

Price Effects and Switching Costs of Airlines Frequent Flyer Program

Claudio A. Agostini¹ Diego Inostroza² Manuel Willington³

Abstract

Frequent flier programs create a switching cost for the consumer and allow firms to exercise market power. In Chile there is a dominant airline in domestic markets that has a frequent flyer program with a large number of affiliates and it faces some competition from two small carriers that do have a frequent flyer program. Using a unique dataset for Chile we estimate the switching cost of each airline and the impact of the dominant airline frequent flyer program on prices. The results show a fare premium of around 18% due to the frequent flyer program

JEL: L93, L11

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1. Introduction

In the air transport industry in Chile there exists free entry, there is no fare regulation, and the role of government is defined by law as one of minimum intervention. However, the evolution of the industry over the last decade has prompted public concern and debate about the degree of competition in the domestic passenger air transport markets, especially in routes where there is only one airline.

As can be seen in Figure 1 the Chilean domestic air travel market is highly concentrated, with a single firm (LAN Chile) whose market share has fluctuated around 80% in the last decade. There has been entry of new firms in the market

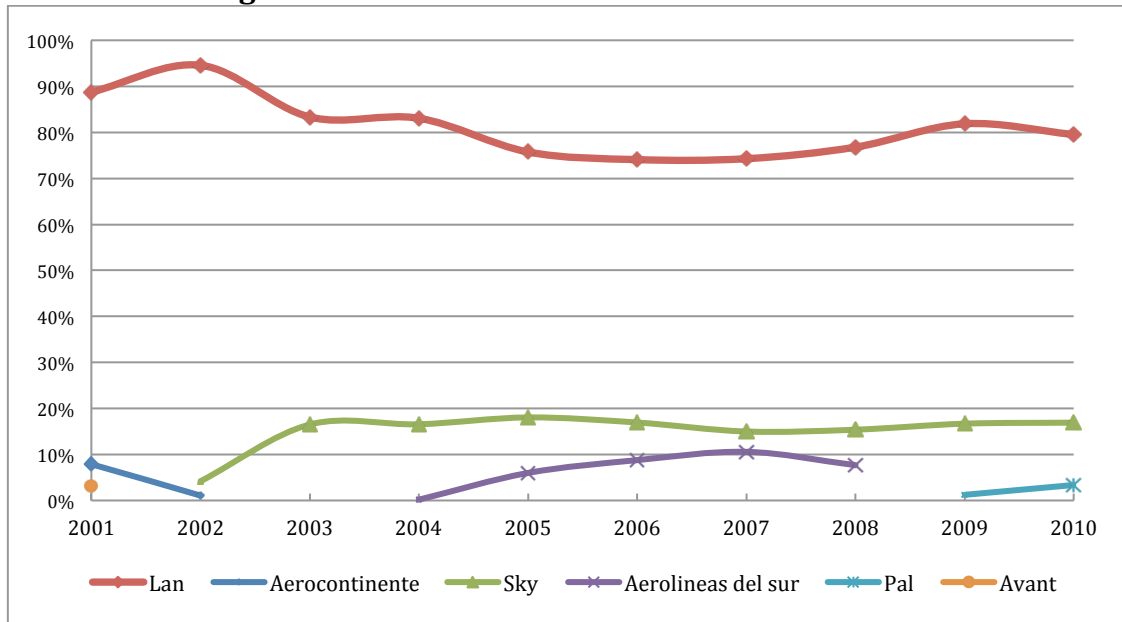
¹ School of Government, Universidad Adolfo Ibañez.

² ILADES-Universidad Alberto Hurtado.

³ .School of Government, Universidad Adolfo Ibañez.

