

Airline choice, switching costs and frequent flyer programs

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Abstract

Switching costs are costs that customers face when switching from one firm to another. In markets such as the airline market where repeated purchases are common, switching costs may be substantial. In this paper we estimate the switching costs for domestic airline routes in Sweden between 1992 and 2002. In addition we also test for the determinants of switching costs. In particular we test to what extent factors such as frequent flyer programs and flag carriers have an effect on switching costs. The paper ends with a brief discussion on the welfare consequences of switching costs, where the connection between habit formation and switching costs is discussed.

Key words: *Switching costs, frequent flyer programs, habit formation.*

JEL-classification: D12, L11

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1. Introduction

In markets with repeated purchases, customers often face a cost of switching from one firm (product) to another firm (product). There is a variety of different types of these so-called switching costs that a consumer can face. An individual may have acquired specific knowledge about the existing product, for example computer software, or the firm may use some kind of reward system for repeated purchases, for example frequent flyer programs. The literature on switching costs focuses mainly on the behaviors of firms given that customers face switching costs (see e.g. Beggs and Klemperer, 1992; Farrell and Shapiro, 1988; Klemperer, 1987, 1995). This theoretical literature shows that the presence of a switching cost can affect the market power of the firms and consequently result in welfare losses. In addition the switching cost itself is a welfare reducing cost when the customer has to change firm or product. There are relatively few empirical estimates of the size and the determinants of switching costs, although the studies that have been made show that switching costs can be considerable (see e.g. Greenstein, 1992; Kim et al., 2001; Sharpe, 1997). One reason for the lack of empirical studies is the difficulties in estimating switching costs. However, Shy (2002) recently proposed a simple way of estimating switching cost using observed data on prices and market shares. Using his approach it is also possible to investigate what factors influences switching costs by collecting firm and market specific data. In the switching cost literature there is little discussion on the determinants of switching costs, although for example Klemperer (1995) discusses different types of switching costs. In order to gain more insight into the role of switching costs, it is important to understand what factors affect the costs. If switching costs to a large extent are affected by the behavior of firms, then appropriate regulations could reduce the switching costs. One such potential factor is frequent flyer programs. In many countries, airline implementation of frequent flyer programs has been criticized for being anti-competitive and resulting in welfare losses due to switching costs - in particular in markets dominated by one airline. In order to investigate this we estimate the switching costs for domestic airline routes in Sweden between 1992 and 2002. Given these estimates we are able to test for the determinants of switching costs, including frequent flyer programs, and hence test whether these programs increase switching costs or not.

This is one area where from a policy perspective it can be important to know what determines the switching cost. However, we will argue that the potential link between habit formation and switching costs complicates the discussion somewhat. If habits are an important part of switching costs, it is not only difficult to implement regulations reducing the switching costs, but the welfare effects of such regulations might be overstated.

2. Switching costs in air transport: Estimation and determinants

Estimating switching costs

Switching costs are costs that a consumer has from switching to a competitor's product; even when the products of two firms are functionally equal (Klemperer, 1995). Switching costs can thus only occur if purchases are repeated. For several reasons it is not easy to estimate switching costs. The costs are seldom of direct monetary expense; instead they are often costs such as learning and transaction costs, and for most customers these costs are not realized since they do not switch. However, Shy (2002) proposes a simple model for estimating switching costs, where only data on prices and market shares are needed. The model rests on a number of simplifying assumptions, but the advantage is of course the possibility to estimate switching costs with a small amount of information. Let us begin with only two firms. Firm A has N_A customers and firm B N_B customers. An individual who is now buying from firm A can, when making the next purchase, either continue with firm A and pay the price p_A , or switch to firm B and pay the price p_B . If the individual switches to firm A, he/she will face a switching cost denoted S_A . The utility for an individual who is now buying from firm A can be written

$$U_A = \begin{cases} -p_A & \text{if the individual continues to buy from A} \\ -p_B - S_A & \text{if the individual switches to firm B} \end{cases} \quad (1)$$

