Competition in the Spanish domestic airline sector: Market deregulation, switching costs and route cost behaviour

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1. Introduction

The importance of incumbent cost reaction to low-cost market entry research was initially proposed by Särndal and Statton (1975) when they suggested that a competitor's business profile, either high-cost or low-cost carriers (LCCs), is a critical factor for competition in the airline sector. The competitive advantages of LCCs and the different incumbent reactions to their entry, for example, cost reduction, increased operating efficiency and creation of low cost (LC) subsidiaries, are considered key elements of firm survival in this new competitive environment (Morrell, 2005; Oum *et al.,* 2005). However, researchers have paid little attention to the effect of incumbent cost reaction on market (route) entry (Sancho-Esper and Mas-Ruiz, 2016) given the difficulties or even impossibility of quantifying key cost drivers, since airlines are not required to disclose cost information at route-level. The system-wide data available does not help in answering these types of research questions. Because of this, existing literature has focused on analysing the firm-level overall cost differences of established carriers when faced with the entry of an LCC to the market (Forsyth, 2001) rather than analysing route-level cost reaction.

An interesting finding of this existing research is the fact that, when prices determine customer switching, it is helpful to evaluate costs together with the various service elements. For example, LC entrants' optimal cost structures and fewer customer facilities can force traditional carriers to reduce their costs (Tan, 2016). Incumbents can also react to LC market entries by reducing their network size and the number of operations to reduce costs and regain profitability (Tsoukalas *et al.,* 2008). Regarding this, researchers have suggested that the key question here relates not only to the comparisons between incumbent and low-cost entrants' costs at firm-level, but rather to their costs and services at route-level. These researchers point

out that the use of smaller aircraft on short-haul routes can minimize costs (Fageda, 2009) and high flight frequency on these routes can also reduce costs if demand-side advantages can be sustained. This paper extends these ideas by focusing on incumbent operating cost response at route-level and by considering flight frequency as a service element.

In addition, this study considers that incumbent cost reaction to entry is conditioned by the relationship between the established firm and the new entrant, in terms of incumbent switching costs (SwCs) related to the new entrant. It is assumed that SwCs have important dynamic effects, which can affect incumbent cost behaviour. Until now, literature on SwCs has focused on price reaction to market entry in regulated/deregulated environments. In service industries like airlines, in a context of stable switching costs over a regulated period, the incumbent firm takes advantage of market power derived from a better exploitation of frequent flyer programs (FFPs), and this advantage may explain why established firms tend to accommodate the LC entrants' prices, rather than trying to match them. In fact, before deregulation, consumers did not prefer lower prices when these corresponded to lower service quality (Gual and Vives, 1991). However, after the substantial price fall following deregulation, new low SwCs customers who preferred lower quality associated with lower prices made an appearance. Thus, in this new context, there is no place for an incumbent pacifist attitude. Under deregulation, incumbents become more aggressive in their pricing because they are pursued by new LC entrants who are able to build up their own customer networks and achieve optimal productive scales (Daraban and Fournier, 2008; Goolsbee and Syverson, 2008). The present study extends this logic and therefore expects that lower SwCs induce a dynamic asymmetric cost response from established firms, evolving from a context where non-threatening LC entrants expect to suffer a small number of minor retaliations from incumbents, to a context where aggressive LC entrants expect a large number of greater

retaliations from incumbents. These expected results have important implications for both public regulators of airspace as well as for airline managers.

The objective of this manuscript is twofold. First, it analyses the operating cost behaviour and service elements at route-level, as well as the SwCs of established carriers in the Spanish domestic airline market from 2000 to 2009. Second, it studies the relationship between SwCs and incumbent cost response to entry at route-level, taking into account the moderating role of the entrant business profile (formerly regulated vs. LCC) and regulatory context (airport restrictions in place between 2000 and 2005, and after their elimination from 2006 to 2009). The estimation of this model involves the calculation of operating costs for each carrier and route in the Spanish airline domestic market where incumbents reacted to market entries from 2000 to 2009.

2. Incumbent cost response to LCC market entry: Switching costs and deregulation

An important line of research, mainly based on economic approaches, suggests that incumbent response to market entry is asymmetric and depends on the specific features of the entrant, such as the scale of the entry, the incumbent market share and incumbent economies of density at hub-level (*e.g.*, Bilotkach *et al.*, 2010; Gayle and Wu, 2013; Oliveira and Huse, 2009). Instead, this study considers SwCs to be a key element that connect the entrant business profile and the incumbent when analysing incumbent cost reaction to market entry, which in turns affects the entry conditions and the later incumbent response.

A product has classic SwCs if it is repeatedly purchased by a buyer who will find it costly to switch from one seller to another (Farrell and Klemperer, 2007). This study builds on the approach of pecuniary SwCs, a specific type of SwC which are artificially created at the incumbent's discretion, and constitute a form of quantity discount (Klemperer, 1987a; 1987b) that prevails in the airline industry. This approach suggests that passengers enrolled on FFPs are rewarded for repeated trips with the same carrier. These SwCs create brand loyalty in

travellers once they have bought services from a particular airline, while travellers who switch between airlines lose opportunities to earn points that yield benefits, such as free or reduced-cost trips (Fageda, 2009; Farrell and Klemperer, 2007). This idea is extended by assuming that SwCs have important dynamic effects which can impact incumbent cost behaviour as a reaction to LC entrants and as the environment evolves from regulation to deregulation. In Section 3.2 of this paper, several dimensions of the concept of SwCs are considered. The first defines SwCs as the cost in monetary terms that a customer incurs to change from their established firm to one of its competitors (Shy, 2002). Alongside this dimension of SwCs that defines it in monetary terms, and according to Carlsson and Löfgren (2006), SwCs can also be quantified in the sense of loss of benefits and service elements to passengers, such as brand loyalty derived from frequent flyer benefits. In other words, the competitive scope of the incumbent in terms of its route network acts as an indicator of the *breadth* of the relationship between the customer and the focal firm, and the age of the incumbent's FFP acts as an indicator of the potential *length* of the relationship between the customer and the focal firm.

