FEP WORKING PAPERS

Research – Work in Progress – nº159, October 2004

Low cost carriers, secondary airports and State aid: an economic assessment of the Charleroi affair

Cristina Barbot

CETE - Centro de Estudos de Economia Industrial, do Trabalho e da Empresa

U.PORTO
FEP FACULDADE DE ECONOMIA UNIVERSIDADE DO PORTO

Faculdade de Economia do Porto - Rua Dr. Roberto Frias - 4200-464 - Porto - Portugal Tel . (351) 225 571 100 - Fax. (351) 225 505 050 - http://www.fep.up.pt

Low cost carriers, secondary airports and State aid: an economic assessment of the Charleroi affair*

Cristina Barbot
CETE/ Faculty of Economics of Porto
Address: Faculdade de Economia
Rua Dr. Roberto Frias 4200 PORTO PORTUGAL
Email: cbarbot@fep.up.pt
Keywords: Low cost carriers, airports, airline competition, State aid
JEL Classification: L93

Abstract

In this paper a vertical differentiation model is built in order to analyse the effects of subsidies to secondary airports, or of lower prices set by them, on the competition between LCC's and FSC's. The Ryanair/ Charleroi agreement is used as an example and as a basis for the model. The main findings are that subsidisation (or lower airport charges) benefits consumers and negatively affects incumbent airlines. However, they may be more affected by competition than by the subsidy. An empirical analysis provides a few insights on LCC's price strategies, namely that they retain rents resulting from lower aeronautical fees on dominated airports, and that their price strategy does not change with the presence of other LCC's.

* The author gratefully acknowledges the financial support of CETE and Fundação para a Ciência e Tecnologia.

1. Introduction

1.1. Low cost airlines and secondary airports

When Ryanair first set its home base at Dublin Airport, it probably faced difficulties concerning the availability of slots, congestion and high aeronautical charges. By the time it established other European bases, such as Paris Beauvais and Brussels Charleroi, Ryanair chose secondary airports in order to avoid this kind of obstacles. So did other low cost carriers (LCC's), as EasyJet at London Luton.

Two main characteristics make secondary airports attractive for LCC's: the existence of idle capacity and location.

Many secondary airports were built in order to serve regional flights from hub airports to small or medium size towns. The frequency of these flights is low, and they were not used for other purposes. For instance, the airport of Orio e Serio was probably due to link Bergamo with Rome, but until the arrival of LCC's, no one would imagine it could be a base for connections between Milan and London. Others were former military basis that were progressively abandoned. Then these airports were built with excess capacity, and their marginal costs were near to zero. Before the establishment of Ryanair, Glasgow Prestwick airport's capacity was used in 1%, and Charleroi received about 20 000 passengers a year, which is an average of 54 passengers a day (European Commission, 2004).

For LCC's, this is an important advantage for a few reasons. First, there are no problems with the availability of slots, which allows LCC's to design schedules in order to make the best use of their fleet. Second, congestion is absent and this makes possible to follow schedules in time and avoids costs of delays. Third, marginal cost is zero, and so aeronautical charges may be very low. And, fourth, infrastructures like check in counters and handling systems were practically inexistent, which makes it possible to design new ones that are simple enough to fulfil LCC's purposes.

Location is another advantage. The distance from secondary airports to the cities they serve are larger than those of main airports. Passengers face longer surface journeys to and from the city centre. But, unlike customers of FSC's (full service carriers), those of LCC's are ready for these longer journeys, as their main focus is on price (Poungias, 2003). The location advantage may come from lower wages and more labour availability, together with the fact

that these regions often face unemployment problems, and region authorities are willing to promote employment through the airport's expansion.

With excess capacity and unemployment, secondary airports and their surrounding regions' authorities are perfect partners for LCC's, as the lowering of aeronautical charges may be in interest of both. The result of this association has been successful, and if LCC's leave, for any reason, as it happened in Clermont Ferrand with Ryanair, traffic decline strongly concerns local governments.

The establishment of LCC's increased so much the traffic in secondary airports that it lead to a transformation of their infrastructures, while assuming a new role and receiving a new kind of passengers.

Table 1. Some characteristics of secondary airports

	Management/ ownership (majority)	Concentration (nºof flights) % of main airline RYANAIR	Main destinations Hub airports	Other secondary airports	Regional airports
Charleroi	Private/Local	89,7%	31,0%	38,0%	31,0%
Beauvais	Local/ Local	84,4%	16,7%	83,3%	0,0%
Ciampino	Private/ Private	63,3%	23,1%	23,1%	53,8%
Stansted	Private/Private	24,8%	12,6%	8,7%	78,7%
Girona	Public/Public	60,0%	0,0%	46,7%	53,3%
Hahn	Private/Private	63,6%	6,5%	25,8%	67,7%
Orio al Serio	Private/Private	35,0%	21,6%	24,3%	54,1%
Skavsta	Private/Private	92,3%	0,0%	87,5%	12,5%
Torp	Private/Private	WIDEROE 75,0%	30,0%	30,0%	40,0%

Source: Airports' and airlines' websites

Table 1 displays some characteristics of secondary airports. Some of them are dominated by one airline, and so become more vulnerable to changes in the airline's network strategy. Ryanair is dominant in most of the airports presented in the table, being almost a

monopoly in Charleroi, Beauvais and Skavsta. In others, like Stanstead and Orio e Serio, there is no clear dominance by any airline.