The number of customers for the two firms in the next period is given by

$$n_A = \begin{cases} 0 & \text{if } p_A > p_B + S_A \\ N_A & \text{if } p_B - S_B < p_A < p_B + S_A \text{ and} \\ N_A + N_B & \text{if } p_A < p_B - S_B \end{cases} \quad (2)$$

$$n_B = \begin{cases} 0 & \text{if } p_B > p_A + S_B \\ N_B & \text{if } p_A - S_A < p_B < p_A + S_B \\ N_A + N_B & \text{if } p_B < p_A - S_A \end{cases},$$

for firm A and B respectively. Thus the number of customers is determined by the two firm's prices and their switching costs. Suppose now that there are K firms and denote firm i 's number of customers by N_i . We assume that $N_1 > N_2 > \dots > N_K$. Further, assume that all firms except the smallest set their prices under the consideration that the smallest firm does not undercut their price, and that the smallest firm sets its price under the consideration that the largest firm does not undercut its price. Shy (2002) then shows that the switching cost for firm I (S_i) and K (S_K) are

$$S_i = p_i - \frac{N_K}{N_K + N_i} p_K \text{ and } S_K = p_K - \frac{N_1}{N_1 + N_K} p_1, \quad (3)$$

where p_i is firm i 's equilibrium price. Consequently, the switching cost for a firm increases, all else equal, if the equilibrium price or the market share increases. Note that in order to calculate the switching costs, all we need is data on prices and market shares.

Potential determinants of switching costs

Firms have an incentive to create and/or increase switching costs. One classical example in the case of transport is *frequent flyer programs*, first introduced in the US in the beginning of the eighties. With a frequent flyer program customers receive points or credits each time they fly. These points can then be used towards free flights or for upgrading to a higher class. By making the reward scheme non-linear, the customer has even more incentives to stay with one airline. In this way a frequent flyer program can increase the switching cost for the passengers. Frequent flyer programs have been heavily criticized for creating barriers to entry and having a negative effect on the competitiveness of airline markets. In particular it has been argued that such programs can have negative effects when one airline dominates the market. For example, if there are two roughly equally sized airlines with similar frequent flyer programs competitiveness would not be affected to any large extent, although the switching cost would increase with a frequent flyer program. Still, observing a large switching cost does not necessarily imply that airlines themselves have created these by various measures such as frequent flyer programs. Other factors that could affect the switching

costs are *perceived quality differences* between the airlines, for example in terms of the number of departures, service quality etc. A strong *habit formation* can also result in large switching costs. This would indicate that the firm does not necessarily intentionally create the whole part of the switching costs. Due to lack of data we cannot test the effect of habit on switching cost, or to put it differently we cannot distinguish between habit formation and switching costs. However, in Section 5 we discuss in more detail the relation between habit and switching costs and the implications this has for the analysis.

3. Data

We use price and passenger data from seven domestic airline routes in Sweden. Of course we can only calculate switching costs when there is competition on the routes, and therefore the data set is an unbalanced panel since the competitive situation varies from period to period. Since Stockholm is the hub city, all routes originate from Stockholm, although they do include departures both from Arlanda and Bromma airport. Arlanda is the larger airport of the two, and SAS, the Swedish flag carrier, use Arlanda as its hub airport for domestic flights. Bromma airport is a smaller city airport that mainly has been used by competitors of SAS. It is difficult to obtain data on prices and passengers for air traffic in the Swedish case. We use actual passenger data for each airline, obtained from the Swedish Civil Aviation Administration, and the price data is the so-called list prices, i.e. the prices published by the airlines (Konkurrensverket, 2003).¹ The time period we study is January 1992 to September 2002. Actual price data would of course be better than the list prices; airlines are known for their advanced price discrimination, and the official list prices contain a number of different types of tickets. In order to minimize the error when comparing prices among airlines and over time we use the price of the most flexible ticket. This means that our estimates of the switching cost will be an upper limit of the switching cost. Furthermore, since it is to a large extent business passengers who purchase the more expensive flexible tickets, the estimated switching cost could be seen as the cost for business passengers. However, since the data we have does not contain information about the purpose of the trip we still have to use the total number of passengers when calculating the market shares. Do

¹ Since data at the airline level is not public information we cannot report descriptive statistics at the airline level.

note that if the share of business passengers does not differ among the airlines, the calculated switching costs would remain unaffected.

4. Results

Based on the data described in the previous section we estimate the switching cost for each of the routes using the method described in Section 3. In order to be able to compare the results across time, all ticket prices are expressed in 2001 prices. The estimated switching costs are presented in Table 1.

