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An Empirical Analysis of a Merger Between a Network and Low-cost Airlines

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Abstract

We use a difference-in-difference estimator to examine the effects of a merger between three airline companies on two types of route: (1) on those where two low-cost carriers and (2) on those where a network carrier and one of the low-cost airlines had previously been competing. We report a reduction in flight frequencies but find no substantial effect on prices in the first case, while in the second we report an increase in prices but no substantial effect on frequencies. The results would seem to be attributable to the differences in the types of passenger flying these routes.

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1.0 Introduction

One of the main features of the post-liberalisation period in the airline industry has been the trend toward consolidation, with an increase in the number both of mergers and of coordinated alliances. Mergers, however, can be detrimental to passenger welfare as they may be characterised by higher fares and lower flight frequency rates.

The first wave of mergers occurred in the US market in the 1980s, and since the beginning of this century a number of mergers have also been implemented in Europe and Asia. The current wave of mergers affects network and low-cost airlines alike, and we find examples of mergers in Europe and the USA between network carriers (Air France and KLM, British Airways and Iberia, Delta and Northwest, Lufthansa with Swiss, Austrian and BMI, United and Continental, US Airways and American West) and between low-cost carriers (Air Berlin with LTU and Condor, easyJet and Go Fly, Ryanair and Buzz, Southwest and AirTran). In addition, several low-cost carriers have become subsidiaries of network carriers in Europe (Germanwings and bmibaby of Lufthansa, Transavia of Air France-KLM, Vueling of Iberia), while the largest low-cost carrier in Europe, Ryanair, has attempted to merge with a network carrier, Aer Lingus.

Several papers have examined the effects of mergers in the airline market, but the analyses have generally focused on network carriers. Drawing on data for Spanish domestic flight routes for the period 2001–11, we use a difference-in-difference estimator to examine the effects on prices and flight frequencies of the merger between a network airline (Iberia) and two low-cost airlines (Clickair and Vueling).

In this particular setting, we would expect the merger to result in a reduction in the intensity of competition on the routes flown. Since airlines compete in terms of prices and frequencies, the merger would be expected to lead to an increase in prices and to a reduction in frequencies on the routes affected (if the cost synergies are not great). We should stress at this point that the merged airlines are dominant or even hold a monopoly on most of the routes on which they offer services following the merger. Thus the behaviour of the company after the merger is likely to determine the overall performance on these routes. However, the entry of competitors (such as Ryanair) may mitigate the impact of the merger.

The main contribution of this paper is that we provide empirical evidence of the distinct effects of a merger on different airline types: first, we examine the impact of the merger on routes on which the two low-cost airlines were previously competing; and, second, we analyse its effects on routes on which the network and one of the two low-cost airlines were competing. Additionally, we examine the impact of the merger on prices as well as on flight frequencies, the consideration of frequencies being less common than that of prices in the literature. This analysis of both aspects allows us to obtain a complete overview of the impact of the merger on consumer welfare. Furthermore, the merger was completed at a time when Ryanair was increasing its operations substantially in the Spanish domestic market. Thus we can measure the extent to which the entry of this major European low-cost airline has affected our empirical results.

The rest of the paper is organised as follows. In Section 2, we review previous empirical analyses of mergers in the airline markets. In Section 3, we construct a model for assessing the effects of the merger and, in Section 4, describe the data used in the empirical analysis. In Section 5, we present the results of the regressions. The last section concludes.

2.0 Literature Review: Mergers in the Airline Market

Table 1 summarises the main results of previous empirical analyses of mergers in the airline market in terms of their effects on prices and frequencies (where available).

The first feature to highlight in the table is the dominance of studies conducted for the US market. Very few studies have examined mergers outside the United States, probably because of the lack of data. Second, the vast majority of analyses have been performed on mergers involving network carriers, while only two have focused on low-cost airlines: Dobson and Piga (2011), and Gaggero and Piga (2010). Moreover, the latter of these two is in fact merely a simulation of a merger, since it was eventually blocked by the European Commission.

If we examine the impact of mergers on fares, in the operation involving Northwest and Republic Airlines, Borenstein (1990) reported increases ranging from 6 per cent, when other airlines were competing on the affected routes, to 22.5 per cent, when the new airline monopolised the route. For this same merger, Werden *et al.* (1991) also found significant price increases (5.6 per cent), as did Peters (2006), who reported an increase of 7.2 per cent. However, the effect reported was much more modest in the analysis performed by Morrison (1996), not rising above 2.5 per cent. Whatever the case, it seems clear that the merger did result in a price increase.

In the case of the merger involving Trans World Airlines and Ozark Airlines, the findings are more ambiguous. While Borenstein (1990) and Morrison (1996) reported price falls of 12.3 and 15.3 per cent, respectively, Werden *et al.* (1991) and Peters (2006) reported price increases of 1.5 and 16 per cent. Despite the diversity of results obtained for this merger, the results of Kim and Singal (1993) and Peters (2006) suggest that, in general, mergers between legacy carriers in the United States lead to significant price increases.