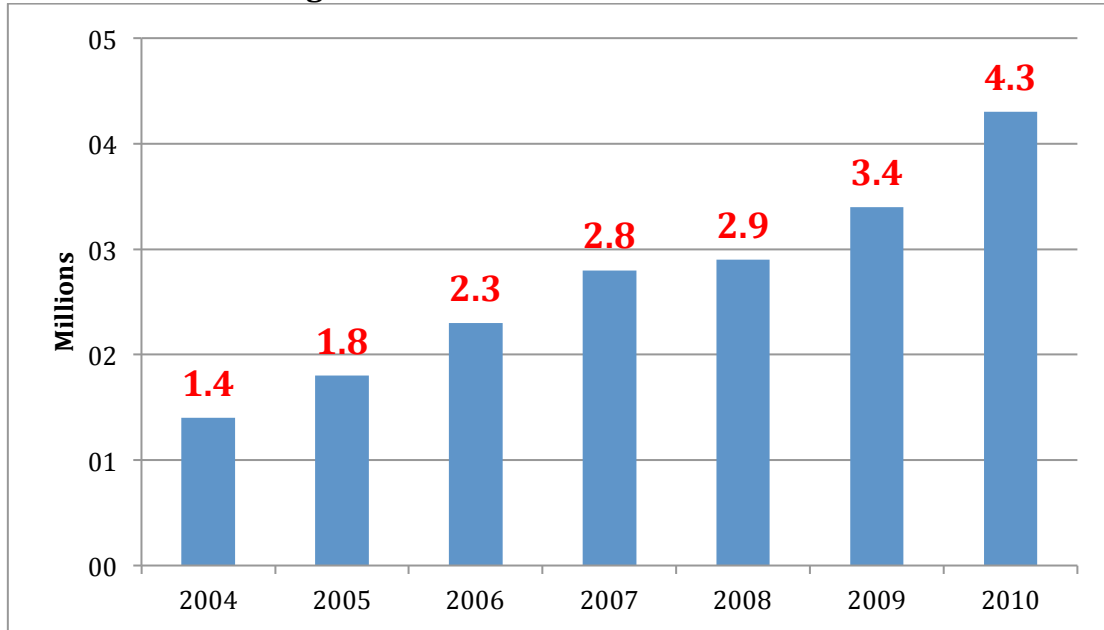
during this period of time, but not always a successful one, three firms exited in less than 5 years and the only firm that still survives has never reached more than 18% market share.

Figure 1: Market Shares in the Domestic Market



There are obviously many potential explanations for the success of LAN Chile in maintaining its dominance in the domestic market, including better quality. However, there is one characteristic that differentiates LAN, it is the only local firm that has a frequent flyer program (FFP) –called LanPass- and belongs to an international alliance (One World). As it is shown in Figure 2, LAN has been really successful increasing the number of affiliates to its program in the last few years reaching 4.3 million in 2010 (in a country of 16 million people where most of the people cannot afford flying).

Figure 2: Number of LanPass Members



It is well established in the literature that FFP may generate switching costs for travelers and/or barriers to entry for potential entrants and, therefore, create market power for the airlines that have them.

In general, the main barriers to entry in air transport markets are the dominant airport presence by an airline (Ciliberto y Williams (2010), Berry (1990, 1992), Borenstein (1990, 1991), Reiss y Spiller (1989)) and the frequent-flyer program, which is sunk cost that an entrant has to pay to compete with an incumbent (Lederman (2008), Cairns y Galbraith (1990)).

As it is already well known, FPPS incentivize the consumer to fly always with the same airline because there is a minimum number of miles required to obtain a free ticket and rewards are non-linearly increasing in the number of miles flown. Once the consumer realizes the advantage of concentrating his trips on one airline, he will do it with airline offering more destinations or frequencies from where he lives. As a result, a frequent flyer program creates a competitive advantage for larger airlines serving more markets. This competitive advantage is not related to any efficiency, service characteristics or technology. However, it allows larger airlines to have a greater fraction of passengers with higher yields. (Borenstein (1989, 1996)). The empirical evidence is that the magnitude of these

effects are not negligible, the results of Lederman (2008) show that fares increase between 7% and 18% and that 25% of the “hub-premium” is explained by the role of frequent flyer programs.

The main goal of this paper is precisely to estimate the effect that LAN’s FFP has on domestic flight tariffs. To identify the effect of the FFP and separate it from other non-observable characteristics of LAN flights, we look at tariffs from flights where passengers earn full miles and others where only a fraction of the total miles (or no miles at all) are accumulated. Additionally, we compare tickets targeted to business travellers with tickets targeted to tourists in different routes where LAN faces from none to up to two competitors. To this aim, we make use of a unique data set collected by ourselves from several airlines’ websites over a period of 8 weeks.

Our preliminary results allow us to conclude that the differential premium LAN is able to charge in weekday flights (when passengers earn full miles), due to its frequent flyer program, is about 18% above its competitors’ price. However, the results show a negligible effect on tariffs when the route is one in which three airlines is competing.