2.1. Switching costs and incumbent cost reaction to entry under regulatory constraints

Essentially, high SwCs tend to reduce competition between firms because they create captive clients who can be 'squeezed'. In markets where consumers face high SwCs, a firm's market share determines its profits. That income, derived from market power, increases with the size of its client base (Carlsson and Löfgren, 2006; Dorotic *et al.*, 2012; Kim *et al.,* 2001). Conversely, low SwCs promote competition because they incite firms to attract new clients. In addition, SwCs can vary across customers (de Boer and Gudmundsson, 2012; Martín *et al.*, 2011; Polo and Sesé, 2009). A regulated airline industry imposes a two-tier fare system, where, for example, SwCs are higher for business travellers because these passengers are more time-sensitive but less price-sensitive, since lower prices lead to a greater sacrifice of the benefits of an FFP. Meanwhile, in this scenario, SwCs are lower for leisure travellers,

because they are less time-sensitive but more price-sensitive (Fageda, 2009). Firms belonging to industries with this type of structure can effectively implement market segmentation through price discrimination and can coexist at different levels of rivalry (Farrell and Klemperer, 2007).

This segmentation can be considered a specific example of *fat cat* incumbent strategy (see Fudenberg and Tirole, 1984), pursued by *puppy dog* new LC entrants (see Call and Keeler, 1985). These terms describe an incumbent that is able to segment its markets effectively, and so responds to entry by reducing prices and service quality to hold on to price-sensitive passengers, and also uses tools like FFPs to keep the loyalty of higher-yield segments without price matching. In such a context, a new entrant will find it difficult to compete with a price-matching incumbent which will tend to retain passengers as they are accumulating rewards in the incumbent's FFP (Farrell and Klemperer, 2007). In short, the market is segmented with a simple two-tier fare system, and business passengers, who have higher SwCs, respond less to price variations than tourists (Levine, 1987). In the US domestic airline industry, this simple two-tier fare system was supported by a price regulation that imposed a rigid fare structure until 1978. A similar two-tier fare system prevailed in Spain until 2004 (see below).

In any case, previous literature on SwCs under price regulation has been focused on price reaction to market entry. Alternatively, this study considers that market power derived from SwCs, namely, the exploitation of FFPs, may explain incumbent cost reaction, conditioned by entrants' cost structures. This study considers an LC entrant (at a competitive disadvantage in terms of FFPs) to be less of a challenge. Therefore, under low SwCs, customers are able to switch only up to a certain point; and so it is expected that, in terms of costs, incumbents may react less to LC entrants compared to similar cost entrants.

In addition, this expected incumbent cost behaviour could be reinforced by entry regulations that increase the market power derived from SwCs. Supporting this assumption is Oliveira and

Huse's (2009) observation, that incumbents offering FFPs can also take advantage of flight frequency and a large, single-carrier route network. In essence, entry regulation can lead to an institutional structure with first-mover advantages in terms of endowment location, particularly at slot-constrained or gate-constrained airports, which serve to distinguish formerly regulated carriers from new LC entrants (Peteraf, 1993). Incumbent airlines can gain advantages by exploiting privileged access to airport scarce resources (slots and gates) which are important entry barriers (Borenstein, 1989). In the Spanish domestic market, even after removing legal restrictions on the entry of EU carriers in 1997, only small foreign LC carriers, for example, Virgin Express, Eurowing and Easyjet, entered domestic routes, and began to operate secondary markets (Fageda and Fernández-Villadangos, 2009) due to the fact that incumbent national carriers were still taking advantage of their former control over airport facilities which acted as an entry barrier. This restrictive environment drives incumbents to improve their service quality in terms of flight frequency and route network, in order to increase the effects of market power derived from SwCs, namely, the exploitation of FFPs.

Regarding demand analysis, business travellers may attach greater importance to frequent flight schedules and a large single-carrier network, perhaps with first-class service; whereas leisure travellers may place little value on these comforts and conveniences (Call and Keeler, 1985; Dorotic *et al.*, 2012; Klophaus, 2005; Martín *et al.*, 2011). This drives incumbents to promote FFPs because a higher flight frequency (in airports where slots and gates are constrained for entrants) speeds up point accumulation (Fageda, 2009). In addition, a large single-carrier network creates scope economies for business travellers, since choosing an airline with a wider variety of destinations will make it easier for them to earn rewards (Farrell and Klemperer, 2007; Levine, 1987). Contrary, new LC entrants do not have a frequent flyer base ─or large networks for that matter─ and so they are at a competitive disadvantage in terms of SwCs in relation to incumbents (Klophaus, 2005). In brief, flight frequency and a large network allow

incumbents exploiting SwCs through FFPs to accumulate greater market power (Dorotic *et al.*, 2012); hence, this study considers that incumbents have less incentive to reduce costs, even though Fageda (2009) suggests that flight frequency can facilitate the exploitation of efficiency through density economies on the cost side.

Based on the above, the market power derived from SwCs, supported by a context of price and entry restrictions, may explain the incumbent cost reaction, conditioned by the cost structure of the entrants. In this restricted situation, it is expected that a LC entrant is less of a challenge, and therefore the following research hypothesis is proposed:

H1. In an industry with price and entry restrictions, lower switching costs induce incumbents to make smaller cost reactions and accommodate when competing against low-cost entrants compared to formerly regulated entrants.

2.2. Dynamic switching costs and incumbent cost reaction to entry under deregulation

In general, previous strategies assume that markets with SwCs are stable and comprise incumbents which act as less aggressive *fat cats* in relation to non-threatening LC entrants. However, SwCs can also have important dynamic effects (Gual and Vives, 1991; Villas-Boas, 2015) and, as Farrell and Klemperer (2007) argue, the opposite scenario is also possible. Incumbents may also act as more aggressive *top dogs*: for example, if US airline sector customers were asked, before price deregulation, if they preferred lower service quality (in terms of waiting times, boarding services, *etc.*) in a trade-off for lower fares, they may have refused. But, as deregulation occurred, fares substantially decreased and converged, air traffic remarkably increased and a new low-SwC customer appeared in the airline sector (Gual and Vives, 1991). Before price deregulation, airline markets were segmented by means of a two-tier fare system, but deregulation increased the difficulty of maintaining such segmentation methods because of acute pressures to keep seats filled. This system was replaced by complex fare structures that reflect different conditions and markets (Levine, 1987). These new fare

structures control aircraft capacity through inventory management programs, dividing the aircraft into subunits to be sold on different terms to different market segments and allowing airlines to optimize a simultaneous service to price-sensitive and less-sensitive portions of the market. In this context of dynamic SwCs, when price restrictions are removed, *fat cat* incumbents tend to evolve into *top dogs* because they are pursued by *lean and hungry* new entrants (see Call and Keeler, 1985).

