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THE IMPACT OF MARKET STRUCTURE AND PRICE DISCRIMINATION STRATEGIES IN THE AIRLINE SECTOR

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1. Introduction

This paper investigates which factors influence airlines' decisions when planning pricing strategies. We explore the impact of market structure and airlines pricing behaviour in a specific geographical context characterised by a low level of intermodal competition. The data used is, in fact, collected on a sample of southern Italian routes, for which alternative accessibility through different modes of transport is limited. We focus primarily on a specific type of pricing strategy: the intertemporal price discrimination (IPD). The IPD consists in charging different fares to different travellers according to the days missing to departure when the ticket is bought. The work aims to verify whether market's concentration levels play a significant role in defining fare levels and, more in particular, whether airlines are more or less keen to engage in IPD when competition increases or when it reduces.

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The paper is structured as follows. In Section 2 we survey the relevant literature; the data collection is described Section 3 and in Section 4 we present the empirical strategy. Afterward, in Section 5 we discuss the main outcomes and in Section 6 we draw some conclusions.

2. Literature review

Airlines engage in price discrimination (PD) to discern travellers with a relative inelastic demand from travellers with a more elastic one to extract their surplus. Gaggero (2010) identifies three categories of travellers. Early bookers show a slightly inelastic demand: they are willing to pay quite higher fares to travel during vacations. Middle-bookers exhibit an higher elastic demand: being more flexible, search for the cheapest fares. Late-bookers reveal an inelastic demand: business travellers book tickets few days before the departure with fixed travel dates and destinations. Airline fares display a trend over time whose shape reminds a J-curve reflecting the opposite pattern of demand elasticity: travellers heterogeneity is a necessary condition to fruitfully implement IPD.

The IPD starts to be empirically analysed by Bachis and Piga (2007) that examine the UK flights to and from Europe: fares remain more stable when departure is further away whereas volatility increases as departure comes nearer. Investigating the Ryan Air's IPD strategy in the UK market, Alderighi and Piga (2010) show a U-shaped trend; exploring the British-isles, Gaggero and Piga (2010) illustrate that fares pattern over time of individual flights follows the J-curve.

Traditionally market power enhances the ability of firms to price discriminate. In the airline industry when competition increases the mark-ups associated to the fares paid by business travellers decrease and align with the ones of leisure travellers. However travellers differ in the degree of brand loyalty: business travellers are more brand loyal than leisure travellers since the join frequent-flyer programs. When competition increases, the mark-ups applied to leisure travellers decrease whereas the ones of business travellers remain almost unchanged: PD increases as competition increases. Theoretical contributions demonstrate that PD can be implemented in competitive markets if travellers show heterogeneity of brand preferences (Borenstein (1985), Holmes (1989)), time valuation and demand uncertainty (Gale (1993), Dana (1998)).

On the empirical side Stavins (2001), exploring the US airline industry, and Giaume and Guillou (2004), exploring the intra-European market defined by flights from Nice (France), provide evidence that PD is enforced when

markets are more competitive: ticket restrictions reduce fares although the effect becomes poorer in more concentrated markets. Consistently Borenstein and Rose (1994) on the US airline industry find that PD are undertaken in more competitive markets since in more concentrated markets the price dispersion is lower.
Gerardi and Shapiro (2009) replicate the cross-sectional analysis of Borenstein and Rose (1994), reaching the same results; however when they set up a panel analysis they achieve opposite results[1]. Analysing the British isles' market, Gaggero and Piga (2011) find that few companies with large market shares can easily price discriminate. However Hayes and Ross (1998) and Mantin and Koo (2009) find no evidence: price dispersion is due to peak load pricing schemes and is influenced by the characteristics of the carriers.

3. The Data

Data on posted fares are collected to replicate travellers' behaviour when making reservations for business or leisure trips: we identify plausible round trips and use airlines' websites to simulate reservations. We observe fares daily starting, generally, sixty booking days before departure. Therefore we define a dataset composed by 20.175 observations on 440 round-trips. The observation period is from November 2006 to February 2011; our sample includes 15 city-pairs (Table I) and 10 carriers[2]. Both FSCs and LCCs are considered, thus we choose the basic services (no add-ons) to make comparable carriers' supply.

[1] The panel approach estimates the effect of competition by accounting for changes in the competitive structure of a given route over time rather than changes in competitive structures across routes.
[2] The list of companies is available from the authors. It includes, among other companies, Alitalia and the major European low cost carriers.

Table 1 - City-pairs

Bari	London
Bari	Milan
Bari	Paris
Bari	Rome
Brindisi	London
Brindisi	Milan
Brindisi	Rome
Catania	London
Catania	Milan
Catania	Rome
Naples	Milan
Naples	Rome
Palermo	London
Palermo	Milan
Palermo	Rome

Given the city-pair, if carriers do not provide flights for the selected departure and return dates, they are not counted among the competitors. In addition, round-trips enable to account for peak-periods to verify if airlines adjust their pricing in phases characterized by greater demand. Airport data are taken to define the daily number of flights of each company and the data on demand. Finally, data on the distance between the two route endpoints belong to the World Airport Codes' web site.