The rest of the paper continues as follows. Section 2 explains the collection process and characteristics of the data used in the empirical analysis. Section 3 shows a basic benchmark calculation of the LAN FFP premium. Section 4 estimates the switching cost generated by LAN FFP and Section 5 estimates its effects on prices. Finally, Section 6 concludes.

2. Data

We collected data on fares from airlines websites in Chile every other day for a period of almost two months. For nine city-pairs, all of them for round-trips from Santiago, we chose eight dates to “travel”: four of them for weekends (Friday afternoon to Sunday afternoon) and four for same day round-trip on Wednesdays. For each of these 72 different trips, we “bought” tickets in LAN and

its competitors (if any) on each route.⁴ Table 1 provides some basic information on the nine routes of interest.

Table 1: Selected Routes

Santiago to:	Distance (Km)	N° Airlines	HHI	Competitive
La Serena	389	2	0,87	YES
Concepción	429	2	0,72	YES
Córdoba	659	1	1,00	NO
Puerto Montt	916	2	0,76	YES
Antofagasta	1106	3	0,57	YES
Buenos Aires	1139	5	0,54	REF
Calama	1225	3	0,58	YES
Arica	1672	3	0,60	YES
Isla de Pascua	3750	1	1,00	NO

The domestic routes were selected taking into consideration several elements: they are all among the most relevant in terms of number of passengers, they have important variety in terms of distance and number of competitors and they are also diverse in terms of their role in the self regulatory plan LAN agreed to comply with when its merge with Ladeco was approved in 1995.⁵

Two international cities were also included among the selected routes: Cordoba and Buenos Aires. The reason is that trips to these two destinations are similar in distance to several domestic trips. However, in Cordoba LAN is the only airline providing service, while Buenos Aires is the route where LAN has the lowest market share and faces two relevant competitors. Tables 2 and 3 show the

⁴ Actually, we did not buy each ticket. The fare we registered when collecting the data was the one shown on the webpage in the last step of the transaction process (when you need to confirm the purchase).

⁵ Until 1995 there was basically a duopoly in Chile, LAN and LADECO had a little more than 40% market share each and there was a third airline with 15%. The merge between the two largest airlines was approved together with a regulatory scheme still in force. The regulation defines two different types of markets, the competitive ones where LAN faces competition from at least one airline flying daily, and the non-competitive markets where the previous condition is not satisfied. The regulatory scheme then establishes that each month LAN cannot have higher yields in the non-competitive markets compared to the competitive markets of similar distance. Additionally, each term the yield in non-competitive markets can be only up to 19.7% higher than the one obtained in the following international routes: Santiago-Buenos Aires, Santiago-Montevideo, Santiago-Lima, Santiago-Sao Paulo, y Santiago-Río de Janeiro.

airlines flying in each route and their market share, respectively. Additionally, in Table 3 we show the HHI concentration index for each route.

Table 2: Competitors per Route

Route	LAN	Sky	Pal	Aero. Arg.
La Serena	X	X	-	-
Concepción	X	X	-	-
Córdoba	X	-	-	-
Puerto Montt	X	X	-	-
Antofagasta	X	X	X	-
Buenos Aires	X	X	-	X
Calama	X	X	X	-
Arica	X	X	X	-
Isla de Pascua	X	-	-	-

Table 3: Competitors' Market Share per Route

Route	Lan	Sky	Pal	Aero. Arg.	Air Canada	Gol	HHI
La Serena	82.6%	17.4%	-	-	-	-	0.71
Concepción	85.3%	14.7%	-	-	-	-	0.75
Córdoba	100%	-	-	-	-	-	1.00
Puerto Montt	83.7%	16.3%	-	-	-	-	0.73
Antofagasta	75.5%	18.7%	5.8%	-	-	-	0.61
Buenos Aires	62.9%	9.1%	-	16.6%	5.0%	6.4%	0.44
Calama	77.0%	17.2%	5.8%	-	-	-	0.63
Arica	69.7%	22.6%	7.7%	-	-	-	0.54
Isla de Pascua	100%	-	-	-	-	-	1.00