Outside the United States, the results have been quite different. Mergers completed in China in 2002 led to fare reductions of between 3 and 4 per cent (Zhang and Round, 2009), while in Europe significant falls in price have also been found, with the exception of the proposed merger between Ryanair and Aer Lingus (Gaggero and Piga, 2010). Likewise, Veldhuis (2005) reported that the merger between KLM and Air France would probably not lead to significant price increases on routes connecting Northwest Europe with Singapore. In a more recent study, Veldhuis (2011) shows that the merger between KLM and Air France, assuming a 10 per cent reduction in costs, would lead to benefits for consumers of between 12.05 and 13.96 euros for passengers flying out of Paris and Amsterdam respectively. As Veldhuis (2011) points out, mergers may generate cost reductions that can account for these reductions in fares. A further potential benefit of the merger for passengers is an increased network scope, particularly when hub airports become linked.

If we examine the few cases in which the firms that merged were low-cost carriers, the results are equally mixed. Dobson and Piga (2011) analysed the mergers carried out between Ryanair and Buzz on the one hand, and between easyJet and Go Fly on the other. In the first case, they report that the merger led to a change in Buzz's price structure, as it adapted to the price structure operated by Ryanair. Thus the merger resulted in lower prices for passengers who purchased their tickets in advance, but it proved detrimental to those buying tickets just a few days before flying. In the case of the Go

Table 1
Effects of Mergers on the Airline Market

Author(s)	*Year*	*Airlines*	*Country*	*Pr. effect*	*Fq. effect*
Borenstein (1990)	1986	Northwest and Republic airlines[2]	USA	6%/22.5%	−28.3%/53%
Borenstein (1990)	1986	Trans World Airlines and Ozark Airlines[1]	USA	0%/−12.3%	−25.5%/18.2%
Werden *et al*. (1991)	1986	Northwest and Republic airlines[2]	USA	5.6%	−23.7%
Werden *et al*. (1991)	1986	Trans World Airlines and Ozark Airlines[1]	USA	1.5%	−16.2%
Kim and Singal (1993)	1985–88	Average of mergers	USA	10%	–
Morrison (1996)	1986	Northwest and Republic airlines[2]	USA	2.5%	–
Morrison (1996)	1986	Trans World Airlines and Ozark Airlines[1]	USA	−15.3%	–
Morrison (1996)	1987	US Air and Piedmont Aviation[2]	USA	22.8%	–
Veldhuis (2005)	2004	KLM and Air France[2]	Europe	0.3%	–
Peters (2006)	1986	Northwest and Republic Airlines[2]	USA	7.2%	–
Peters (2006)	1986	Trans World Airlines and Ozark Airlines[1]	USA	16%	–
Peters (2006)	1986	Continental and People Express[1]	USA	29.4%	–
Peters (2006)	1986	Delta and Western[2]	USA	11.8%	–
Peters (2006)	1987	US Air and Piedmont Aviation[2]	USA	20.3%	–
Zhang and Round (2009)	2002	China Southern Airlines; China Northern Airlines and China Xinjiang Airlines[1]	China	−3%	–
Zhang and Round (2009)	2002	China Eastern Airlines; China Yunnan Airlines and China Northwest Airlines[1]	China	−4%	–
Gaggero and Piga (2010)	2007	Aer Lingus and Ryanair[1]	Ireland	7%/8%	–
Kwoka and Shumilkina (2010)	1987	US Air and Piedmont Aviation[2]	USA	9%/12.1%	–
Bilotkach (2011)	2005	US Airways and American West[2]	USA		−1.2%/−9.5%
Dobson and Piga (2011)	2003	easyJet and Go Fly[1]	Europe	−12/−£27	–
Dobson and Piga (2011)	2003	Ryanair and Buzz[1]	Europe	−29/£14	–
Veldhuis (2011)	2004	KLM and Air France	Europe	−12.05/−13.96€	–

Note: 1 = Acquisition, 2 = Merger.
Source: Authors' own.

Fly and easyJet merger, the authors reported a significant reduction in fares independently of when tickets were purchased.[1]

A further study examining the potential impact of a merger on the airline market in which low-cost airlines operate was undertaken by Gaggero and Piga (2010). This study measured the level of competition between Aer Lingus and Ryanair, and the pricing changes predicted should the merger have gone ahead. The authors reported that Aer Lingus fares were between 7 and 8 per cent lower on the routes on which the company competed with Ryanair, and concluded, on this basis, that had these two companies merged, fares on these routes would have increased by that percentage.