But do secondary airports effectively perform their role? Are they less expensive than hub airports? And, if so, can they offset eventual losses from aeronautical activities with revenues from concession ones?

Forsyth (2003) analyses the question of lower fares and concludes that, though secondary airports have economies of scale, there may be other factors that allow for lower costs. These factors include a greater efficiency, a lower quality service, and subsidies, among others. However, economies of scale derived from high fixed costs may not exist, as some capacity costs are often sunk.

Lower airport costs should be combined with revenues from other activities in order to allow profits for secondary airports. Non-airside (or concession) activities often provide the main part of airport's revenues. They generated from 40% to 80% of all revenues in 50 major world airports in 1999 (Oum *et al.* ,2003). Does the same happen with secondary airports? Although data is not available, it is known that their passengers usually have lower incomes and are more price sensitive. There are no connections and not so many delays, so the time spent inside the airport is shorter. Then, they should not spend so much in concession activities. On the other hand, the no frills system means that no meals are served on board and passengers should spend more in food and beverages. Besides, passengers face longer surface journeys and less availability of intermodal transport systems, which makes way for more expenses in car rental.

Brussels South Charleroi Airport currently offers 136 flights (arrivals or take-off's) a week, 89.7% of which are performed by Ryanair. It has several concession activities: three shops, of which one duty free shop, one coffee shop and car rental. The dominance of Ryanair makes the airport more sensible to the airline strategy.

Flights leaving from Charleroi are mainly to large towns (hub airports and other secondary airports). These flights account for 69% of the destinations and for 76% of the traffic.

1.2. The agreement and the issues

The terms of the agreement are well known so they will be stated here very briefly, based on the document produced by the European Commission (European Commission, 2004). In November 2001 the Walloon region, owner of Charleroi airport, signed an

agreement with Ryanair, stating special conditions for the use of the airport. These conditions involved a reduction in landing charges, a fixed price of one euro per passenger for ground handling services and a financial support for the opening of Ryanair's base and for advertisement and other forms of promotion of Ryanair's flights.

Comparing with the amounts published by the government for regional airports, the reduction in the landing fees was of about 50% and Ryanair would only pay 10% of the published handling charges (European Commission, 2004). According to the calculations of an anonymous interest party, the direct (airport) cost of departing from the Brussels region would reach 5 euros at Charleroi and amount to 32,14 euros at Brussels International Airport.

The Commission decided to open a procedure on this agreement in the basis of Article 87(1) of the Treaty, on the compatibility of State aid to firms with the common market rules.

Article 87(1) states that " Save as otherwise provided in this Treaty, any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, insofar as it affects trade between Member States, be incompatible with the common market".

In February 2004 the procedure was concluded and the reductions on landing and handling charges were declared to be incompatible with the common market, within Article 87(1).

Then, the main issue is about the statement that aid distorts competition, or, put in other words, that the agreement favours Ryanair and negatively affects other airlines that compete in the same routes. But who are the competitors?

Table 2 shows that Ryanair has from zero to five airlines competing on its routes departing from Charleroi. As SN Brussels airlines did not exist by the time of the agreement[1], and as some of the airlines fly in code sharing, this number is reduced. Most competitors are FSC's, but there are also other LCC's.

Certainly that competition may be extended. Flights from Charleroi can compete with flights from Paris or Amsterdam. In fact, Airfrance and KLM expressed comments as interest parties during the Commission procedure. So did Scandinavian Airlines, a direct competitor on the route to Stockholm.

[1] SN Brussels airlines started in February 2002. Most of its routes considered here as Ryanair's rivals were opened in 2003. Italian routes are flown in code share with Alitalia.

Table 2: Ryanair routes from Charleroi

Ryanair Destinations	Competitors Airports*	Airlines**	Number of airlines
Carcassone	no	no	0
Dublin	Dublin	ei	1
Gerona	Barcelona	ib,sn,tv	3
Glasgow Prestwick	Edinburgh	bd	1
Milan Bergamo	Linate,Malpensa	sn, az	2
Pisa	Florence	sn	1
Rome	Roma Fiumicino	az,sn,tv	3
Shannon	no	no	0
Stockolm Skavsta	Arlanda,Bromma	sk,ay,sn,aa,tv,tf	5
Valladolid	Madrid	tv,sn,ib	3
Venice Treviso	Venice Marco Polo	ay,aa,az,sn	4

* Airports where land flights of the same route with departure from Brussels Intern. Airport

**Airlines flying in the same route from Brussels International Airport

Source: Airport's and airlines' websites

1.3. Purpose of the paper

This paper intends to build a model that explains, as much as possible, the implications and effects of State aid provided by the agreement between Ryanair and the Walloon region authorities. It is not at all concerned with any critical assessment of the Commission's decision. Only economic and academic issues are expressed and analysed. However, the implications concerning the use of secondary airports by LCC's and findings can be extensive to other cases.