In any case, previous literature on SwCs after price deregulation has been focused on price reaction to market entry. Alternatively, this paper considers that, when there are low SwCs, in terms of costs, incumbents may be more prone to react to LC entrants than to similar cost entrants. In addition, this expected incumbent cost behaviour would be reinforced by the removal of entrant capacity restrictions. Ultimately, the elimination of the competitive restraints at airports occurs parallel to the massive entry of LCCs (Bottasso *et al.*, 2017; Wiltshire, 2018; Thelle and la Cour, 2018). Furthermore, in the period of transition to a deregulated airline environment, the incumbent *fat cat* strategy will cease to apply over time: as the new LC entrant becomes better established, it will be able to expand its frequency, build up its own network, and become more trusted by business people as a means of travel (Call and Keeler, 1985; Dobruszkes, 2006). In fact, nowadays, EasyJet and Ryanair have the largest networks in Europe and many LCCs have developed their own business flight programs. Passenger relationship management has become a vital concern even for the LCCs (Akamavi *et al*., 2015; Palmer *et al*., 2016). If the cost structure of a new entrant (mainly LCCs) is more efficient than that of the incumbent, and without entry restrictions preventing the entrant from achieving optimal production capacity, it can make large-scale entries and send a signal of its commitment in such markets to existing competitors. This aggressive entry will be perceived as threatening to existing competitors who will respond quickly and robustly (Gatignon and Bansal, 1990; Tan, 2016; Varella *et al*., 2017; Gorin and Belobaba,

2008). Levine (1987) suggests that in this situation, established carriers would inexorably be transformed into *top dogs*, forced to lower their costs and simplify their fare structures, or fail. The incumbent reaction of reducing costs would show that the most efficient innovators destabilize an industry and the least efficient must exit (Candela, 2008). Thus, an entry of a more viable competitor pressures incumbents to improve their efficiency (Kangis and O'Reilly, 2003; Hannigan *et al.*, 2015), providing a 'wake-up call' to act if they want to remain a viable competitor.

In the Spanish airline industry, entry capacity restrictions were removed with, since 2004, a huge public investment in airports to increase their capacity. This occurred in parallel to the increase of LC entrants (Fageda and Fernández-Villadangos, 2009; Sancho-Esper and Mas-Ruiz, 2016), and, according to the above logic, a rise in the competitive pressures on incumbent firms to improve efficiency. In view of the above, the dynamic effects of SwCs in an industry with unrestricted price and entry threaten firm stability, and so the following research hypothesis is proposed:

H2. In an industry with unrestricted price and entry, lower switching costs induce incumbents to make greater cost reactions when competing against low-cost entrants compared to formerly regulated entrants.

3. Sample, methodology and variables

3.1. Descriptive analysis of routes and carriers

The analysis of the Spanish domestic airline market is based on the following data collection process. Firstly, potential competitive reactions of incumbent airlines to a competitive entry were identified, within the parameters of given routes in the Spanish airline market between 2000 and 2009. To this end, the AENA database (which provides general traffic and passenger data) was searched and the routes of 38 airports were selected from a total of 45. The 38 airports selected have a minimum level of regular commercial operation, with 300

flights per year and 10,000 passengers (PAX) per year. At these airports, potential reactions by incumbents could be observed. A potential reaction to entry from an established firm is considered to occur when an incumbent carrier is operating a route and faces the entry of a new competitor on this same route, for example, if Iberia and Air Europa are incumbents operating the Barcelona-Madrid route and Ryanair enters this route, this would produce two potential reactions; one from Iberia and another from Air Europa. A route is included in the sample if it has a minimum of two airlines jointly operating on it between 2000 and 2009, and if there is an entry that may cause a potential reaction. There were 193 routes with potential reactions in Spain's domestic market (from a total of 703 routes) between 2000 and 2009.

Eleven airlines operate scheduled domestic operations (excluding charter operations) on these 193 routes. They are categorised by business profile: i) formerly regulated carriers (national: Iberia, Air Europa and Spanair; and regional: Air Nostrum, Binter and Naysa); and ii) LCCs (Vueling, Clickair, Ryanair, Air Berlin and Easyjet). The evolution of market share of the carriers operating the selected routes, in terms of PAX, shows a gradual reduction of the formerly regulated carriers' market share, from 64 % in 2000 down to 47 % in 2009; while the LCCs' market share shows important growth from 2.5 % in 2000 up to 35 % in 2009 due, mainly, to the improved capacity of Spain's airport infrastructure. The selected routes show 394 entries in the 2000s. Until 2005 the entry of formerly regulated carriers prevails (Spanair and Air Europa). However, in the second half of the decade, the entry of international LCCs (Ryanair, Air Berlin and Easyjet) prevails. This qualitative change in entrant profile, also observed by Aguiló *et al.* (2007), could have generated a change in the reaction strategy of established firms in domestic markets (Fageda, 2009). Lastly, the selected routes show 661 potential reactions from established carriers to 394 competitive entries between 2000 and 2009. In general, potential reactions from formerly regulated carriers prevail. Until 2005 the number of reactions is stable, with exponential growth during the second half of the decade,

partly due to the huge investment in Spanish airports and the threat of new LC entrants (Fageda and Fernández-Villadangos, 2009).

Secondly, information was gathered on the different variables (see Section 3.2) related to the 661 potential reactions, and the operating costs of the carriers involved in such operations are estimated.

3.2. Methodology and variables

The incumbent cost response model used here relates the behaviour of the established firm in response to an entry and the relevant variables that condition such behaviour. It proposes a dynamic specification [1] with the dependent variable in differences. For each reaction k, defined by incumbent firm i in route m and given entrant j and period t, the incumbent's response is measured as the difference in average costs in current period t ($y_{k,t}$) and average costs in previous period t-1($y_{k,t-1}$).