A number of other empirical approaches have been adopted to examine the impact of mergers on prices or on other strategic variables in the airline industry. In examining price effects, Martin (2011) simulates potential mergers between United and US Airways on the one hand, and between Delta and Northwest on the other. His results show that these mergers would generate a welfare loss, due principally to the loss of producer surplus. In the Japanese market, Mizutani (2011) reports that the merger between Japan Airlines and Japan Air System increased competition and reduced the equilibrium price. In examining the impact on other variables, Clougherty (2002a, 2002b) shows how mergers in domestic markets can enhance the position of airline companies in international markets.

No previous studies have examined the effects of mergers on flight frequencies outside the US market. And, as mentioned above, all previous research has focused its attention on mergers of two network carriers or those involving two low-cost carriers. Uniquely, therefore, this paper presents empirical evidence of the effect of mergers on both prices and frequencies in a European market, and, moreover, the merger analysed involves that of a network and two low-cost airlines.

3.0 The Empirical Model

The merger under analysis in this paper involved three airlines:

1. Iberia, a network carrier belonging to the Oneworld alliance;
2. Clickair, a low-cost subsidiary belonging to Iberia;[2] and
3. Vueling, an independent low-cost carrier.

In July 2008, the three agreed a two-step merger deal: first, Clickair was taken over by Vueling (with Clickair ceasing to operate) and, second, Iberia became the leading shareholder in the new firm (now called Vueling). Iberia thus obtained 45.8 per cent of the shares, while the second-largest shareholder was Nefinsa with 4.15 per cent of the shares. Nefinsa is the owner of Air Nostrum, a regional airline that has a franchisee contract with Iberia. The remaining 50 per cent of the capital was owned by shareholders

[1] Alves and Barbot (2009) examined the price discrimination strategies of low-cost carriers. They conclude that low-cost carriers offer low advance fares to attract leisure passengers, who show a low willingness to pay and a high probability of travelling on the day of the flight. Then they set higher last-minute prices to maximise rents from business passengers, who show a high willingness to pay but a low probability of travelling on the day of the flight.

[2] Iberia had a 20 per cent stake in Clickair and controlled 80 per cent of its economic rights.

(investment funds and individual investors) with holdings well below 1 per cent. Thus Iberia effectively controls the board of directors of the new Vueling. In January 2009, the European Commission agreed to the merger between Iberia, Clickair, and Vueling on the condition that certain slots on given routes were transferred to other airlines (case no. COMP/M-5364 — Iberia/Vueling/Clickair). The merger was completed in July 2009.

Iberia does not have a majority holding in the capital of Vueling, since it holds less than 50 per cent of shares. However, the integration of the two companies' respective operations is quite clear (recall that all other investors are minority shareholders in Vueling's capital). Most of Vueling's flights are offered under code-share agreements with Iberia, yet they do not operate simultaneously on any route except Madrid–Barcelona (which is one of the densest routes in the world). Furthermore, since the merger came into effect, they have shared the same frequent-flyer programme.

Here, our empirical strategy involves identifying the effects of the merger in two situations that prevailed in the pre-merger period: the routes on which the two low-cost airlines (Clickair and Vueling) formerly competed; and the routes on which the network company (Iberia) and one of the two low-cost airlines (Vueling) formerly competed.

Data capturing the respective proportions of business and leisure travellers using the different routes are not available. However, we assume that the proportion of leisure travellers (who are price sensitive but who are not particularly time sensitive) is higher on routes dominated by low-cost carriers. By contrast, the proportion of business travellers (who are time sensitive but who are not especially price sensitive) is assumed to be higher on routes dominated by the network carrier.

To analyse the effect that the merger has had on prices and frequencies, we use a difference-in-difference estimator. The empirical approach is defined by the following expression:

$$Y_{kt} = \beta_0 + \beta_1 pam_{kt} + \beta_2 ram_{kt} + \beta_3 (pam^* ram)_{kt} + \beta X_{kt} + \varepsilon_{kt}. \quad (1)$$

The endogenous variable Y_{kt} is the weighted average price on route k at time t when analysing the impact of the merger on prices, and alternatively the number of weekly flights offered on route k at time t when analysing its impact on flight frequencies. The following variables were then introduced as regressors:

The variable *pam* (period after the merger) is a dummy variable that takes the value 1 for all routes in the periods after the merger and 0 otherwise. This variable reflects the change in prices and frequencies after the merger on all the routes.

The variable *ram* (routes affected by the merger) is a dummy variable that takes the value 1 for all periods of time only on those specific routes affected by the merger and 0 otherwise. We understand routes affected by the merger as being those on which Clickair and Vueling, on the one hand, and those on which Iberia and Vueling, on the other, had previously been offering services. No one route was previously served by all three operators at the same time. This variable reflects the impact on those routes affected by the merger in relation to those that remain unaffected. When analysing separately the effects of the merger on the two types of route previously being operated, we use two dummy variables: *Click-Vue*, which takes the value 1 if Clickair and Vueling previously operated on that route, and 0 for all other routes; and *Ib-Vue*, which takes the value 1 if Iberia and Vueling previously operated that route, and 0 otherwise.