In order to avoid any judgements on the Commission's decision, State aid is treated in the model as a subsidy to landing and handling charges supplied by the secondary airport. The subsidy may be paid by the airport or by regional authorities. Thus the model keeps adequate to analyse any case of a secondary airport used by a LCC, even without agreements and/or State aid, where the airport charges are lower than those of hub airports.

The main issues analysed in the paper can be summarised as follows.

1. In the Commission's report Ryanair states that the agreement allowed for an increase in all traffic. But if demand grows, how is this growth split between

the LCC and the FSC? In particular, will the LCC capture passengers that used to fly with the FSC, and /or passengers that otherwise did not fly at all?

2. It is obvious that the subsidy favours the airline that receives it. If services are homogeneous, it is also obvious that it affects the incumbent(s). But does the same happen when there is vertical differentiation, or when the new entrant is a LCC?

3. Ryanair's entry in the market creates a competitive situation and competition is welfare enhancing. In what extent are incumbents more affected by fair competition than by state aid to one LCC?

4. How are the extra profits derived from the subsidy shared between Ryanair and Charleroi airport? Who benefits more, the foreign airline or the locally owned airport?

Based on a model that attempts to embody the main features of the situation on analysis, this paper tries to provide insights on these issues. An empirical test on the eventual benefits that an LCC may get from its dominance of a secondary airport, and on their main sources of competition is presented in the final part of the paper.

The paper is structured as follows. In Section 2 the model is developed and the most important findings are presented. In Section 3 the empirical analysis is detailed. Some concluding remarks follow, in Section 4.

2. The model

According to the above considerations, in a particular route Ryanair (or any other LCC) may be a monopoly or else face competition from one or more airlines. This model considers the situation of a duopoly with one LCC and one FSC exploring traffic in one route. The LCC departs from a secondary airport, and the FSC from a hub airport. The two airlines compete in prices and supply services with different qualities, and this is an important theoretical feature of the model. Vertical theory differentiation is used as a basis of the competitive game between the two airlines. The incumbent is a FSC's supplying a high quality service, while the new entrant offers a no frills service, or lower quality flights. The difference in qualities is set by a few items, such as seat density of aircrafts and the provision (or not) of food and beverages during the flights. The FSC and the new entrant's relevant variables will be denoted by the subscripts **2** and **1**, respectively, so that the former has a quality of $\mathbf{q_2}$ and the latter of $\mathbf{q_1}$.

Qualities are set previously to the game, and so they are exogenous variables. In this case, quality is associated to decisions concerning either fixed factors, like seat density or staff per passenger, or variable ones, such as the supply of food and beverages. It is supposed that there is no possibility of changing quality. In order to reduce the number of parameters, $\mathbf{q_1}$ is normalised to the unity and $\mathbf{q_2}$ is equal to "**a**". Then, "**a**" measures the quality differential, $\mathbf{a = q_2/q_1}$.

The demand for flights is derived from vertical differentiation theory, as proposed first by Gabszewicz and Thisse (1979) and Shaked and Sutton (1982), and using the simplified version of Motta (1993). A brief explanation is here provided for readers not familiar with this theory.

Consumers are potential passengers uniformly distributed (along a line) according to their quality taste parameter, **v**, which is here set between zero and the unit. They may either buy one flight ticket or none. The parameter **v** expresses consumers' utility of one unit of quality. A consumer who is indifferent between buying a low quality flight and not buying any flight at all has a value of $\mathbf{v=v_0}$ such that: $\mathbf{v_0 q_1 - p_1 = 0}$. For the consumer who values equally both services, discounted from prices, $\mathbf{v=v_t}$, with $\mathbf{v_t}$ such that: $\mathbf{v_t q_1 - p_1 = v_t\, q_2 - p_2}$.

Demand for the high quality flights, $\mathbf{y_2}$, is computed by the difference between the highest value of **v** ($\mathbf{v=1}$) and $\mathbf{v_t}$, $\mathbf{y_2 = 1 - v_t}$. Demand for the low quality flights is the difference between $\mathbf{v_t}$ and $\mathbf{v_0}$, $\mathbf{y_1 = v_t - v_0}$. The number of consumers who do not buy any flight at all is $\mathbf{v_0 - 0}$. Solving for $\mathbf{v_0}$ and $\mathbf{v_t}$, and letting $\mathbf{p_1}$ and $\mathbf{p_2}$ stand for the tickets' fares, these functions are:

$$\mathbf{y_1 = (p_2 - a p_1) / (a-1)}$$

$$\mathbf{y_2 = 1 - ((p_2 - p_1) / (a-1))}$$

The airlines cost functions are supposed to be linear so that marginal costs are constant and set as costs per passenger. Costs are divided in two parts. The parameter **H** denotes costs (per passenger) originated by the payment of aeronautical fees, including the charges for landing and for ground handling. **C** stands for costs (per passenger) related to all the other inputs. As airline 1 is a LCC, its marginal cost is equal to **bC**, with **b** measuring the cost differential and $\mathbf{b<1}$[2]. The parameter **b** embodies some quality costs, which means that the LCC has lower costs because it may be more efficient, but mainly because it supplies a service with a worse quality.