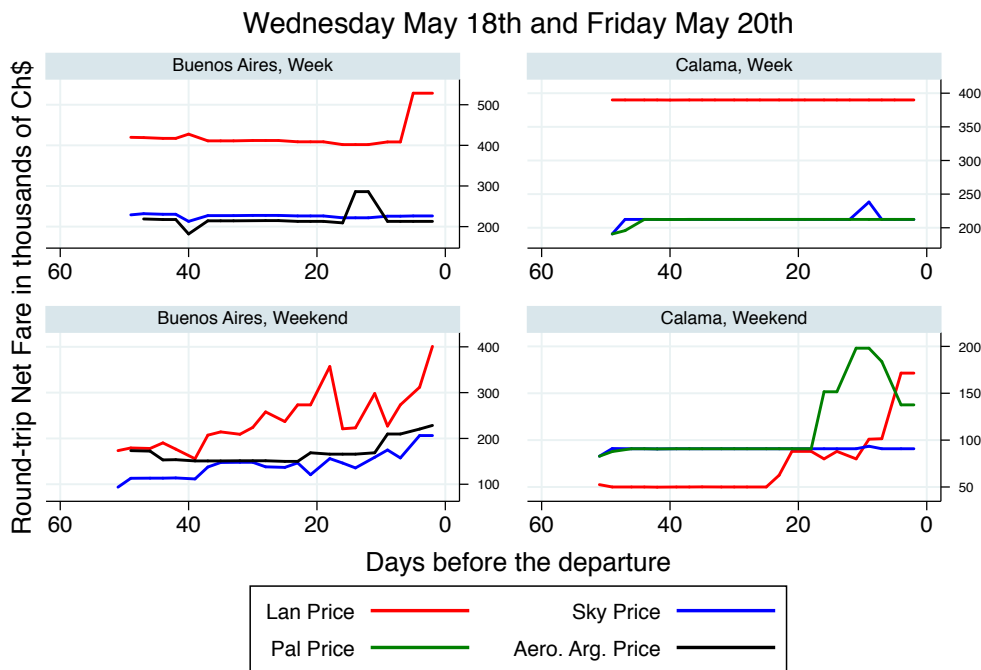
The data collection started on March 30th and lasted 8 weeks. Tickets were bought every Monday, Wednesday, and Friday until May 18th for travelling at eight different fixed dates: April 13th, April 20th, May 11th and May 18th (each one corresponding to a round-trip on Wednesdays) and April 15th, April 21st, May 13th, and May 20th (each one corresponding to a trip on weekends, leaving on Friday and coming back on Sunday).

Besides collecting information on airfares for each airline for each trip, we also registered time of departure, frequencies in a relevant timeframe, type of fare

(varying on the degree of flexibility and the fraction of total miles accumulated)⁶, taxes, FFP's miles earned, and the domestic price of fuel the day of purchase. We also collected information on ground transportation fares for the trips to the closest destinations from Santiago (La Serena, Concepción and Puerto Montt), because consumers might consider it as an imperfect substitute of air transportation.

Summarizing, we have a dataset of 833 observations, each one consisting of a destination-date of travel-date of purchase-airline). Figures 3, 4 and 5 below illustrate for several destinations/date of trip the fare evolution based on the date of purchase for LAN and its main competitors (on the x-axis it is reported how many days before the trip the ticket is purchased). Each figure compares two routes of similar distance but with different degrees of concentration between them.

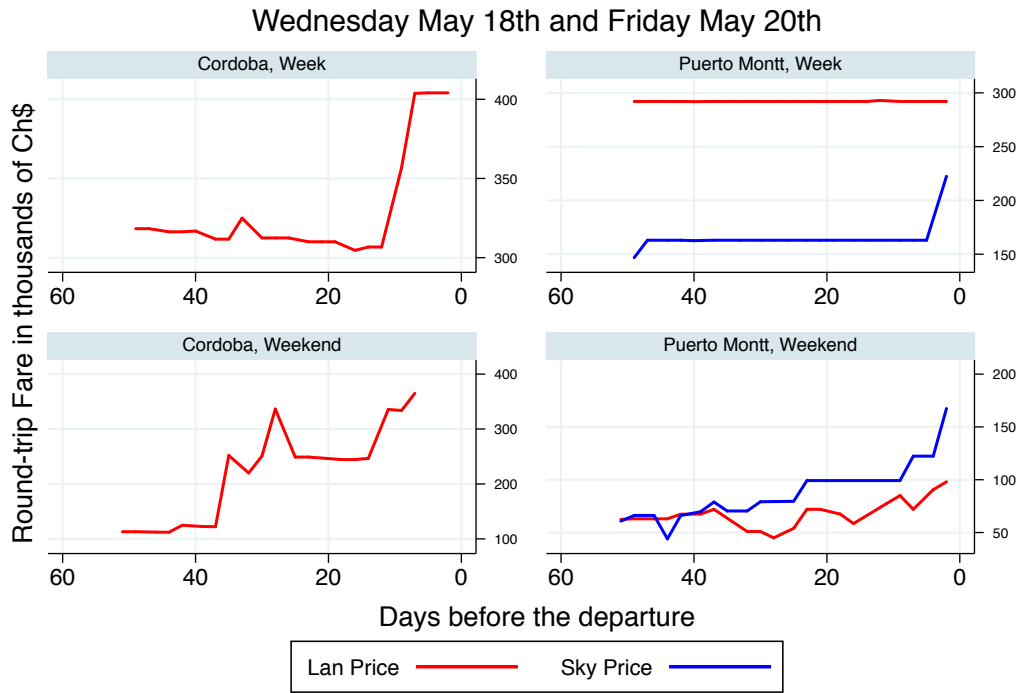
Figure 3: Fares to Buenos Aires and Calama