The variable ($pam^{*}ram$) is a dummy variable that takes the value 1 only in the periods after the merger and only for those routes affected by the merger, and 0 otherwise. The coefficient accompanying this variable is our difference-in-difference estimator. If the coefficient is negative and significant then the merger led to a reduction in prices or frequencies, while if the coefficient is positive and significant then it led to an increase in prices or frequencies. As for the *ram* variable, we differentiate the effect of the merger on routes previously operated by Clickair and Vueling, and that on the routes where Iberia and Vueling operated. To do this we multiply the dummies *Click-Vue* and *Ib-Vue* by the dummy variable *pam*, obtaining ($pam^{*}Click\text{-}Vue$) and ($pam^{*}Ib\text{-}Vue$). The coefficients associated with these two variables show the effects of the merger on routes operated by Clickair and Vueling, and those operated by Iberia and Vueling, respectively.

Finally, we introduce a set of control variables that might affect prices or flight frequencies (X). Since Borenstein's (1989) seminal paper, several studies have estimated pricing equations that include explanatory variables related to demand, competition, and other route characteristics. Less attention has been paid to estimating frequency equations, but, in general, the variables used are similar to those used in pricing equations (see Bilotkach *et al.* (2010), for a recent example). Hence, we estimate the following equations:

Pricing equation. The price of route k at time $t(PR)$ can be explained by the following equations:

$$\begin{aligned} PR_{kt} = {} & \beta_0 + \beta_1 pam_{kt} + \beta_2 ram_{kt} + \beta_3 (pam^{*}ram)_{kt} + \beta_4 Demand_{kt} \\ & + \beta_5 Distance_k + \beta_6 HHI_{kt} + \beta_7 D_{kt}^{Ryanair} + \beta_8 D_{kt}^{high\_speed\_train} \\ & + \beta_9 D_k^{island} + \beta_{10} D_t^{summer} + \beta_{11} TimeTrend_t + e_k, \end{aligned} \tag{2a}$$

$$\begin{aligned} PR_{kt} = {} & \beta_0 + \beta_1 pam_{kt} + \beta_{2a} Click\text{-}Vue_{kt} + \beta_{2b} Ib\text{-}Vue_{kt} + \beta_{3a} pam^{*} Click\text{-}Vue_{kt} \\ & + \beta_{3b} pam^{*} Ib\text{-}Vue_{kt} + \beta_4 Demand_{kt} + \beta_5 Distance_k + \beta_6 HHI_{kt} + \beta_7 D_{kt}^{Ryanair} \\ & + \beta_8 D_{kt}^{high\_speed\_train} + \beta_9 D_k^{island} + \beta_{10} D_t^{summer} + \beta_{11} TimeTrend_t + e_k. \end{aligned} \tag{2b}$$

Frequency equation. The estimation of the frequency equations for route k at time $t(FQ)$ takes the following form:

$$\begin{aligned} FQ_{kt} = {} & \beta_0 + \beta_1 pam_{kt} + \beta_2 ram_{kt} + \beta_3 (pam^{*}ram)_{kt} + \beta_4 Demand_{kt} \\ & + \beta_5 Distance_k + \beta_6 HHI_{kt} + \beta_7 D_{kt}^{Ryanair} + \beta_8 D_{kt}^{high\_speed\_train} \\ & + \beta_9 D_k^{island} + \beta_{10} D_t^{summer} + \beta_{11} TimeTrend_t + e_k, \end{aligned} \tag{3a}$$

$$\begin{aligned} FQ_{kt} = {} & \beta_0 + \beta_1 pam_{kt} + \beta_{2a} Click\text{-}Vue_{kt} + \beta_{2b} Ib\text{-}Vue_{kt} + \beta_{3a} pam^{*} Click\text{-}Vue_{kt} \\ & + \beta_{3b} pam^{*} Ib\text{-}Vue_{kt} + \beta_4 Demand_{kt} + \beta_5 Distance_k + \beta_6 HHI_{kt} + \beta_7 D_{kt}^{Ryanair} \\ & + \beta_8 D_{kt}^{high\_speed\_train} + \beta_9 D_k^{island} + \beta_{10} D_t^{summer} + \beta_{11} TimeTrend_t + e_k. \end{aligned} \tag{3b}$$

The dependent variable in the pricing equation is the lowest mean round trip price charged by airlines weighted by their corresponding market share, while the dependent variable in the frequency equation is the total weekly frequency offered by airlines on each route. We use the following control variables in the price and frequency equations:

1. Demand. Total number of passengers carried by airlines on the route. Note that prices and demand, and frequencies and demand, may be simultaneously determined.