The panel data structure of reactions allows for the analysis of incumbent cost behaviour ($\Delta \text{Cost}_{k,t}$) related to each new market entry, taking into account the joint effect of incumbent SwCs and the type of entrant (interaction effect), as well as the control variables (incumbent market dominance, market concentration and tourist destination index). Where the dependent variable ($\Delta\text{Cost}_{k,t}$) measures the variation in the incumbent's average flight operating cost [2] ($\text{Cost}_{k,t} - \text{Cost}_{k,t\text{-}1}$) for a given route (See appendix A1 for more detail). The independent variables are the interaction effects between the incumbent SwCs and the type of entrant (formerly regulated and LCC), and they assess the differential effect of SwCs between the different types of entrant carriers. The classification by type of airline (formerly regulated: national and regional; and LCCs) is based on the regulatory and institutional structure of Spain's domestic market. Formerly regulated carriers are not restrained by the initial airport capacity limitations or entry restrictions for foreign companies (non-European carriers), and

are able to exploit first-mover advantages at monopoly and/or slot-constrained airports, as well as their higher operating costs.

Furthermore, three measures of incumbent SwCs, aimed at quantifying the different dimensions of the concept based on the available data [3] are used. Firstly, according to Shy (2002), SwCs can be defined as the cost in monetary terms that a current customer incurs to change from the established firm to one of its competitors (monetary SwC). Alongside this dimension, SwCs are also quantified here in the sense of loss of benefits and service elements to current passengers, such as brand loyalty derived from frequent flyer benefits. In this way, and based on Carlsson and Löfgren (2006), two additional variables are included to quantify the importance of FFP in creating SwCs for customers in a given market: the incumbent competitive scope (incumbent market scope) which refers to the route network; and the age of the incumbent FFP (See appendix 1 for more detail).

In Eq. (1) the incumbent operating cost response to market entry is modelled as a function of the three different measurements of incumbents' SwCs, taking into account the type of entrant (moderation effect) and the main control variables.

$$\begin{aligned}\Delta COST_{k,t} = \Delta COST_{k,t-1} &+ \beta_1\,[\text{monetary SwC} * (D \text{ low-cost entrant})]_{k,t-1} \\ &+ \beta_2\,[\text{monetary SwC} * (D \text{ formerly regulated entrant})]_{k,t-1} \\ &+ \beta_3\,[\text{incumbent market scope} * (D \text{ low-cost entrant})]_{k,t-1} \\ &+ \beta_4\,[\text{incumbent market scope} * (D \text{ formerly regulated entrant})]_{k,t-1} \\ &+ \beta_5\,[\text{FFP age} * (D \text{ low-cost entrant})]_{k,t-1} \\ &+ \beta_6\,[\text{FFP age} * (D \text{ formerly regulated entrant})]_{k,t-1} \\ &+ \beta_7\,[\text{incumbent market dominance}]_{k,t-1} \\ &+ \beta_8\,[\text{market concentration}]_{k,t-1} + \beta_9\,[D \text{ tourist destination index}]_{k,t-1} + \varepsilon_{k,t} \qquad \text{(Eq. 1)}\end{aligned}$$

3.3. Econometric implementation

The data used to estimate the incumbent cost response to entry model is structured as a balanced panel, including 620 incumbent reactions (k) where their operating cost behaviour is observed over six quarters after each market entry (t= 0,1,…, +6), occurring between 2000 and 2009. The proposed model is estimated in two periods (2000-2005 and 2006-2009) based

on the structural changes that occurred in the Spanish domestic airline sector (see Section 2.2 for more information) and also supported by the statistical change in the dependent variable (incumbent cost reaction) in the second half of the decade.

Panel data methods are used to tackle the potential bias due to unobservable heterogeneity and potential endogeneity of regressors (Hsiao, 2003; Baltagi, 2005). Hence, individual (incumbent reaction) heterogeneity is controlled for by modelling it as reaction-specific (η_i), which is then eliminated by taking the first differences of the variables (see Garin-Munoz and Montero-Martín, 2007; Clougherty and Zhang, 2009 for studies of the airline sector). Moreover, an instrumental variable method is used to control for the potential endogeneity of the explanatory variables, which has been previously used by Borenstein (1991). In this respect, the most suitable alternative is the Generalised Method of Moments (GMM) estimator because it embeds all other instrumental variable methods as special cases (Ogaki, 1993). Moreover, the GMM estimator is particularly appropriate for the present study given the dynamic nature of airline cost reaction, which requires the inclusion of lagged cost reaction as an explanatory variable in the empirical model used here.

This approach imposes an additional restriction that is met by the dataset (balanced panel). That is, at least four consecutive quarters of information per reaction relative to the entry are needed in order to test for the absence of second order correlation using the GMM assumption estimation method.

Regarding instrument selection, and given the extreme difficulty of finding valid external instruments that comply with the validity conditions, the GMM is used here, and it relies on a set of internal instruments (*i.e.*, the lags of the explanatory variables), thus eliminating the need for external instrumental variables (see Rey *et al.*, 2011; Escobari, 2012 for studies of the airline sector). Concretely, in this case, the instruments are the lags of all right-hand side

variables in the model, since these lags are highly correlated with the regressors that they instrument (there are three periods available before each entry: t= -3, -2, -1).

To verify that the GMM is a suitable method for this study, a sequential process has been followed where the results obtained from the estimation of the baseline specification using different estimators have been compared (available upon request). The Hansen J statistic of overidentifying restrictions is used to test for the absence of correlation between the instruments and the error term. Moreover, several tests have been performed to check for the potential misspecification of the model. The m_2 statistic is used to test for the lack of second-order correlation in the first-difference residual (Arellano and Bond, 1991) whereas the z_1 and z_2 statistics are Wald tests that analyse the joint significance of the reported coefficients and of the year dummy variables respectively. The estimation is carried out using the xtabond2 package in STATA, following procedures outlined by Roodman (2009).

4. Results

4.1. Operating cost and SwCs of the established carriers in the Spanish domestic market

Regarding incumbent operating costs, the measurement proposed by Sancho-Esper and Mas-Ruiz (2016) based on ATA standards is used. This approach overcomes the general limitations of studies based on firm-level aggregate accounting data (*e.g.*, Encaoua, 1991; Gillen *et al.,* 1990; Morrell, 2005), deriving from the fact that they do not analyse full operating costs for each carrier at the route-level for a given time period. Incumbent Operating Costs (IOC) data (see Table 1) reveals that, during the first period, formerly regulated incumbents show greater operating costs in the face of entry of other formerly regulated carriers (*e.g.*, 10,964.3) compared to when LCC incumbents enter (*e.g.*, 8,783.2). However, this difference disappears during the second period (2006-09) partly due to the cost controls implemented by the formerly regulated incumbents and the general increase of costs affecting all carriers, for example, jet-fuel expenditures and airport and navigation taxes.