The flight of May 18th returns the same day; The flight of May 20th returns on May 22th

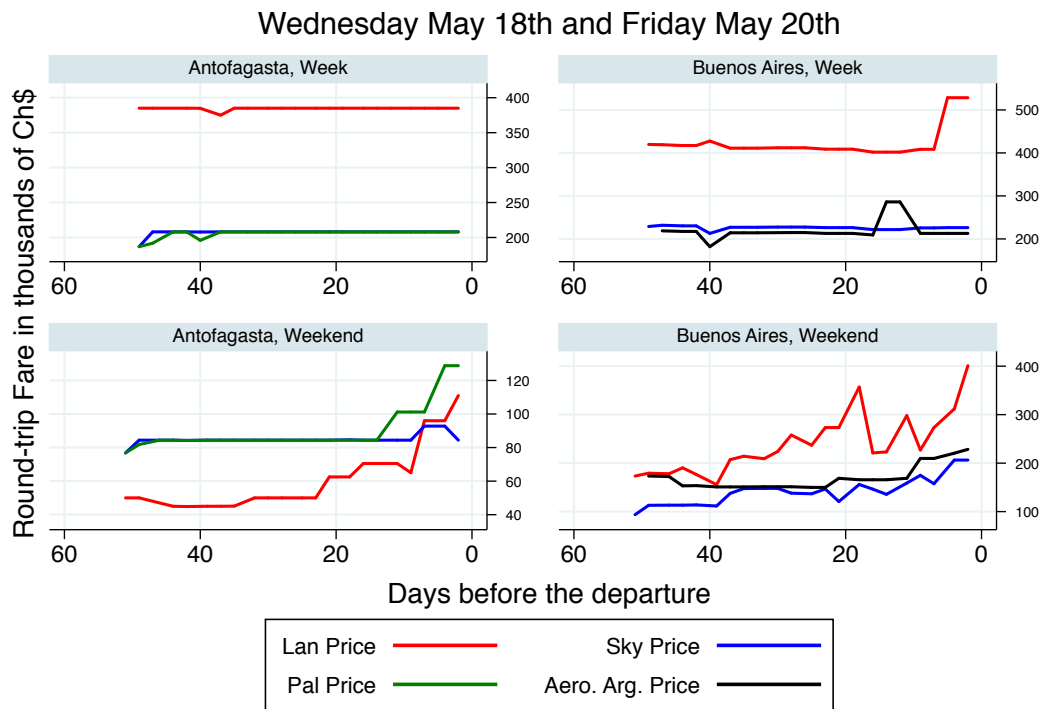
⁶ Sometimes on weekends LAN offers cheaper tickets that accumulate 25%, 50% or 75% of the total miles flown.

Figure 4: Fares to Cordoba and Puerto Montt



The flight of May 18th returns the same day; The flight of May 20th returns on May 22th

Figure 5: Fares to Antofagasta and Buenos Aires



The flight of May 18th returns the same day; The flight of May 20th returns on May 22th

The three previous figures illustrate in a simple and direct manner the main effect we would like to capture in the empirical analysis: the price differential between LAN and its competitors drops dramatically when we compare weekend trips fares targeted mostly to tourists (where only a fraction of the miles are accumulated) versus Wednesdays round-trips fares targeted mostly to business travellers (where full miles are accumulated and, presumably, an important percentage of all sold tickets are paid by traveler's employers rather than by themselves). Interestingly, the price drop is smaller for the route of Cordoba, where LAN faces no competitors and can presumably exercise some market power even on tourists travelling on weekends.