In order to correct for any possible bias in the estimated coefficients of demand, we apply an instrumental variables procedure. We use the mean population and GDP per capita of the endpoints of the route as instruments. The expected sign of the coefficient of the demand variable is ambiguous in the pricing equation. Intense traffic on a route means it is possible to gain density economies, as airlines can use larger planes at higher load factors and thus optimise the use of crew. In a competitive environment this should lead to lower prices. However, equally, more traffic might lead to higher mark-ups over costs, if capacity constraints are present.

The expected sign of the coefficient of the demand variable in the frequency equation is positive. In fact, this should be the variable with the strongest influence on the airlines' frequency decisions, since supply must adjust (at least at a certain point) to the levels of demand.

2. Distance. Number of kilometres separating the airports of origin and destination on the route.

Route length is a major determinant of airline costs, and its coefficient in the price equation is expected to be positive and lower than 1. This means that the increase in costs is less than proportional to the increase in the number of kilometres flown. Long-haul routes involve higher average speeds, less intense consumption of fuel, and lower airport charges per kilometre. By contrast, a negative relationship is expected between frequency and route length. On longer routes, airlines may prefer to reduce flight frequency and use larger planes whose efficiency increases with distance. In addition, since on long-haul routes intermodal competition with cars, trains, and ships is weak, airlines may offer lower frequencies.

3. HHI. Concentration index measured as the Herfindahl–Hirschman Index (HHI) at the route level in terms of frequencies.

Route concentration can be determined simultaneously with prices and frequencies, and, as such, we should take into account any possible bias due to the endogeneity of this variable. We instrument concentration at the route level using the HHI at the airport level. A positive sign for the coefficient associated with this variable is expected in the pricing equation, since less competition should result in higher prices being charged. In the case of the frequency equation, by contrast, a negative sign is expected, since fewer flights will be offered as competition on the route falls.

4. $D^{Ryanair}$. Dummy variable that takes the value 1 on routes where Ryanair offers flights at time t.

A negative sign is expected for the coefficient associated with this variable in the pricing equation. Ryanair usually fixes very low charges, thus inducing other route competitors to reduce prices. Less clear, however, is the expected effect of the presence of Ryanair in the frequency equation.

Note that Ryanair established an operating base at Madrid airport in the winter of 2007–8 (albeit that the most significant impact on the domestic market was not recorded until the beginning of the winter of 2008–9) and at Barcelona airport in the summer of 2010. Furthermore, Ryanair has become more active at other Spanish airports since the winter of 2010–11. Thus the period during which the merger was made coincided with the period in which Ryanair, the leading low-cost carrier in Europe, expanded its operations substantially in the Spanish airline market.

5. $D^{high\_speed\_train}$. Dummy variable that takes the value 1 on routes where high-speed trains may be used by passengers as an alternative to air transport.

A negative sign is expected for the coefficient associated with this variable in the pricing equation, since competition from high-speed trains can force airlines to reduce fares. Less clear, however, is the expected effect on the frequency equation, given that airlines are required to maintain high frequencies if they wish to compete with high-speed trains.

6. D^{island}. Dummy variable that takes the value 1 on routes that have an island as an endpoint.

The coefficient associated with this variable is *a priori* ambiguous in the pricing equation. The proportion of leisure travellers may be higher on routes that have islands as endpoints, but airlines may charge higher prices on these routes because of the lack of intermodal competition. By contrast, a negative sign is expected for the coefficient associated with this variable in the frequency equation, since leisure passengers are moderately influenced by flight frequency and the lack of intermodal competition may also induce airlines to reduce flight frequencies.

7. D^{summer}. Dummy variable that takes the value 1 in the summer season to account for differences across seasons.

8. TimeTrend. A time trend is also included in the model to account for changes over time that cannot be captured by the variables considered in the empirical model.

4.0 Data

We have data for seventy-three routes. The frequency of the data is semi-annual, as we differentiate between summer and winter seasons in a time period that starts in the summer of 2001 and finishes in the winter of 2010–11. The merger between Iberia, Clickair, and Vueling was completed in summer 2009, so that our data contain observations for four post-merger periods (from summer 2009 to winter 2010–11). Twenty-two routes were affected by the merger. On twelve of these, Clickair and Vueling had been competing before the merger, while on ten, Iberia and Vueling had previously been in competition. No one route was previously served by all three operators at the same time. Note also that on nine routes the merged airline was obliged by the European Commission to surrender some slots.

Price information was collected for a sample week for each half year in the period 2001–11. We considered the lowest mean round trip price charged by all airlines operating the route weighted by their corresponding market share. The analysis is thus more representative for price-sensitive travellers. Unfortunately, we are not able to take into account the impact of the explanatory variables on the business fares of Iberia. Although we would expect some correlation in the evolution of prices for the different fare classes, this is a limitation of the present analysis.