[2] There are several estimates of the parametre b. As an example, ECA (2002) calculates an average cost per ASK of 10.5 eurocents for the three larger European airlines, and of 6.6 eurocents for an average of three LCC's.

The subsidy to the LCC on landing and handling charges is of **(1-k)H** per passenger, the airline paying the airport an amount of **kH**, also per passenger. The situation without subsidy is depicted by making **k=1**.

The airlines' profits are then expressed by:

$$\pi_1 = p_1 y_1 - bCy_1 - kHy_1$$
$$\pi_2 = p_2 y_2 - Cy_2 - Hy_2$$

Price competition seems to be the most adequate choice for the game between the two airlines. Solving the Bertrand game, the solutions for prices are:

$$p_1 = (C+H+a+2abC+2akH-1) / (4a-1)$$
$$p_2 = (2aC-2a+2aH+abC+akH+2a^2)$$

Notice that the above expression of p_1 is the price paid by passengers, while the price Ryanair receives is equal to $p_1 + (1-H)k$.

The model could also picture a situation with **n** LCC's on the market, each one with half of the low quality demand, $y_i = y_1 = (p_2 - ap_1) / n(a-1)$, and selling at the same price, p_1, as their services are homogeneous. First, each airline maximises its profit, π_i, resulting a best reply function for each one of the LCC's. Solving these functions the result is the best reply function to the FSC, and it is exactly the same than the one with only one LCC. Then, the presence of other LCC's does not lower p_1, and so does not benefit passengers. It only lowers the LCC's demands and profits. If there were no vertical differentiation, or if the FSC was not in the market, the presence of another airline would bring the price down to marginal cost, as it is known from standard oligopoly theory.

As the local community owns the airport, it may be supposed that this one pays the subsidy. Then the airport receives an amount of kHy_1 as landing and handling charges, for which it has a cost of **D** per passenger. Supposing that each passenger spends an amount of **P** euros in concession activities, the airport's profits may be written as $\pi_A = (P+kH-D)\, y_1$.

In order to establish some results presented below, it is convenient to develop the monopoly situation before the entry of the LCC. In this case, there is only one airline, with quality $q_2=a$. The consumer indifferent between buying or not a ticket can be expressed by:

$\mathbf{v_t a - p = 0}$. The incumbent's demand is $\mathbf{y = 1 - p/a}$, where $\mathbf{p}$ is the ticket price. Monopoly profits are: $\pi_m = ((\mathbf{1-p})/\mathbf{a})(\mathbf{p-H-C})$.

Next some propositions will be presented as the answers this model provides for the questions stated in section 1. To avoid unnecessary complications resulting from adding more variables, the subsidy will be denoted by a fall in $\mathbf{p_1}$ whenever this is possible.

Proposition 1: With the subsidy more passengers will fly. In particular, the LCC will capture demand from both the left and from the right side of the line along which consumers are distributed, thus reducing the high quality airline's demand and gets new customers that did not fly before its entry.

Proof: Recall that $\mathbf{v_0\, q_1 - p_1 = 0}$ for the consumer who is indifferent between buying and not buying a ticket. As $\mathbf{q_1 = 1}$, $\mathbf{v_0 = p_1}$. The higher the subsidy is, the lower $\mathbf{p_1}$, and the greater the number of new consumers.

As $\mathbf{v_t\, q_1 - p_1 = v_t\, q_2 - p_2}$, then $\mathbf{v_t = (p_2 - p_1)/(a-1)}$. The best reply function of firm 2, $\mathbf{p_2 = (p_1 + C + H + a - 1)/2}$, is upwards sloping with $(\partial \mathbf{p_2}/\partial \mathbf{p_1 = 1/2})$. When $\mathbf{p_1}$ decreases with the subsidy, $\mathbf{p_2}$ is also reduced, but not so much as $\mathbf{p_1}$. Then $\mathbf{v_t}$ moves rightwards meaning that less passengers will fly in the FSC.

This result is according with Ryanair's claim (49) of the Commission's report and has some consistency with evidence provided by Ryanair and included in the same report. In the six Ryanair routes displayed in Table 3 the entry of the airline increased traffic. In four of these routes the increase was due both to new passengers and to a reduction in rivals' demand.

Table 3: Traffic in Ryanair's routes

Ryanair routes	before Ryanair (1)	Total 2002 (2)	Ryanair's 2002 (3)	Others 2002 (4)	Difference (2)-(1)
Pisa	1065691	1654570	627985	1026585	-39106
Milan Bergamo	1061397	1252878	360389	892489	-168908
Pescara	114024	295875	196389	99486	-14538
Bologna	45933	150309	112508	37801	-8132
Liverpool	333000	2835088	252310	2582778	2249778
Derry	49000	199543	129298	70245	21245

Source: European Commission (2004) and own calculations

Other evidences confirm this result. Franke (2004) when analysing the three major errors in FSC's first perception of LCC's, shows that LCC's attract passengers who would not have flown otherwise (on the left side of the consumer's line) as well as regular clients of FSC's, including business class travelers (on the right side of the line).