3. The LanPass Program Premium

As a first basic approximation to measure the advantage of LanPass frequent flyer program we calculate the differential price paid for flying LAN compared to the main competitor in each city-pair considering in the calculation the free trip a consumer can obtain with miles. For this purpose, we first calculate for each destination the number of trips necessary to get a free ticket to the same destination. Then we adjust LAN fares by the free trip in each destination to obtain a "LanPass Fare", which is the one we finally compare to the fare of the main competitor.⁷ Tables 4 and 5 show the results of these calculations for weekday and weekend fares respectively, for each destination in which LAN faces a competitor.

⁷ For example, a trip Santiago-La Serena-Santiago accumulates 778 miles in LanPass and 14,000 miles are needed for a free domestic trip to La Serena. Therefore, 18 round-trips to La Serena are needed to obtain a free one. Then, the average fare charged by LAN for a round-trip from Santiago to La Serena was multiplied by 0.9473 to consider the free trip. Finally, this adjusted fare was compared to the fare of the cheapest competitor in the same route.

Table 4: Adjusted Price Differential - Weekday

Destination	LanPass Fare	Competitor Fare	LanPass/LAN Fare	LanPass Fare/ Compet. Fare
La Serena	195058	118480	0.94	1.65
Concepción	224055	153552	0.93	1.46
Puerto Montt	270442	177134	0.89	1.53
Antofagasta	343495	218386	0.87	1.57
Buenos Aires	412051	255915	0.91	1.62
Calama	349834	228611	0.87	1.54
Arica	342210	223276	0.85	1.53
Average	305306	196479	0.89	1.56

Table 5: Adjusted Price Differential - Weekend

Destination	LanPass Fare	Competitor Fare	LanPass/LAN Fare	LanPass Fare/ Compet. Fare
La Serena	64961	75316	0.97	0.88
Concepción	48118	80439	0.98	0.63
Puerto Montt	106211	130663	0.96	0.82
Antofagasta	79226	106573	0.96	0.74
Buenos Aires	261645	211149	0.94	1.25
Calama	92873	122083	0.96	0.77
Arica	139308	132776	0.94	1.05
Average	113192	122714	0.96	0.88

As can be seen from the tables, the results show that for all city pairs consumers flying on weekdays would be better off, in terms of fares paid, flying on LAN's main competitors in each route. Weekday travellers pay between 46% and 65% higher fares when flying with LAN after including the free trip they can get to make the right comparison. Obviously, the fare difference might be due also to a better service provided by LAN. For example, the number of daily frequencies to each city might be important and valuable for business travelers. Therefore, it is important to estimate the switching cost created by LAN's frequent flyer program and then also control for service quality and some other determinants of airfares. Both analyses are done in the next two sections.

It is important to notice, however, that these results are reversed for weekend travellers who pay lower fares in 5 routes out of 7 when flying LAN. One potential explanation is precisely the role played by the frequent flyer program,

which matters mostly for business travellers whose ticket is paid by their employers.

4. Estimation of Switching Costs

Using the methodology proposed by Shy (2002), which maps observed brand's prices and market shares in a given industry onto the switching costs that deter a consumer of a specific brand from switching to any other competing brand, we estimated switching costs for business (round-trip the same day on a weekday) travelers.

The model proposed by Shy(op.cit.) for estimating switching costs relies on the assumption that firms, competing in prices in a market, acknowledge the existence of switching costs and then maximize prices subject to the constraint that no other firm will find it profitable to undercut its price to "subsidize" its consumers' switching costs.