The data were obtained from the airlines' websites using a homogenous procedure: information was collected one month before travelling and the price is for the first flight of the week, with the return leg being on a Sunday. Although the fares by route and airline change substantially on a monthly/weekly basis, we consider our price data to be reliable. The data are collected at the same time for all airlines and routes, and by imposing the same conditions on all airlines and routes, we can be confident in the data variability attributable to the differences between routes. Note also that low-cost carriers typically do not quote return fares. However, we have collected data manually and in all cases we have identified the price for a round trip flight with the same airline. Finally, prices are corrected for inflation.

The flight frequency variable shows the weekly number of flights offered by the airlines on each route, while the HHI is computed as the sum of the share squared in terms of flight frequencies. This information was obtained from the website of the Official Airlines Guide (OAG) and refers to the same sample week as the prices.

Demand data refer to the number of passengers carried by airlines on a particular route, including direct and connecting flights. This information was obtained from the website of the Spanish Airports and Air Navigation Agency (AENA). Distance is the number of kilometres between the airports of origin and destination on the route. Data were collected at the WebFlyer site. The dummy variable for high-speed trains includes four routes that leave from Madrid airport and two that leave from Barcelona airport. In most instances, high-speed trains have only recently become an alternative for travellers. Finally, the dummy variable for those routes on which Ryanair is operating takes the value 1 on twelve routes leaving from Madrid (in general, since winter 2008–9), on nine routes leaving from Barcelona (since summer 2010), and on eight routes leaving from other airports (since winter 2010–11).

The dummy variable for the summer season was constructed on the understanding that the summer season starts on the last Sunday of March and finishes on the last Saturday of October, both inclusive. Finally, the *TimeTrend* was constructed as an index that takes the value 1 in 2001, the value 2 in 2002, and so on.

5.0 Estimation and Results

We estimated the pricing and frequency equations by applying an instrumental variables procedure in a random effects setting. Given that the demand and route concentration variables might be endogenous, we need to account for any possible bias in the estimation by using the two-stage least squares estimator. Note that the use of a fixed-effects model is inappropriate in our context since this technique discards any time-invariant variables (such as route distance or the fact of being an island) from the model.

The main results of the pricing and frequency equations are shown in Table 2. The first three columns show the results for the impact analysis on prices, while the next three columns show the results on flight frequencies.

We find that the difference-in-difference estimator is positive and significant for the impact of the merger on prices, representing a significant increase in the fares paid by consumers of 20.89 euros on average. However, if we distinguish the price effect between those routes on which Clickair and Vueling were competing before the merger and those on which Iberia and Vueling were competing, it can be seen that the latter have been much more markedly affected by the merger. Thus on routes where Iberia and Vueling were operating before the merger, the price increase is 33.11 euros, while the increase on those where Clickair and Vueling were previously operating is only 7.47 euros, and is not significantly different from zero.

If we examine the control variables, we find that the coefficient associated with the demand variable is not statistically significant. In all likelihood, the better exploitation of density economies on thicker routes is compensated for by the airlines' stronger market power.

Several variables have a positive effect on the fares that airlines charge. Here, the HHI is positive and statistically significant at the 1 per cent level, showing that less competition results in higher prices. Likewise, the coefficients associated with the dummy variables for the summer season and for routes that have an island as an endpoint are positive and statistically significant at the 1 per cent level. These results suggest that travellers are willing to pay more on routes with major tourist destinations and during the summer.

As expected, the coefficient associated with the distance variable is positive and statistically significant at the 1 per cent level, but it is lower than 1. Airline costs are obviously higher on longer routes, but the distance economies discussed above account for the fact that the distance variable coefficient is less than 1.

Variables having a negative impact on fares include the presence of Ryanair, which significantly increases competition on the route, leading to a reduction in fares. Thus the coefficient associated with the Ryanair dummy variable is negative and statistically significant at the 5 per cent level. By contrast, intermodal competition from high-speed trains does not seem to affect the airlines' pricing behaviour.

The difference-in-difference estimator shows that frequencies on the routes affected by the merger have been reduced by 2.9 flights a week. If we differentiate this effect between the routes operated by Clickair and Vueling, and those operated by Iberia and Vueling, before the merger, we find that in the case of the two low-cost airlines the merger has led to a reduction in frequency of 6.5 flights a week, while in the case of the network company and the low-cost airline, frequencies have been increased by 0.5 flights a week, though the effect is not statistically significant.

Therefore, the merger has resulted in a decrease in flight frequencies solely on those routes where Clickair and Vueling were operating before the merger. This reduction in frequencies has had a significant negative impact on consumer welfare since it represents an increase in the schedule delay cost (that is, the difference between the desired and actual times of departure).