Proposition 2: In a vertical differentiation competitive setting, the incumbent is negatively affected by the subsidy. However, if equilibrium price $\mathbf{p_1}$ was so low that the entrant could not compete in the incumbent's cost conditions, this latter would not lose profits.

Proof: It is trivial to show that the FSC is affected by the subsidy. As stated in Proposition 1, with the subsidy $\mathbf{y_2}$ falls, as well as $\mathbf{p_2}$, due to the reduction in $\mathbf{p_1}$.

In fact, $\boldsymbol{\pi_2 = (p_2(p_1)-H-C)y_2(p_1, p_2(p_1)) = \pi_2 (p_2(p_1),y_2(p_1, p_2(p_1))}$.

The subsidy causes a fall in $\mathbf{p_1}$. The total change in $\boldsymbol{\pi_2}$ due to this fall is:

$$\boldsymbol{\partial\pi_2 /\partial p_1 =\partial\pi_2 /\partial p_2\, \partial p_2 /\partial p_1 +\partial\pi_2 /\partial y_2(\partial y_2 /\partial p_1+\partial y_2/\partial p_2\, \partial p_2 /\partial p_1)}$$

There is direct effect through $\mathbf{p_2}$, which is pushed downwards by the fall in $\mathbf{p_1}$, and an indirect effect through $\mathbf{y_2}$. On one hand, $\mathbf{y_2}$ is reduced by the fall in $\mathbf{p_1}$, but the negative reaction of $\mathbf{p_2}$ pushes $\mathbf{y_2}$ upwards. The net result is that $\mathbf{y_2}$ is smaller, as shown in the precedent proposition. Computing the other derivatives with the best reply function, $\boldsymbol{p_2 = (p_1+C+H+a-1)/2}$, and the expression of $\mathbf{y_2}$, the total change in $\boldsymbol{\pi_2}$ is:

$$\boldsymbol{\Delta\pi_2 =\partial\pi_2 /\partial p_1 = (p_1+(a-1)-H-C)/2(a-1)}.$$

The total change must have a positive sign, $\boldsymbol{\partial\pi_2 /\partial p_1 >0}$, or $\boldsymbol{p_1 >H+C-(a-1)}$. The new entrant must be able to set a price that can be higher than the incumbent's unitary costs deduced of a quality differential measure, **a-1**. Thus it could have profits without a subsidy higher than **a-1**. If the new entrant could not compete with the incumbent at the same costs, and still set the price equal to $\mathbf{p_1}$, or if $\boldsymbol{p_1+(a-1)<H+C}$, then $\boldsymbol{\partial\pi_2 /\partial p_1 <0}$ and the FSC would not be affected by a subsidy.

Proposition 3: The incumbent has lower profits and this is due both to the entry of the LCC and to the subsidy. In particular, it will be more affected by entry than by aid if the subsidy per passenger is smaller than a certain amount that depends on the quality and the profit margins differential.

Proof: First it is necessary to prove that monopoly profits are higher, or that the incumbent is affected by entry. This is straightforward without product differentiation but needs a confirmation for the vertical differentiation case.

Recall that monopoly profits are $\pi_m = ((1-p)/a))(p-H-C)$. Profits of the high quality airline, after the entry of the LCC are $\pi_2 = ((1-(p_2-p_1))/(a-1))(p_2-H-C)$, where $(p_2-p_1)/(a-1) = v_t$. It is assumed that the LCC enters with a lower price, or that $p>p_1$ and that the incumbent lowers its price, so $p>p_2$. But $v_t = (p_2-p_1)/(a-1)>p$, as shown is Proposition 1. Then $(1-p/a)/a)(p-H-C)> ((1-(p_2-p_1)/(a-1))(p_2-H-C)$, or $\pi_m > \pi_2$.

The second part of the proposition states that, under certain conditions, the incumbent may be more affected by the entry of the LCC. Let p_1 and sp_1 be the equilibrium prices, without and with the subsidy, as well as π_2 and π_2^S the incumbent's profits in the same situations.

The total difference in profits can be divided in $(\pi_m - \pi_2)$ and $(\pi_2 - \pi_2^S)$, that correspond, respectively, to the loss of profits due to the LCC entry and due to the subsidy. Then $(\pi_m - \pi_2^S) = (\pi_m - \pi_2) + (\pi_2 - \pi_2^S)$.

Taking the expressions of profits:

$(\pi_2 - \pi_2^S) = (p_2-H-C)(1-s)p_1/(a-1)$, and

$(\pi_m - \pi_2) = (1-p)/a)(p-H-C)-((1-(p_2-p_1)/(a-1))(p_2-H-C) = (1-p/a)M-(1-v_t) M_2$, where M and M_2 are monopoly and duopoly profit margins. Then, $(\pi_m - \pi_2) >(\pi_2 - \pi_2^S)$ if $(1-p/a)M-(1-v_t)M_2 > (p_2-H-C)(1-s)p_1/(a-1)$.