Complementarily, Incumbent Cost Reaction (CR) to market entry (cost difference between consecutive quarters for each incumbent reaction) reveals that both types of incumbents do not reduce their operating costs during the first period, whereas once entry capacity restrictions are removed, they implement important operating cost adjustments (see Table 1). It is worth highlighting that both types of incumbents perform greater cost reductions in reaction to LC entrants than in reaction to formerly regulated entrants from 2006 to 2009.

< Insert Table 1 about here>

Complementary to these cost figures, it is necessary to analyse other service elements, such as Incumbent Flight Frequency (IFF). Table 1 evidences that both types of incumbents pursue different service strategies related to their flight frequency (number of monthly flights of the incumbent carrier on a given route). As expected, formerly regulated incumbents offer a greater flight frequency than LCCs, although this difference is substantially reduced in the second period, once entry capacity restrictions are removed.

In addition, in findings similar to those reported by Peteraf (1993), firms within the Spanish airline sector began the deregulatory period with asymmetrical cost structures. Formerly regulated carriers enter the new era with higher labour costs due to strong unions, while new entrants without labour unions thusly benefit from more flexible work regulations and a lower wage bill. These incumbents also had a given fleet mix, so in the mid-term were affected by long production lags and gluts. However, these cost structures could be adjusted at the mid-term by reallocating and improving their production techniques, as well as increasing productive capacity, highlighting the importance of the route-level analysis. From 2004 to 2013, formerly regulated carriers in the Spanish domestic airline market made constant aircraft reallocations at route-level to adapt to the competition and demand, alongside huge investments in new aircraft models to improve their relative efficiency. For example, Iberia acquired the A320 and A321 in 2006, Air Nostrum started flying the B737NG and A330 in

2006, and Spanair added the B717 to its fleet in 2007. Moreover, Iberia, the most important formerly regulated carrier, set up a LC subsidiary, Clickair [4] in 2006 to operate short-haul routes with less labour restrictions. In addition, the whole group of formerly regulated carriers signed around twenty collective agreements and revisions affecting crew salaries from 2000 to 2013.

Finally, Table 2 shows three complementary measures of SwCs (monetary SwC, incumbent market scope and age of the FFP) that quantify the SwCs of established carriers in the Spanish domestic market from 2000 to 2009. Monetary SwC data reveals that, regardless of the period, formerly regulated carriers show greater SwCs than the LCCs. Additionally, it was found that, regardless the type of carrier, there is a substantial increase in the incumbent SwCs between the first (2000-2005) and the second period (2006-2009), this increase being greater for formerly regulated incumbents. Second, formerly regulated carriers' scope (number of destinations offered by the incumbent) is greater than that of the LCCs, congruent with the Hub-and-Spoke versus the point-to-point generic strategies (Dobruszkes, 2006), respectively. There is also a substantial increase in the number of destinations offered by formerly regulated carriers, whereas the number of destinations remained stable for the LCCs. Finally, the age of the loyalty programs (in months) reflects that formerly regulated FFPs allow travellers to earn more points/miles than those promoted by the LCCs, noting however, that some LCCs such as Air Berlin, Clickair and Vueling, start to increase benefits for customers during the second period (2006-2009).

< Insert Table 2 about here>

The aforementioned measures support the efforts made by established carriers in the Spanish domestic market to increase SwCs in comparison to their competitors, to make passenger migration to new entrants more difficult. Different types of carriers seem to have different strategies regarding SwCs. While formerly regulated carriers try to increase their monetary

SwCs, market scope and the availability of FFPs; only a set of LCCs, that does not include Clickair, Ryanair and EasyJet, pursue an increase in monetary SwCs and the establishment of FFPs once capacity restrictions are removed (2006-2009).

4.2. Relationship between SwCs and incumbent cost response to market entry in the Spanish airline domestic market

In this section the relationship between incumbent SwCs and cost response to market entry is analysed, taking into account the profile of the entrant and the period in which the entry takes place. The panel data model in Eq. (1) is estimated (see Table 3) using a difference GMM, distinguishing between reactions under entry capacity restraints (2000-2005) and once these restraints are removed (2006-2009). Overall, all the specification tests for the three proposed models show that the required results yield reliable and consistent estimates. That is, both the joint inclusion of the explanatory variables and the joint inclusion of year dummies are statistically significant (z_1 and z_2). Moreover, there is not second order correlation between the residuals of the model (m_2= 0, a basic requirement for GMM estimation) and all models are over identified according to the Hansen J test (supporting the joint validity of the included instruments).

< Insert Table 3 about here>

The three GMM estimations indicate that the joint inclusion of the three indicators of SwCs (model 3) show equivalent results rather than individual estimations (models 1 and 2). Moreover, the comparison between periods suggests that regulatory changes affect the relationship between the three dimensions of SwCs and incumbent cost reaction (model 3). Thus, monetary SwCs that are non-significant during the first period become significant in the second when facing the entrance of both LCCs and formerly regulated carriers. However, the magnitude of the effect in each case suggests that LCC entrants become a more important threat ($\beta_{MonetSWC\_LCC,\ 2006\text{-}09}$= -1,975.98, p<0.01 and $\beta_{MonetSWC\_Former,\ 2006\text{-}09}$= -1,095.88, p<0.01).

The relationship between incumbent scope and cost reaction also changes between periods; it is significant in the first period for both types of entrants, but quantitatively less important for LC entrants ($\beta_{Scope\_LCC,\ 2000\text{-}05}$ = -164.70, $p<0.05$ and $\beta_{Scope\_Former,\ 2000\text{-}05}$= -382.72, $p<0.1$); while during the second period the relationship remains significant only when facing LCC entrants ($\beta_{Scope\_LCC,\ 2006\text{-}09}$ = -249.35, $p<0.1$). Finally, the relationship between FFP age and incumbent cost reaction to entry also substantially changes between periods. While during the first period it is not significant either for LCC entrants or for formerly regulated carriers; it becomes significant for both types of entrants once capacity restraints are removed. However, the magnitude of the effect in each case suggests that LCC entrants become a more important threat ($\beta_{FFPage\_LCC,\ 2006\text{-}09}$= -170.75, $p<0.01$ and $\beta_{FFPage\_Former,\ 2006\text{-}09}$= -89.69, $p<0.01$).