Consider two firms in a market, A and B, which have N_A and N_B customers respectively. A consumer who is currently buying from Firm A, next time he buys can either buy from firm A paying a price P_A or switch to firm B paying a price P_B and a switching cost of S_A . The next purchase utility of this consumer buying from firm A can be defined as:

$$U_A = \begin{cases} -P_A & \text{if keeps buying from A} \\ -P_B - S & \text{if switches to B} \end{cases}$$

$$U_B = \begin{cases} -P_A - S & \text{if switches to A} \\ -P_B & \text{if keeps buying from B} \end{cases}$$

where U_A is the utility of consumer buying from firm A and U_B is the utility of a consumer buying from firm B. Therefore, after the next purchase of each consumer the number of Firm A and firm B buyers is going to be:

$$n_A = \begin{cases} 0 & \text{si } P_A > P_B + S \\ N_A & \text{si } P_B - S \leq P_A \leq P_B + S \\ N_A + N_B & \text{si } P_A < P_B - S \end{cases}$$

$$n_B = \begin{cases} 0 & \text{si } P_B > P_A + S \\ N_B & \text{si } P_A - S \leq P_B \leq P_A + S \\ N_A + N_B & \text{si } P_B < P_A - S \end{cases}$$

If there are K firms instead of just two and it is assumed that $N_1 > N_2 > \dots > N_K$ and also that, all firms except the smallest one set their prices considering that the smallest firm will not undercut their price and the smallest one set its price considering that the largest firm will not undercut its price, then Shy (op.cit.) shows that the switching cost for firms I(S_i) and K(S_K) are:

$$S_i = P_i - \frac{N_K}{N_K + N_i} P_K \quad y \quad S_K = P_I - \frac{N_1}{N_1 + N_K} P_1$$

where P_i is firm i equilibrium price. The main advantage of this result is that only prices and market shares are required to estimate switching costs.

Based on this method, we estimated the switching cost for each of three airlines flying in domestic markets in Chile (LAN, Sky, Pal) plus Aerolineas Argentinas, which flies from and to Buenos Aires, as follows:

$$\begin{aligned} S_{Lan} &= P_{Lan} - \frac{N_{Pal} P_{Pal}}{N_{Pal} + N_{Lan}} \\ S_{Sky} &= P_{Sky} - \frac{N_{Pal} P_{Pal}}{N_{Pal} + N_{Sky}} \\ S_{Pal} &= P_{Pal} - \frac{N_{Lan} P_{Lan}}{N_{Pal} + N_{Lan}} \end{aligned}$$

The results of the estimation are shown on Table 6. The estimated switching cost for LAN ranges between 89% and 96% and represents on average 93% of the fare for business travelers. This figure is higher than the 70% switching cost estimated by Carlsson and Lofgren (2006) for SAS in Sweden. The result, however, might reasonable if we consider that LAN has much larger market shares than SAS in all domestic city-pairs and is the dominant airline in Santiago, which is the only hub in Chile.

Table 6: Estimated Switching Cost for Business Travelers

Destination	LAN	Sky	Pal	Aero.Arg.
La Serena	189188 (90.4%)	-55864 (0%)	-	-
Concepción	218373 (90.4%)	-51343 (0%)	-	-
Puerto Montt	272548 (89.3%)	-71671 (0%)	-	-
Antofagasta	380699 (96.1%)	166646 (76.5%)	-152576 (0%)	-
Buenos Aires	417125 (92.4%)	-131623 (0%)	-	155704 (61.2%)
Calama	389030 (96.4%)	178996 (78%)	-155433 (0%)	-
Arica	377555 (93.9%)	163810 (73.3%)	-136505 (0%)	-
Average	320645 (92.7%)	28422 (32.5%)	-148171 (0%)	155704 (61.2%)

5. Effect on Prices

Finally, we estimate the effect of LanPass frequent flyer program on fares controlling for observable service quality variables. Additionally, because we also estimate the impact on fares comparing LAN prices on weekdays with LAN prices on weekends, unobserved service characteristics that do not vary between weekdays and weekends are also controlled for.

Table 7 shows the descriptive statistics of the data. The variable LAN Fare is the price for a round-trip ticket in Chilean pesos charged by LAN and the variable Fare Difference is just the difference in Chilean pesos between LAN fare and its cheapest competitor in each route. These are the two variables used as a dependent variable in the regressions.

The variable Distance is the number of kilometers between Santiago and each destination. The variable “% LanPass Miles Earned” is the fraction of the total miles actually flown that each fare allows to earned for LanPass for the purpose of miles accumulation. Even though there is no business class in domestic flights in Chile, LAN offers 125% or 150% miles in more expensive and more flexible

fares. Weekend is a dummy equal to 1 for weekend fares and equal to 0 for weekday fares. The variable Days before Flight is the number of days in advance the ticket was bought. HHI is the Hirschman-Herfindahl index of concentration for each route. International flight is a dummy equal to 1 when the destination is either Cordoba or Buenos Aires and equal to 0 for all the domestic destinations. LAN Frequency and Competitor Frequency are the number of daily flights LAN and its cheapest competitor have in each route respectively.