If we examine the control variables, we find that frequencies are, as expected, higher on thicker routes. Indeed, the coefficient associated with this demand variable is positive and statistically significant at the 1 per cent level. By contrast, flight frequencies are lower on longer routes. The coefficient associated with the distance variable is negative and statistically significant at the 1 per cent level. On longer routes, airlines do not suffer from intermodal competition and may prefer to use larger planes.

Table 2

Econometric Results (Two-stage Least Squares Random-effects Estimator)

	Prices			*Frequencies*		
Constant	−17.156	−2.087	−52.111	17.724**	22.730***	17.843**
	(40.107)	(46.065)	(41.275)	(7.178)	(7.711)	(7.801)
Pam	−13.719	−12.760	−19.893**	3.492***	3.806***	3.127**
	(8.877)	(8.774)	(9.075)	(1.319)	(1.281)	(1.275)
Ram	−6.618	–	–	−1.226	–	–
	(8.064)			(1.875)		
Click-Vue	–	−7.271	–	–	−0.500	–
		(10.388)			(2.547)	
Ib-Vue	–	−4.460	–	–	−1.650	–
		(14.541)			(3.638)	
Ram with remedy and entry of Ryanair	–	–	8.891	–	–	−1.774
			(12.363)			(3.304)
Ram with remedy but not entry of Ryanair	–	–	4.657	–	–	−0.393
			(11.680)			(3.178)
Ram without remedy and entry of Ryanair	–	–	−31.011***	–	–	−4.005
			(9.957)			(2.954)
Ram without remedy and not entry of Ryanair	–	–	−0.427	–	–	3.658
			(12.505)			(3.554)
*pam***ram*	20.889*	–	–	−2.899*	–	–
	(11.880)			(1.688)		
*pam***Click-Vue*	–	7.470	–	–	−6.505***	–
		(14.424)			(1.968)	
*pam***Ib-Vue*	–	33.110**	–	–	0.481	–
		(15.810)			(2.215)	
*Pam***Ram* with remedy and entry of Ryanair	–	–	24.961	–	–	−0.981
			(25.192)			(3.398)
*Pam***Ram* with remedy but not entry of Ryanair	–	–	41.547	–	–	−2.341
			(25.308)			(3.339)
*Pam***Ram* without remedy and entry of Ryanair	–	–	−2.772	–	–	−6.690***
			(18.112)			(2.377)
*Pam***Ram* without remedy and not entry of Ryanair	–	–	43.179**	–	–	0.189
			(21.362)			(2.910)
Demand	0.00003	0.00002	0.00006	0.0002***	0.0002***	0.0002***
	(0.00003)	(0.00004)	(0.00004)	(7.33e-06)	(9.34e-06)	(8.66e-06)

HHI route	186.445***	172.136***	218.897***	6.486	1.631	6.197
	(37.274)	(42.536)	(38.452)	(6.573)	(6.916)	(7.099)
D^{Summer}	54.622***	54.835***	54.423***	−3.638***	−3.566***	−3.586***
	(4.418)	(4.366)	(4.695)	(0.671)	(0.655)	(0.676)
D^{Island}	46.855***	44.491***	57.650***	0.411	−0.436	0.630
	(9.813)	(11.107)	(9.850)	(2.040)	(2.407)	(2.316)
Distance	0.121***	0.120***	0.125***	−0.016***	−0.016***	−0.015***
	(0.008)	(0.009)	(0.006)	(0.002)	(0.002)	(0.002)
Ryanair	−28.484**	−30.126**		−1.656	−2.407	
	(11.956)	(11.867)		(1.745)	(1.687)	
$D^{high\_speed\_train}$	−8.590	−3.456	−25.360*	1.634	2.826	0.745
	(13.326)	(13.786)	(13.712)	(2.247)	(2.313)	(2.345)
TimeTrend	−8.122***	−8.381***	−7.689***	−0.651***	−0.722***	−0.635***
	(1.293)	(1.306)	(1.368)	(0.204)	(0.200)	(0.207)
No. Obs.	1314	1314	1314	1387	1387	1387
Wald Test (χ^2)	786.82***	740.01***	1008.95***	2232.43***	1504.60***	2304.99***
(H_0: No joint significance)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
R^2	0.4216	0.4305	0.3904	0.9271	0.9272	0.9265
Anderson LR Statistic (χ^2)	124.406***	93.889***	–	127.359***	95.374***	–
(H_0: Equation is under-identified)	(0.0000)	(0.0000)		(0.0000)	(0.0000)	
Hansen *J* Statistic (χ^2)	2.523	2.575	2.982*	0.939	0.987	0.164
(H_0: Instruments Exogenous)	(0.1122)	(0.1086)	(0.0842)	(0.3326)	(0.3205)	(0.6857)

Note: Significance levels *** 1 per cent, ** 5 per cent, * 10 per cent. Robust Standard Deviation in brackets.