In general, these results show that the relationship between incumbent SwCs and cost reaction is moderated by the type of entrant airline (formerly regulated vs. LCCs) and is conditioned by the regulatory and institutional context at entry period. Under entry capacity restrictions, the power that incumbent market scope (non-monetary SwCs) has in explaining incumbent operating cost reaction to entry (its coefficient is significant) is less for LCC entrants, so Hypothesis 1 cannot be rejected for this dimension of SwCs. This result can be explained by the fact that in a period of stable SwCs, consumers do not prefer lower prices as a trade-off for lower service quality (Gual and Vives, 1991). The incumbent firm can take advantage of the market power derived from better exploitation of FFPs and market scope, and this may explain how an established firm accommodates rather than matches the LCC entrant. Thus, the airline industry seems to be one of *fat cat* incumbents pursued by *puppy dog* LCC entrants (Call and Keeler, 1985), where an incumbent able to segment its markets can effectively and very rapidly make its pricing competitive in order to hold on to price-sensitive passengers, while using tools such as FFPs to preserve the loyalty of higher-yield segments without price matching (Farrell and Klemperer, 2007). In addition, this incumbent behaviour is reinforced by

entry regulations that increase market power derived from SwCs. First-mover advantages, in terms of slot-constrained or gate-constrained airports (Peteraf, 1993), allow established carriers (formerly regulated during the first period) to obtain advantages from privileged access to scarce airport resources (slots and gates) which constitute important barriers to entry for LCCs (Borenstein, 1989). And FFPs can take advantage of a large, single-carrier route network (Oliveira and Huse, 2009). So, under entry capacity restrictions, established airlines have less incentive to reduce costs when competing against LCC entrants compared to formerly regulated ones.

However, results change with the removal of airport capacity restrictions in Spain's domestic airline market (2006-2009), with all three SwCs indicators becoming more relevant when facing LCC entrants than when facing formerly regulated ones. This evidence does not allow for the rejection of Hypothesis 2. This result could be explained by the dynamic effects of SwCs, where in a context without price and entry restrictions, prices will substantially fall because new low SwCs customers who prefer lower quality levels will appear (Gual and Vives, 1991; Villas-Boas, 2015). Therefore, there is no place for a pacifist attitude in incumbents that are facing LCCs. In the new situation, the incumbent is characterised as aggressive because it is being pursued by aggressive LCC entrants (see Call and Keeler, 1985). In addition, this incumbent behaviour will be exacerbated by an environment that eliminates entrant capacity restrictions. In an unrestricted entry airline environment, the *fat cat* strategy will cease to apply over time: as an LC entrant airline becomes better established, it will be able to expand frequencies, build up its network, and become more trusted by business people as a means of travel. If there are no airport capacity restrictions, the incoming carrier can perform a large-scale entry (aggressive entry), which could be perceived as a threat by incumbent competitors who can react quickly and robustly to such an entry (Gatignon and Bansal, 1990).

In brief, these results suggest that in the first period (2000-2005), under stable SwCs in a price and entry restricted industry, incumbent carriers (which are mainly formerly regulated during this period) tend to act as *fat cats* towards the entry of *puppy dog* LCCs; whereas in the second period (2006-2009), under dynamic SwCs due to the absence of price and entry restrictions in the industry, incumbent carriers tend to behave as *top dogs* towards the entry of *lean and hungry* LCCs. From a route-level analysis, these results support the findings and managerial implications suggested in Section 4.1. That is, formerly regulated carriers adjust their operating costs above all during the second period to improve their efficiency relative to the new LCCs, through aircraft reallocations at route-level, investments in new aircraft models and setting up a LC subsidiary to operate in short-haul routes, as is the case of Iberia's venture Clickair, set up in 2006.

5. Conclusions, managerial implications and limitations

This research analyses the role of SwCs on established firm cost behaviour towards a competitive entry in the airline sector. A dynamic reaction model is defined in order to analyse the moderating role of the type of entrant on the relationship between SwCs and incumbent cost reaction to entry, and the moderating role of the regulatory and competitive environment (airport capacity restriction) on this relationship. Results show that SwCs have important dynamic effects on incumbent reaction to entry. In a context with stable SwCs in a price and entry restricted industry, a decrease in SwCs leads to a smaller incumbent cost reduction when competing with LC entrants compared to formerly regulated ones. Conversely, when SwCs become unstable in an industry with unrestricted price and entry, a decrease in SwCs leads to greater incumbent cost reduction when competing with LC entrants as opposed to formerly regulated ones.

This study has important implications for both public regulators and airline managers. In a period with price and entry restrictions, the use of FFPs by established carriers also acts as an anticompetitive tool, and according to Lederman (2008), public intervention to increase

competition should target the sources of this advantage, such as the scarcity of airport facilities and the SwCs themselves created through FFPs. To promote the entry of new carriers, regulators should monitor the evidence of incumbent hub dominance when entrants complain about slots and gates allocation (Lijesen *et al.*, 2001). Moreover, it could be necessary to reduce hub power by controlling the use of FFPs, for example, through guides that limit non-lineal features of FFPs or by taxing miles received by business travellers (Lijesen *et al.*, 2001). Authors such as de Boer and Gudmunsson (2012) even state that FFPs should be eliminated for domestic routes, so that carriers take notice of this regulatory action and try to establish more sustainable loyalty programs (Kearney, 1989). Conversely, in a period without price and entry restrictions, there is less need to perform such regulatory interventions on FFPs because they actually increase competition between carriers (Caminal and Claici, 2007; Dowling and Uncles, 1997). In fact, when several carriers adopt FFPs, the competition for profits can become so intense that aggregate supply profits tend to be reduced (Fong and Liu, 2011). Second, the competitive situation where LC entrants start to become under attack, as occurred in the second period observed here, also has important policy implications, such as the government support of mergers between formerly regulated companies (*i.e.*, Iberia and British Airways) to improve efficiency, as well as the termination of grants that LC airlines received during the pre-financial crisis that struck in 2008. These subsidies helped Ryanair and EasyJet, among others, to enter into new markets, through the operation of new routes. This situation has been criticised by several authors (*e.g.*, Barbot, 2006; Graham and Shaw, 2008).