Recalling that the subsidy per passenger is $(1-k)H$, and taking the equilibrium price of the LCC, the above inequality may be written as: $(1-k)H < D(\Delta m\ (1-v_0^m)-(1-v_t))$, where D is a measure of the quality differential, $D = (a-1)/2a\ (4a-1)$, Δm is a measure of the profit margin differential $\Delta m = M/M_2$, and v_0^m is the quality evaluation of the consumer indifferent between buying one ticket or none in the monopoly situation.

The limit value of the subsidy, $D(\Delta m\ (1-v_0^m)-(1-v_t))$ depends negatively on D if a is not too small ($a>1.87$). Then, the larger the monopoly margin and the quality differential, the larger the amount of aid that makes the incumbent more affected by competition than by the subsidy.

Proposition 4: The secondary airport may be more benefited by the aid than the low cost airline.

This is one of Ryanair's claims, stated in point (52) of the Commission's report. In what conditions may the airport's profits exceed those of the LCC?

If $\pi_A > \pi_1$ it must be: $\mathbf{(P+kH-D)y_1 > (p_1-kH-bC)y_1}$, or $\mathbf{P+2kH-D> p_1-bC}$. Then the airline must set a price, $\mathbf{p_1}$, which is lower than **P+2kH+bC-D**. As the airline margin, $\mathbf{p_1- kH-bC}$, must be positive, the condition $\mathbf{(P+kH-D)y_1 > (p_1- kH-bC)y_1}$ is verified if $\mathbf{P+kH-D > 0}$, which means that the airport must at least have positive profits, even paying the subsidy. Ryanair's claim is true if the airport can be competitive at the fees it actually receives from the airline, or if these fees plus concession revenues exceed its costs. It all depends on the airports efficiency, on its ability to attract consumers to concession activities, and on the amount of the subsidy. The higher the two firs items, the higher may the subsidy be.

3. Empirical Analysis

This empirical analysis intends to get some insights on the nature of competition that LCC's departing from secondary airports face.

As it can be seen in Table 1, some secondary airports are dominated by one airline and some are not. Beauvais, Charleroi and Skavsta have doubtlessly a majority of Ryanair flights. Conversely, Stanstead and Milan Bergamo are airports where Ryanair's share of flights is not so important.

This empirical analysis intends to investigate the effects on airlines' fares of departing from (or arriving at) a dominated or a non-dominated airport. If an airline is the only user of the airport it may behave as a monopsonist and ask for lower aeronautical charges. In the case of the model analysed in the preceding section, charges were lower by means of subsidisation. If a secondary airport serves a large number of LCC's and none of them has a significant share of flights, it may charge higher aeronautical fees.

As the airports' charges are not divulgated, the prices to consumers (tickets' fares) are used as a proxy. Then, it is to expect that in dominated airports aeronautical charges are lower and that this is transferred to consumers by means of lower fares.

Competition is another variable that may explain fares. In monopolised routes airlines are expected to charge higher fares. A different but more interesting issue is the way LCC's set their pricing strategy when they face competition from FSC's or from other LCC's. Apparently, it should be expected that prices are lower when another LCC is a rival. However, and recalling the result presented in Section 2, the presence of another LCC in one particular route does not change the price.

The empirical analysis includes 42 routes of the same airline, Ryanair, in order to avoid differences in airline's pricing strategies. The 43 routes included one-way flights departing from Beauvais, Charleroi, Dublin, Stanstead and Milan Bergamo. Routes between two dominated airports were excluded. The dependent variable, **FARE**, is the price of the ticket per kilometer flown. This procedure seems more adequate than using the distance as an independent variable, as it is often done[3].

The variable **SHARE** represents the share of Ryanair's flights in each airport and was used to distinguish departing points. According to the model, it is expected that this variable will have a negative coefficient, indicating that when a flight leaves from a dominated airport, the price is lower on account of lower aeronautical fees.

Competitive conditions were assessed by **NUMB**, the number of airlines supplying flights in the same route. Code share agreements were excluded by considering only one airline for a code share flight. This variable should have a negative coefficient since more competition should push prices down.

The dummy variable **LCC** was added to account for the competition from another low cost airline in the same route. It takes the value of 1 when there is at least one more LCC in the same route, and the value of zero when competitors are only FSC's.

Data was collected from airlines websites, on the same day, for departures one month ahead. Only regular fares were used. When more than one regular fare was displayed, the daily flights fares were chosen. Night flights are usually less expensive, but they do not compete so nearly with FSC's flights.

Results are displayed in table 4. **LCC** is not significant, indicating that Ryanair's price strategy is not influenced by the presence of a near rival. This confirms the result of the model presented above. There may be more than one LCC in the market but the price does not fall on account of it. Of course that another LCC means less profits, and this matters for the airline. But for passengers it is enough that one LCC is flying in a particular route. In most cases, Ryanair was the first LCC to enter the market, so the newcomers probably adjusted their prices to Ryanair's.