Table 7: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
LAN Fare	218157.2	131874.4	24100	528331
Fare Difference	68245.17	87996.95	-147700	315421
Weekend	0.5352601	0.4990437	0	1
Distance	942		389	3750
% LanPass Miles Earned	0.7971098	0.4257078	0.25	1.25
Days before Flight	20.73295	13.59506	1	51
Days before Flight ²	614.4671	668.5991	1	2601
HHI	0.6853506	0.1634104	0.4383	1
International Flight	0.14285	0.35309	0	1
LAN Frequency	9.610405	4.163847	2	19
Competitor Frequency	4.951445	3.064877	0	13
Number of Observations = 865				

Table 8 shows the results of the econometric estimation. The dependent variable in Models (1) and (2) is the price of LAN net of taxes and airport fees, while the dependent variable in Models (3) and (4) is the difference in prices between LAN and its main competitor in each city-pair for equivalent tickets (i.e., flying the same day at around the same time with tickets bought the same day). Models (1) and (3) are estimated using random effects while Models (2) and (4) using fixed effects.⁸

⁸ A Hausman test does not reject the random effects specification in both cases.

Table 8: Econometric Results

	(1) LAN Fare	(2) LAN Fare	(3) Price Difference	(4) Price Difference
Weekend	-112,341*** (5,303)	-111,934*** (5,348)	-107,245*** (5,057)	-99,175*** (5,330)
Distance	112.1*** (23.68)	-	-	-
Distance ²	0.00676 (0.0130)	-	-	-
Days Before Flight	-1,366*** (373.8)	-1,396*** (365.2)	-403.3 (333.4)	-583.3* (327.0)
Days Before Flight ²	17.76** (7.564)	18.96** (7.370)	11.25* (6.748)	12.83* (6.600)
% LanPass Miles	67,626*** (3,097)	65,562*** (3,066)	28,279*** (2,842)	29,445*** (2,829)
HHI	72,927*** (18,628)	-315,416** (123,716)	-328,393*** (18,236)	94,554 (103,999)
LAN Frequency	6,790*** (741.6)	12,016*** (1,185)	3,700*** (572.0)	6,659*** (1,019)
Competitor Frequency	-4,185*** (854.1)	-5,716*** (1,220)	-3,646*** (733.7)	-1,662 (1,049)
International Flight	100,843*** (4,471)	-	-15,685** (6,260)	-
Constant	-48,979** (20,239)	308,586*** (83,448)	269,672*** (15,278)	-44,969 (66,124)
N	833	833	731	731
R ²		0.905		0.864
Number of City-Pairs	8	8	7	7

The results show an average fare premium for LAN of Ch\$66,000 for domestic fares due to its frequent flyer program and an average difference of around Ch\$29,000 higher fares with respect to its main competitor. These results are equivalent to an average fare premium of around 18% due to the LanPass program.

One interesting result is that the fares charged by LAN have a small frequency premium ranging between Ch\$6,800 and Ch\$12,000. Consistently, LAN fares are decreasing in competitor's frequency, even though the effect is also small.

The rest of the coefficients have the expected sign. Fares are much lower on weekends compared to same day round-trip fares and LAN charges Ch\$110,000 less on weekends on average. As is its well known, airfares are also decreasing in the number of days the ticket is purchased before the flight date. Finally, fares are increasing in distance and market concentration.

6. Conclusions

The use of a frequent flier programs by an airline creates a switching cost for the consumer and usually allows them to exercise some degree of market power.

The effect is exacerbated when the airline has a hub in the cities where the consumers live.

In Chile since mid 90s there have been a dominant airline with an 80% market share in domestic markets. Additionally, it is the only airline that has a frequent flyer program. Using a unique dataset collected by ourselves over the period of two months from airlines websites for Chile, we estimate the switching cost of each airline and the impact of the dominant airline frequent flyer program on prices. The results show the existence of a switching cost from the dominant airline ranging between 89% and 96%, which represents 93% of the fare for business travelers. The estimated fare premium of created by the frequent flyer program is of around 18%.

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