For airline managers, firstly, those working for an incumbent should analyse its competitive environment from a twofold perspective: entrant airline cost structure and incumbent SwCs. While incumbent carriers may perceive LC entrants as potentially threatening rivals, entrants with less efficient cost structures should be their actual target in a context of stable SwCs.

However, in a context of unstable SwCs, while incumbent firms may perceive entrants with less efficient cost structures as potentially dangerous rivals, it is the LC entrants that should be their actual target (Kangis and O'Reilly, 2003). In fact, currently, the LC model dominates regional airline industries worldwide, and the ultra-low-cost airlines have great business previsions. In any case, although this situation could be explained by SwCs and the evolution of customer loyalty through the use of FFPs, nowadays, loyalty programs are not exclusive to airlines: websites such as Orbitz and Travelocity offer discounts and rewards for their customers, regardless of the airline used.

Second, attacks on LC entrants should distinguish the routes (markets) that they run. In fact, formerly regulated carriers are adjusting their costs through aircraft reallocations at route-level to adapt them to the demand, and are setting up LC subsidiaries to operate short-haul routes. Third, these results make it easier to analyse the impact of a managerial decision (market entry) on incumbent behaviour and, therefore, to predict incumbents' most likely cost response to entry. Thus, the effects of stable SwCs in the airline industry may lead to an incumbent *fat cat* strategy of capturing a client base and accommodating LC entrants which follow a *puppy dog* strategy. Whereas unstable SwCs may lead to more efficient entrants destabilising the industry and generating competitive pressures on incumbents to improve their efficiency; leading to an optimal incumbent *top dog* strategy, which responds aggressively to LC entrants that follow a *lean and hungry* strategy.

This paper has some limitations that are potential areas of future research. First, since the objective of this study is to analyse the incumbent cost reaction (short and mid-term) to entry, for multiple periods, the proxy outlined by Shy (2002) has been used for the monetary SwCs, as well as other dimensions of SwCs such as incumbent FFPs and incumbent destination network (Carlsson and Löfgren, 2006), also used as longitudinal measurements in several industries. Future studies should include other sources of SwCs in the airline sector. Second, the results

outlined here are specific to the Spanish domestic airline market. Therefore, it would be interesting to analyse other airline markets in order to test the validity of these results under similar deregulations of the market. For instance, in addition to short-haul domestic routes it would be useful to study mid- and long-haul routes (international), given that distance is a key factor for understanding scale and scope economies in the airline industry (Fageda and Fernández-Villadangos 2009). Third, it would be beneficial to evaluate the impact of regulation on behaviour, by implementing a Regression Discontinuity Design (RDD), given that the sample covers a period when price and entry restrictions were in place and the subsequent lifting of these restrictions.

Footnotes:

[1] The model intends to study the incumbent's decision in period *t* (in terms of cost variation, $\Delta y_{k,t}$), given the new entry, through other relevant variables at the beginning of the period ($X_{k,t-1}$). For each reaction, information on the quarter prior to entry (-1) and six quarters after entry (0, +1,…, +6) is used to measure anticipated incumbent reaction and the short and mid-term post-entry reaction respectively.

[2] This procedure does not rely on aggregated cost measurements (obtained from accounting statements) to make route approximations, but rather it considers the specific features in terms of costs for each carrier and on each route, such as: the aircraft used, the number of passengers, taxes paid, the approximate fuel consumption, the labour costs, *etc*. Thus, it allows for an estimation of the full operating cost for each carrier for a route for a given period (for more detail regarding the Spanish case, see Sancho-Esper and Mas-Ruiz, 2016).

[3] Despite the concept of SwCs being largely studied in the literature (see Klemperer 1987a, 1987b), several authors such as Jones *et al.* (2002) and Burnham *et al.* (2003), state that its empirical application has been limited in time-series or panel data studies because there are measurement difficulties over time given its multidimensional nature (where customers can not be asked about previous periods).

[4] Clickair ceased operations in 2009. Iberia then developed a new LCC, Iberia Express, after the foundation of International Airlines Group (IAG).

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Table 1
Descriptive analysis of operating costs (magnitude -IOC- and cost reaction to entry –difference between quarters) and of service elements (incumbent flight frequency) in the Spanish domestic market, 2000-2009.

Type of Incumbent	Type of Entrant	Incumbent Operating Cost (IOC)		Incumbent Cost Reaction (ICR)		Incumbent Flight Frequency (IFF)	
		2000-2005	2006-2009	2000-2005	2006-2009	2000-2005	2006-2009
Formerly regulated	Formerly Reg.	10,964.3	10,899.4	300.3	-225.0	50.5	86.1
	LCC	11,708.0	14,559.8	366.2	-507.6	136.5	75.9
Total Form. Reg. incumbents		**11,214.1**	**13,615.6**	**322.5**	**-434.7**	**79.4**	**78.5**
LCC	Formerly Reg.	8,783.2	13,202.7	285.0	22.5	39.3	46,36
	LCC	10,582.9	12,751.6	417.7	40.8	42.2	49,79
Total LCC incumbents		**11,149.8**	**13,528.2**	**323.1**	**-420.1**	**29.8**	**49.1**

Notes: The unit of analysis is the incumbent operating cost (in constant euros), for each reaction in a given quarter.
Flight frequency = number of monthly flights of the incumbent carrier on a given route.
All figures are the average for the total sample of reactions (n=620) divided into two subperiods ($n_{2000-05}$=266 and $n_{2006-09}$=354)

Table 2
Descriptive analysis of Switching costs measurements by carrier, type of incumbent and period