All other variables are significant at 1% level. The variable **SHARE** has a positive sign, the opposite of what was expected. The airline charges higher fares when departing from a dominated airport. If it happens that it pays lower aeronautical charges, as it may be expected, these lower costs are not transferred to passengers. If lower charges are subsidies or

[3] Some authors use the distance as an explanatory variable and find that fares always increase with the distance. As an example, see Oliveira and Huse (2004).

any forms of state aid, the region may be benefited, by means of more employment and revenues, but not passengers.

Table 4: Regression results

Variable	Coefficient
Constant	**236.57** **(T=3.91)**
SHARE	**3.41** **(T=4.77)**
LCC	**24.09** **(0.514)**
NUMB	**-46.94** **(T=-2.83)**
R^2	**0.45**
F-Statistic	**10.67**

The variable **NUMB** has the expected sign. The presence of one more airline in one route makes the price per kilometer fall of 47 eurocents. Then, Ryanair sets fares according to the number of competitors, whoever they may be, LCC's or FSC's.

5. Concluding remarks

The main findings of the paper point out the importance of competition of LCC's, and not only of eventual subsidisation of secondary airports. In fact, FSC's are negatively affected by subsidies, but competition may affect them more. Their reply should be turned to restructuring their services, in order to be able to compete with LCC's. A higher quality service is a possible answer.

An empirical analysis using Ryanairs' and its competitors' data suggests two important facts on LCC's pricing strategies. First, that the presence of at least one more LCC does not change the price the airlines charges to passengers. Second, that the domination of airports and consequent benefits on aeronautical charges is kept by the airline and not transferred to passengers.

REFERENCES:

ECA, European Cockpit Association, (2002) *ECA ISG Presentation on low cost carriers*, IFALPA Conference, Stavanger.

European Commission (2004) Commission decision of 12 February 2004. *Official Journal of the European Union*, 30.04.2004.

Franke (2004), "Competition between network carriers and low cost carriers- retreat battle or breakthrough to a new level of efficiency?", *Journal of Air Transport Management*, 10: 15-21.

Forsyth, Peter (2003) "Airport competition and the efficiency of price structures at major airports", Paper presented at GARS Research Seminar, Leipzig, November.

Gabszewicz, J. and Thisse, J.F., (1979), "Price competition, quality and income disparities", *Journal of Economic Theor,*: 20: 340-359.

Motta, Massimo (1993), "Endogenous quality choice: Price versus quantity competition", *The Journal of Industrial Economics*, XLI: 113-131.

Oliveira, Alessandro V.M. and Huse, Christian (2004), "Localised competitive advantage and price reactions to low cost carrier entry in the Brasilian airline industry", Paper presented at the 8th ATRS World Conference, Istanbul, July.

Oum, Tae Hoon *et al*. (2003), "Concession profit and its efficiency implications on alternative forms of economic regulation of airports", Paper presented at the 7th ATRS World Conference, Toulouse, July.

Poungias, Peter (2003), "Should airports specialise in the markets they serve: Low cost airports for low cost airlines?" Paper presented at the 8th Hamburg Aviation Conference, Hamburg.

Shaked, Avner and Sutton, John, (1982), "Relaxing price competition through product differentiation", *Review of Economic Studies*, XLIX: 3-13.

Recent FEP Working Papers

Nº 158	Sandra Tavares Silva, Aurora A. C. Teixeira and Mário Rui Silva, *Economics of the Firm and Economic Growth. An hybrid theoretical framework of analysis*, September 2004
Nº 157	Pedro Rui Mazeda Gil, *Expected Profitability of Capital under Uncertainty – a Microeconomic Perspective*, September 2004
Nº 156	Jorge M. S. Valente, *Local and global dominance conditions for the weighted earliness scheduling problem with no idle time*, September 2004
Nº 155	João Correia-da-Silva and Carlos Hervés-Beloso, *Private Information:Similarity as Compatibility*, September 2004
Nº 154	Rui Henrique Alves, *Europe: Looking for a New Model*, September 2004
Nº 153	Aurora A. C. Teixeira, *How has the Portuguese Innovation Capability Evolved? Estimating a time series of the stock of technological knowledge, 1960-2001*, September 2004
Nº 152	Aurora A. C. Teixeira, *Measuring aggregate human capital in Portugal. An update up to 2001*, August 2004
Nº 151	Ana Paula Delgado and Isabel Maria Godinho, *The evolution of city size distribution in Portugal: 1864-2001*, July 2004
Nº 150	Patrícia Teixeira Lopes and Lúcia Lima Rodrigues, *Accounting practices for financial instruments. How far are the Portuguese companies from IAS?*, July 2004
Nº 149	Pedro Cosme Costa Vieira, *Top ranking economics journals impact variability and a ranking update to the year 2002*, June 2004
Nº 148	Maria do Rosário Correia, Scott C. Linn and Andrew Marshall, *An Empirical Investigation of Debt Contract Design: The Determinants of the Choice of Debt Terms in Eurobond Issues*, June 2004
Nº 147	Francisco Castro, *Foreign Direct Investment in a Late Industrialising Country: The Portuguese IDP Revisited*, May 2004
Nº 146	Óscar Afonso and Álvaro Aguiar, *Comércio Externo e Crescimento da Economia Portuguesa no Século XX*, May 2004
Nº 145	Álvaro Aguiar and Manuel M. F. Martins, *O Crescimento da Produtividade da Indústria Portuguesa no Século XX*, May 2004
Nº 144	Álvaro Aguiar and Manuel M. F. Martins, *Growth Cycles in XXth Century European Industrial Productivity: Unbiased Variance Estimation in a Time-varying Parameter Model*, May 2004
Nº 143	Jorge M. S. Valente and Rui A. F. S. Alves, *Beam search algorithms for the early/tardy scheduling problem with release dates*, April 2004
Nº 142	Jorge M. S. Valente and Rui A. F. S. Alves, *Filtered and Recovering beam search algorithms for the early/tardy scheduling problem with no idle time*, April 2004
Nº 141	João A. Ribeiro and Robert W. Scapens, *Power, ERP systems and resistance to management accounting: a case study*, April 2004
Nº 140	Rosa Forte, *The relationship between foreign direct investment and international trade. Substitution or complementarity? A survey*, March 2004
Nº 139	Sandra Silva, *On evolutionary technological change and economic growth: Lakatos as a starting point for appraisal*, March 2004
Nº 138	Maria Manuel Pinho, *Political models of budget deficits: a literature review*, March 2004
Nº 137	Natércia Fortuna, *Local rank tests in a multivariate nonparametric relationship*, February 2004
Nº 136	Argentino Pessoa, *Ideas driven growth: the OECD evidence*,