Table 1. Average switching cost in SEK (2001 prices), standard errors in parentheses. Number of observations for each route in parentheses in the first column

Route (number of obs)	Airline 1	Airline 2	Airline 3
Stockholm – Gothenburg (27 obs)	2289 (223)	1035 (145)	
Stockholm – Luleå (21 obs)	2745 (364)	1017 (234)	
Stockholm – Malmö (26 obs.)	2305 (218)	1303 (175)	2390 (63)
Stockholm – Sundsvall (17 obs.)	2484 (392)	703 (210)	
Stockholm – Umeå (22 obs.)	2307 (346)	1169 (487)	
Stockholm – Östersund (3 obs.)	2440 (226)	1009 (254)	
All routes (116 obs.)	2411 (343)	1068 (326)	2390 (63)

The switching cost for SAS (Airline 1) is significantly higher than the other airlines' switching costs except for the case when there are three airlines. The calculated costs are very high, which is partly due to the fact that they are based on the fully flexible, most expensive, tickets. As a comparison, the mean ticket price used in the calculations is approximately 3,500 SEK. Thus the average switching cost for Airline 1 is almost 70% of the average ticket price. If a ticket price lower than the price of a fully flexible ticket would have been used and if the decrease in the ticket price would have been roughly the same for all airlines, then the ratio between the switching cost and the ticket price would have remained more or less the same.

Now let's investigate what determines the switching costs that we have estimated. As discussed there are a number of factors that can affect the switching cost. With the type

of data we use, i.e. aggregate data and not individual level data, some factors cannot be analyzed. The variables included in the regressions are presented in Table 2.

Table 2. Descriptive statistics.

Variable	Description	Mean	Standard deviation
<i>Price</i>	List price (most flexible ticket)	3470.64	444.4
<i>Passengers</i>	Airline number of passenger	98211.5	55255.1
<i>Departures</i>	Number of departures/arrivals for the airline	1279.73	517.54
<i>Departures competitor</i>	Number of departures/arrivals for competing airline	1326.31	563.56
<i>SAS</i>	Dummy variable = 1 if SAS	0.494	0.501
<i>Bromma airport</i>	Dummy variable = 1 if Bromma airport	0.226	0.419
<i>FFP</i>	Dummy variable = 1 if no restrictions on the use of SAS frequent flyer program	0.349	0.478
<i>SASFFP</i>	Dummy variable = SAS*FFP	0.174	0.380

As in many other European countries, Sweden has a state-owned national airline, although SAS is really owned together with Denmark and Norway. National carriers have in many cases benefited from both direct and indirect governmental support and they have had strong positions in their own domestic market (Doganis, 2001; Janic, 1997). This is also the case for SAS, the Scandinavian flag carrier. SAS operates on all the routes that we study, and Arlanda airport has been used as a hub for the domestic network for the whole period. It is therefore of interest to see if the switching cost for SAS is different from switching costs of other airlines. One of the main competitors to SAS after the deregulation has been Braathens/Malmö Aviation, which to a large extent has operated from the smaller airport in Stockholm, Bromma. Since this airport is located closer to the city-center the switching costs for flight from this airport could be higher. In 1997 SAS introduced its frequent flyer program, Eurobonus, to the domestic market. However, in 2001 their use of the frequent flyer program was limited to monopoly routes by a ruling in the Swedish Market Court (Konkurrensverket, 2003). Since we have data from both before the introduction and from after the limitations of the use of Eurobonus, we can estimate the influence of the frequent flyer program on the switching costs, both for SAS and its competitors. Since the observations where there are three airlines are few and seem to be outliers, we include a dummy variable for these observations. In addition to these variables we also include the number of departures (both the airlines own number of departures and the competitors' numbers of departures) as explanatory variables.

Testing for functional form, using a PE-test (Verbeek, 2000) between a linear and a log-log function, we can reject the linear model in favor of the log-log mode. The results of the regression are presented in Table 3. In addition to the reported parameters the regressions included city-pair dummy variables. In the last column the marginal effect for each of the independent variables is calculated.

Table 3. Estimated switching cost function, dependent variable is the logarithm of switching cost in SEK per passenger (2001 prices). White-corrected variance-covariance matrix. City-pair dummy variables not reported.

