1998).

Table 9. Outcomes of the regression analysis of the effects on prices due to the route specificity (u_i)

Variables	Coeff.	t
Independent variable: specific parameter of the route u_i		
Const.	-45.03	-2.53**
GDP of the original region	$4.11 \cdot 10^{-08}$	0.50
GDP of the destination region	$4.48 \cdot 10^{-08}$	0.94
Route length	0.05	6.50***
Flight frequency	-0.94	-2.44**
HHI index on the route	30.06	2.14**
Alternative routes number	-5.58	-2.07**
Airline's dummy		
Aerlingus	34.16	1.82*
Airberlin	-9.21	-0.76
Alpieagles	-15.30	-1.00
Easyjet	-32.66	-2.89***
Germanwings	-41.21	-4.69***
Hapaglloyd	-5.78	-0.45
Hapaglloyd express	-29.77	-3.40***
Jet2com	-40.37	-3.08***
Ltu	-12.52	-1.08
Meridiana	8.64	1.12
Monarch	-103.27	-8.88***
Ryanair	-43.96	-4.98***
Windjet	-36.13	-2.74***
Transavia	-6.90	-0.48
R^2=0,5896		

Notes: *** significance level <0.01; ** significance level <0.05; * significance level <0.1.

The outcomes of the regression analysis were processed through the use of strong estimates in case of heteroscedasticity. The outcomes show the importance, even though not very significant (p = 0,012) of the role played by the presence of alternative routes: the coefficient has a minus sign, meaning that the presence of an alternative route reduces the route price. A high market concentration on the route increases the fare level (Carlsson, 2002).

The other control variable values largely confirm expectations. Route length is positively correlated with price, while flight frequency is negatively correlated with it, assuming the presence of economies of density on the routes. Unlike expectations and documented outcomes available, the region GDP is surprisingly not very significant (Ashford and Benchman, 1987). One possible reason is that the region GDP of the airport could not be completely representative of the airport consumer network. Moreover, this may be attributed to the fact that, particularly in smaller geographic regions with one or two big "economic or even administrative conglomerates" there is a wide gap between the GDP produced and consumed in a given region.

The choice of the airline has an influence: there are important price differentials between the carriers; *Monarch* (charter carrier with a medium-little network of scheduled flights) seems to be the airline with the comparatively lowest prices, followed by *Ryanair*.

Conclusions

This study presents a great number of monopolistic routes in Europe. Documented outcomes available suggest that, in a market structure like this, airlines having the exclusive of the route can adopt a premium policy (Alderighi et al., 2004). Routes with a lower density show low competition; this fact points out the importance of route competitiveness evaluation. Deregulation analysis can not set aside the consideration of competitive pressure caused by both the presence of alternative routes and network competition.

In Italy the share of monopoly routes appear aligned to Europe considering the characteristic of the routes offered. The potential for indirect competition and especially the competition among feeder routes toward alternative European hub airports appear to be even stronger.

Fare analysis, even though it is not yet at a final stage, seems to confirm the importance of indirect competition. Such outcome points out the importance of competition forms between airports as well, especially in the development of a competitive air transport market.

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