Furthermore, airlines offer lower flight frequencies in the summer, since the coefficient associated with the dummy variable for the summer season is negative and statistically significant at the 1 per cent level. Controlling for demand, it is presumably the case that the proportion of leisure passengers is higher in the summer. We also find a time tendency towards a reduction in flight frequencies. Finally, the other control variables are not statistically significant.

Based on the foregoing analysis, we can conclude that the merger has led to an increase in prices for passengers on those routes that Iberia and Vueling operated before the merger, while passengers on the routes that Clickair and Vueling were operating have suffered a reduction in service quality owing to lower weekly flight frequencies. In general, therefore, the overall effect on consumers has been negative. The merger has caused prices to increase by 10.5 per cent and the weekly frequency to fall by just over 4 per cent. However, passengers on the routes operated by Clickair and Vueling have suffered only a slight price increase as a result of the merger, but have been affected by a drop in flight frequency of just over 12 per cent. By contrast, passengers on the routes operated by Iberia and Vueling have not had to face significantly different flight frequencies, although following the merger there has been a price increase of over 15 per cent.

Finally, we make an additional estimation of the price and frequency equations in which we include new variables that differentiate between four types of routes affected by the merger in the difference-in-difference estimator:

1. routes for which slot surrender commitments were agreed and on which Ryanair entered;
2. routes for which the remedy was agreed but on which Ryanair did not enter;
3. routes for which the remedy was not applied but on which Ryanair entered; and
4. routes for which no remedy was applied and on which Ryanair did not enter.

The results of this additional estimation for both price and frequency equations are shown in the third column of Table 2.

From these estimations, we can see that on the routes for which no remedies were agreed and on which Ryanair did not enter, the prices rose significantly. The increase in prices was similar on routes for which slot surrenders were imposed and on which Ryanair did not enter, yet the corresponding variable is not statistically significant. Regardless of the imposition of slot surrenders or otherwise, the routes on which Ryanair offered services after the merger did not show any different price movements to those shown by routes unaffected by the merger. As for flight frequencies, routes that were unaffected by the remedy and on which Ryanair entered show a significant reduction in frequencies.

When analysing the impact of slot surrender commitments by the merged airlines, the entry of Ryanair is a critical aspect to consider. Note that Ryanair's business model is based on low flight frequencies, while its low prices for any particular route probably serve to deter the entry of other airlines. In this regard, the effects of the slot surrender commitments could have been to increase competition and/or to promote the entry of Ryanair. Having inspected the data, no substantial differences are seen in the evolution of the HHI on routes affected by the merger regardless of the imposition or otherwise of remedies. Furthermore, of the twenty-two routes affected by the merger, Ryanair is currently offering services on thirteen routes following the event. Six of these routes were affected by the slot surrenders, while seven were unaffected. It is thus unclear as to whether the slot surrender commitments promoted the entry of Ryanair. It might be the case that the effect of the slot surrender commitments is more relevant in instances of severe airport congestion, which was not the case for Spain in the period following the merger.

6.0 Conclusions

In this paper, we have examined the effects of a merger between one network and two low-cost airlines on fares and flight frequencies. We find that the merger has been detrimental to consumers, but that the impact varies depending on the competition between companies on specific routes before the merger.

The merger has resulted in a marked reduction in the frequency of flights, but no substantial changes in pricing on the routes for which the two low-cost carriers were previously competing. By contrast, the merger has resulted in a considerable price hike, but no substantial changes in frequency on routes for which the network carrier and one of the two low-cost carriers were previously competing. Thus consumers have suffered a negative impact as a result of the merger, because of either a lower flight frequency or higher fares.

The behaviour of the airlines following the merger may be related to the different passenger types that are the predominant users of the routes affected by the merger. It would appear that the proportion of leisure travellers (price sensitive and less time sensitive) is higher on routes where the two low-cost airlines previously operated. By contrast, the proportion of business passengers (time sensitive and less price sensitive) appears to be higher on routes on which the network carrier and one of the low-cost carriers previously operated.

As we have noted, the completion of the merger studied here coincided with the increased presence of Ryanair in the Spanish airline market. Indeed, the impact of the merger has been greatly determined by the entry or otherwise of Ryanair on the affected routes. It seems likely that it is Vueling that will be most affected by the increase in price competition introduced by Ryanair, since Iberia focuses its business on exploiting connecting traffic at the hub airport. This may also provide an explanation for our results.

Less clear is the effect of the slot surrender commitments agreed by the merged airlines for certain routes. The effect of this remedy would appear to be more relevant in situations of severe airport congestion.

In short, the differences in the impact of the merger are substantial depending on the type of airline involved. We thus conclude that any assessment of a merger needs to account for the perceived product differentiation between network and low-cost airlines. In this regard, both prices and frequencies must be considered, since the effects of the merger can depend on the type of traveller (business or leisure) that is the most frequent user of the route.

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