	December 2003
Nº 135	Pedro Lains, *Portugal's Growth Paradox, 1870-1950*, December 2003
Nº 134	Pedro Mazeda Gil, *A Model of Firm Behaviour with Equity Constraints and Bankruptcy Costs*, November 2003
Nº 133	Douglas Woodward, Octávio Figueiredo and Paulo Guimarães, *Beyond the Silicon Valley: University R&D and High-Technology Location*, November 2003.
Nº 132	Pedro Cosme da Costa Vieira, *The Impact of Monetary Shocks on Product and Wages: A neoclassical aggregated dynamic model*, July 2003.
Nº 131	Aurora Teixeira and Natércia Fortuna, *Human Capital, Innovation Capability and Economic Growth*, July 2003.
Nº 130	Jorge M. S. Valente and Rui A. F. S. Alves, *Heuristics for the Early/Tardy Scheduling Problem with Release Dates*, May 2003.
Nº 129	Jorge M. S. Valente and Rui A. F. S. Alves, *An Exact Approach to Early/Tardy Scheduling with Release Dates*, May 2003.
Nº 128	Álvaro Almeida, *40 Years of Monetary Targets and Financial Crises in 20 OECD Countries*, April 2003.
Nº 127	Jorge M. S. Valente, *Using Instance Statistics to Determine the Lookahead Parameter Value in the ATC Dispatch Rule: Making a good heuristic better*, April 2003.
Nº 126	Jorge M. S. Valente and Rui A. F. S. Alves, *Improved Heuristics for the Early/Tardy Scheduling Problem with No Idle Time*, April 2003.
Nº 125	Jorge M. S. Valente and Rui A. F. S. Alves, *Improved Lower Bounds for the Early/Tardy Scheduling Problem with No Idle Time*, April 2003.
Nº 124	Aurora Teixeira, *Does Inertia Pay Off? Empirical assessment of an evolutionary-ecological model of human capital decisions at firm level*, March 2003.
Nº 123	Alvaro Aguiar and Manuel M. F. Martins, *Macroeconomic Volatility Trade-off and Monetary Policy Regime in the Euro Area*, March 2003.
Nº 122	Alvaro Aguiar and Manuel M. F. Martins, *Trend, cycle, and non-linear trade-off in the Euro Area 1970-2001*, March 2003.
Nº 121	Aurora Teixeira, *On the Link between Human Capital and Firm Performance. A Theoretical and Empirical Survey*, November 2002.
Nº 120	Ana Paula Serra, *The Cross-Sectional Determinants of Returns: Evidence from Emerging Markets' Stocks*, October 2002.
Nº 119	Cristina Barbot, *Does Airport Regulation Benefit Consumers?*, June 2002.
Nº 118	José Escaleira, *A Procura no Sector das Artes do Espectáculo. Tempo e Rendimento na Análise das Audiências. Um Estudo para Portugal*, June 2002.
Nº 117	Ana Paula Serra, *Event Study Tests: A brief survey*, May 2002.
Nº 116	Luís Delfim Santos and Isabel Martins, *A Qualidade de Vida Urbana - O caso da cidade do Porto*, May 2002.
Nº 115	Marcelo Cabús Klötzle and Fábio Luiz Biagini, *A Restruturação do Sector Eléctrico Brasileiro: Uma análise comparativa com a Califórnia*, January 2002.
Nº 114	António Brandão and Sofia B. S. D. Castro, *Objectives of Public Firms and Entry*, December 2001.

Editor: Prof. Aurora Teixeira (ateixeira@fep.up.pt)

Download available at:

http://www.fep.up.pt/investigacao/workingpapers/workingpapers.htm

also in http://ideas.repec.org/PaperSeries.html

FEP 2004