Incumbent type	Incumbent carrier	Switching costs								
		Monetary SwCs			Incumbent market scope			FFP age (months)		
		2000-05	2006-09	t-stat	2000-05	2006-09	t-stat	2000-05	2006-09	t-stat
Formerly regulated	Air Europa	3.45	4.49	9.95***	6.53	6.21	-1,69*	40.35	99.28	63.12***
	Iberia	3.43	4.26	11.42***	9.83	10.50	1,88*	149.16	201.13	48.11***
	Spanair	3.40	4.62	14.22***	7.35	10.06	8,26***	8.90	57.62	68.89***
	Air Nostrum	3.59	4.83	9.21***	4.47	4.16	-1,91*	77.16	127.61	36.70***
	Binter Canar	2.84	7.16	34.36***	2.92	3.44	1,66*	0.00	42.80	63.78***
	Naysa	2.43	*na*	*na*	0.50	*na*	*na*	0.00	*na*	*na*
Formerly regulated avg.		3.45	4.66	24.56**	7.12	8.06	5.10**	63.35	109.86	29.88***
LCC	EasyJet	*na*	2.80	*na*	*na*	0.87	*na*	*na*	11.25	*na*
	Air Berlin	2.51	3.94	7.02***	3.88	3.95	0.31ns	0	37.97	26.53***
	Clickair	*na*	4.98	*na*	*na*	1.67	*na*	na	37.80	*na*
	Vueling	3.94	3.77	-1.05ns	2.04	4.00	7.51***	0	10.93	13.51***
	Ryanair	*na*	2.75	*na*	*na*	0.95	*na*	*na*	9.50	*na*
LCC avg.		2.65	3.83	7.71***	3.70	3.71	0.04ns	0	16.25	13.83***

Notes: t-stat = t statistic to test difference between two independent samples without assuming equal variances (reject variance equality in every case with the Levene's test)
*, **, *** Significant at 10, 5 and 1 percent, respectively

Table 3
Incumbent cost reaction to entry model: AB difference GMM estimation, 2000-2005 and 2006-2009

Independent variables	Model 1		Model 2		Model 3	
INCUMBENT SWITCHING COST:	2000-2005	2006-2009	2000-2005	2006-2009	2000-2005	2006-2009
Monetary SwC(t-1) x D low-cost entrant	269.55	-2,882.61**			268.24	-1,975.98***
Monetary SwC(t-1) x D formerly reg. entrant	-133.12	-1,904.09***			5.82	-1,095.88***
Market scope(t-1) x D low-cost entrant			-154.26*	-196.74***	-164.70**	-249.35*
Market scope(t-1) x D formerly reg. entrant			-379.66*	7.31	-382.72*	33.76
FFP age(t-1) x D low-cost entrant			0.19	-106.04***	6.42	-170.75***
FFP age(t-1) x D formerly reg. entrant			-5.21	-8.26	-6.15	-89.69***
CONTROL VARIABLES:						
Δ COST I (t-1)	-0.22***	-0.01	-0.21***	-0.01	-0.21***	-0.01
Incumbent market dominance (t-1)	-20.89**	-4.99	-20.99***	11.18	-20.58***	12.38
Market concentration (t-1)	0.13**	1.18**	0.08	-0.07	0.06	0.51***
D Small (destination tourism index t-1)	1,165.99	-2,130.68	421.95	3,937.23***	521.66	47.13
SPECIFICATION TESTS:						
z1 (joint significance regressors)	20.61***	50.67***	22.94***	10.39***	19.19***	35.03***
z2 (joint significance fixed effects)	1.78*	1.66*	1.71*	1.86*	1.67*	1.66*
m1 (1st order correlation)	-5.41***	-8.00**	-5.01***	-8.29***	-4.94***	-8.36***
m2 (2nd order correlation)	-1.61	-0.31	-1.22	-0.60	-1.20	0.24
Hansen over identification test	155.23	158.67	253.33	300.82	255.03	299.62

Note: Dependent variable: incumbent cost reaction (ΔCOST *i*, *t*). GMM difference estimation (Arellano and Bond, 1991) with period fixed effects and robust variance/covariance for small samples (Windmeijer, 2005).
Total n=4,960 (620 reactions x 8 per.), $n_{2000\text{-}2005}$=2,128 (266 reactions x 8 per.) and $n_{2006\text{-}2009}$=2,832 (354 reactions x 8 per.)
*, **, *** Significant at 10, 5 and 1 percent, respectively

APPENDIX

Table A1.
Incumbent operating cost response to entry model: variables and sources

Variable	Type of variable	Description	References	Sources
$\Delta Cost_{k,t}$	Dependent (in differences)	Full operating flight cost of carrier *i*, in route *k* and quarter *t* (Difference between quarters)	Calculated costs (direct and indirect) based on ATA standards (Radnoti, 2002, Shaw, 2007 and Wensveen, 2007. For more detail in the Spanish case, see Sancho-Esper and Mas-Ruiz, (2016).	- AENA: traffic and taxes. - Jet fuel costs: ARA Market. - Aircraft costs and depreciation: DEAGEL and producers' websites. - Labour costs: Collective agreements, annual reports, *etc*. - Luggage and ticketing costs: Flight care, Ground force, GDS firms, Travolution, *etc*.
Type of entrant (dummy)	Independent	Type of entrant dummy: formerly regulated vs. low-cost entrant.	Peteraf (1993)	
SwC 1: Monetary SwC	Independent	Difference between the average price (Pi,t) of the focal carrier *i* in period *t*, for every route, and the average price of its competitors in period *t* (Pr,t), for every route	Shy (2002), Maicas *et al.* (2009), Gómez and Maicas (2011); Polo *et al.* (2011)	- AENA: traffic. - SABI and COMPUSTAT financial and accounting data.
SwC 2: FFP market scope	Independent	Destinations served by the incumbent from both the origin and destination airports of the route (value of the network)	*Breadth* of the relationship between the current customer and the focal firm (Polo and Sesé, 2009).	- AENA: traffic. - Corporate websites of included carriers and Annual reports.
SwC 3: FFP age	Independent	Months that the incumbent carrier has an FFP before the period under study (potential of FFP miles achievement)	*Length* of the relationship (Polo and Sesé, 2009)	
Incumbent market dominance	Control	Incumbent market share in a given route at the beginning of *t*	Baum and Korn (1996)	- AENA: traffic.
Market concentration	Control	Herfindahl-Hirschman index of the carriers operating on a route at the beginning of period *t*	Borenstein (1989); Baum and Korn (1996)	- AENA: traffic.
Destination tourism index	Control	Relative tourist orientation of passengers on a given route as a function of a tourism measure of the passengers' destination area (relative weight of tourism GDP at the destination province, relative to its total GDP)	Borenstein (1989)	- Spanish Annual Statistical Report "La Caixa", 2000-09.

Source: Prepared by the authors