4. Empirical strategy

We specify our empirical strategy drawing on Stavins (2001):

$$Ln\,(P_{ijt}) = \beta_0 + \beta_1 Market\ Structure_{ij} + \beta_2 Booking\ Day_t + \beta_3 Booking\ Day^2{}_t + \beta_4 (Market\ Structure_{ij} * Booking\ Day_t) + \theta_5 Flight\ Characteristics_{ijt} + \theta_6 Route\ dummies_j + \delta_t + \varepsilon_{ijt}$$

where *i* indexes the carrier, *j* the route, *t* the time. Time refers to the number of times we observe the fares, it goes from 1 to 60. For some round-trips we have less than sixty observations thus we manage an unbalanced panel. The equation is estimated with the Random Effects (RE) estimator. The dependent variable is the log of the fares. *Booking Day* measures the IPD and ranges from 1 to 60, $Booking\ Day^2$ accounts for the non-linearity.

We define two proxies of market structure at city-pair level[3]: *Market Share,* average share of the daily flights operated by an airline at the two endpoints of a city-pair, and the relating *Herfindahl-Hirschman Index* (*HHI*).
Flight Characteristics are: *Holiday*, a peak-periods dummy equal to 1 in case of holidays, 0 otherwise; *LCC*, a carrier dummy equal to 1 if an airline is a low cost, 0 otherwise.
Route Dummies captures the route-specific effects; δ_t is a set of monthly dummies for each year controlling for seasonal effects, ε_{ijt} is the error term. We treat the endogeneity by employing instruments largely adopted in the literature[4]: the observed carrier's geometric mean of enplanements at the endpoints divided by the sum across all carriers of the geometric mean of each carrier's enplanements at the endpoint airports, targeted *Market Share*; the square of the market share fitted value plus the rescaled sum of the squares of all other carriers' shares, targeted to *HHI*; the distance in km between the two route endpoints, addressed to both.

5. Results

The following table displays our estimates:

[3] We need the city-pair level to capture the real competition between carriers since in perpherical areas almost all the carriers operate as a monopolist on a given route.
[4] The first two instruments are designed by Borenstein (1989) pg 351-353.

Table II - The effect of market structure and IPD on fares.

	Market Share		*HHI*	
	OLS	IV	OLS	IV
Market Share	0.4053*	0.5095**		
	(0.1579)	(0.1712)		
*Market Share*Booking Day*	0.0065*	0.0068*		
	(0.0029)	(0.0025)		
HHI			0.4674***	0.5485***
			(0.1022)	(0.1218)
*HHI*Booking Day*			0.0067*	0.0068*
			(0.0030)	(0.0031)
Booking Day	-0.0373***	-0.0356***	-0.0379***	-0.0361***
	(0.0029)	(0.0026)	(0.0029)	(0.0028)
Booking Day^2	0.0004***	0.0004***	0.0004***	0.0004***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Holiday	0.3181***	0.3023***	0.3217***	0.3058***
	(0.0747)	(0.0816)	(0.0820)	(0.0844)
LCC	-0.2633***	-0.2358**	-0.4266***	-0.4333***
	(0.0576)	(0.0724)	(0.0651)	(0.0657)
R^2	0.702	0.711	0.697	0.705
Observations	20175	16954	20175	16954

* signif. at 10%; ** signif. at 5%; *** signif. at 1%. Robust Standard errors in parentheses clustered by route. Route and seasonal dummies are included but not reported.

Market Share and *HHI* have a positive and significant impact on fares, robust across regressions: the market power due to the higher market concentration allows airlines to increase fares. Moreover the negative and significant impact of *Booking Day* on fares shows that airlines effectively engage in IPD. *Booking Day*^{2} allows to detect the so-called J-curve effect: early-bookers pay moderately higher price compared to middle-bookers, whereas late-bookers pay the highest fares.

The interaction of *Booking Day* with *Market Share* or *HHI* is positive and significant, claiming that more concentrated markets are less suitable for the enforcement of IPD strategies. Our results provide arguments in favour of competitive discrimination as Borestein and Rose (1994), Stavins (2001) and Giaume and Guillou (2004), although contrasting with Gerardi and Shapiro (2007) and Gaggero and Piga (2011). The results of control variables are those expected. Holiday is positive and significant: during

peak periods airlines exploit the greater demand setting higher fares. Moreover *LCC* is negative and significant, underlying that LCCs price lower than FSCs[5].

6. Conclusions

We have explored airlines pricing strategies defining which factors influence airline decisions in specific geographical areas. Our main findings show that the market power arising from more concentrated markets leads to higher fares. Airlines do undertake the IPD strategy: fares distribution seems to follows a J-curve by which airlines exploit the different willingness to pay of travellers to maximize their profit. The empirical evidence is in favor of "competitive discrimination": a more competitive market structure fosters the implementation of IPD strategies. Moreover LCCs adopt a more aggressive pricing behavior by setting, on average, lower fares. One might argue that PD is only beneficial for airlines. Nevertheless in more competitive markets airlines charge lower fares that, together with the IPD, allow to target larger segments of demand which leads to a "democratisation" of air travel.

Developments for future research could be twofold. On the one hand, following the preliminary analysis carried out in Bergantino and Capozza (2011a, 2011b), we plan to enlarge the territorial coverage of the study in order to compare different exogenously determined accessibility conditions. We aim to investigate whether airlines exploit their dominant position with respect to both modal - as in the case of mergers - and intermodal competition. In the latter case, we aim to test whether the lack of alternative transport services strengthens airlines power, thus reflecting in higher fares and more aggressive pricing strategies with respect to customers. On the second hand, we would like to test the role of low cost carriers in terms of net benefits for accessibility. Furthermore, we aim to take account of the local governments' subsidies, often granted to airlines, to evaluate their impact on fares and pricing strategies and, thus, on the net welfare of the interested area.

[5] In line with the findings of Bergantino (2009). Exploring carriers pricing behavior on some Italian routes involving small airports, she highlights, in fact, that LCCs post, on average, half the fares of FSCs.

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