Variable	Coefficient	P-value	Marginal effect
Log(Departures)	0.443	0.000	0.63
Log(Departures comp.)	-0.768	0.000	-1.33
Triopoly	0.603	0.000	1401.84
SAS	0.282	0.001	467.97
Bromma airport	0.184	0.001	339.83
FFP	-0.071	0.239	-121.58
SASFFP	0.284	0.000	530.32
Adjusted R ²	0.81		

The number of departures has a significant effect on the switching cost. This is expected, since if an airline increases its number of departures, the benefits of traveling with that airline increases, all else equal. For example, it is easier to reschedule the trip and the negative effects of a delay are smaller. The coefficient for the triopoly variable is significant and positive. However, there are very few observed triopoly routes. The switching cost for the flag carrier SAS is higher compared to other airlines. This is interesting and it should be noted that this is corrected for the number of departures. The switching cost for SAS is almost 470 SEK higher compared to other airlines (calculated at sample mean). As we have discussed, SAS is the flag carrier and has enjoyed a strong position in the domestic market for a long time. However, at the same time the switching cost is higher for flights from the smaller airport in Stockholm, Bromma. This airport is, and has been, used mainly by the main competitor to SAS. It is a smaller airport located closer to the city center. The effect of SAS's frequent flyer program, Eurobonus, on the switching cost varies among the airlines. For airlines other than SAS, the switching cost were lower in the period when the Eurobonus program was used without any restrictions. For SAS the net effects was the opposite, i.e. the switching cost was higher during the period when their Eurobonus program could be used without any

restrictions. The net effect for SAS is around 410 SEK, which corresponds to almost 12% of the average ticket price used in our calculations. Previous studies of frequent flyer programs have analyzed the choice of airline using either actual travel data (e.g. Morrison and Winston, 1989) or stated preference data (e.g. Prousaloglou and Koppelman, 1999). All of these studies focused on domestic travel in the US. From these analyses it is possible to estimate travellers' willingness to pay for different attributes of the transport modes. Prousaloglou and Koppelman (1999) find that frequently traveling business passengers value their memberships in frequent flyer programs to 72 dollars each, while the average business passenger states a value of 52 dollars. These values correspond to 11 and 8% of the ticket price, respectively. Nako (1992) estimates an average willingness to pay for a frequent flyer membership to 52.5 dollars for an airline with a market share of 30%. This corresponds to roughly 10% of the average ticket price. The study by Morrison and Winston (1989) does not contain any information about average ticket prices. However, according to Nako (1992), the results in Morrison and Winston are similar to his results. All these results correspond fairly well with the results we have found in this study in terms of the share of the ticket price.

5. Habit formation, switching costs and policy recommendations

We have found a rather substantial switching cost and that frequent flyer programs attribute to a non-negligible part of this. The existence of a high switching cost could be seen as an argument for some type of policy intervention in that market. For example, in a survey article on switching costs Klemperer (1995) argues that the welfare losses of switching costs may be substantial through increased prices, deadweight losses due to reduced competition, and consumers suffering from the switching cost itself. As we have seen, a policy intervention is actually what happened in Sweden, where the use of frequent flyers programs was limited for the largest airline, SAS. Although this paper is not directly about a welfare evaluation of switching costs, we feel that it is important to comment on the neglected link between switching costs and habit formation, and the implications that this may have on the arguments for a policy intervention. This is also in line with the importance of considering psychological aspects of economics, which has been emphasized in recent economic literature (see e.g. Loewenstein, 1992, and

Rabin, 1998, for extensive overviews). The psychological definitions of habit rule out *deliberate* repeated actions as habits (see e.g. Ronis et al. 1989; Gärling and Garvill, 1993). In economics, deliberate repeated actions could be considered habits. Pollak (1970) summarizes the notion of habit formation such that (i) past consumption influences current preferences and hence current demand, and (ii) a higher level of past consumption of a good implies, *ceteris paribus*, a higher level of present consumption of that good. All these definitions allow for firms to be able to affect habits. If the influence of past consumption is strong, then firms can use different strategies for attracting consumers - in particular it is crucial to attract *new* consumers. Hence, some of the determinants of switching costs also affect habit and hence reinforce the effect on switching costs. For example, it seems reasonable that frequent flyer programs could affect habit formation. It is also a major advantage for firms to operate monopoly routes initially, since then passengers have built up a stock of habit formation when a new airline enters the route.

The empirical evidence of habit formation in transport is rather scarce, in particular in the economics literature. Findings in psychology suggest that travel choice is indeed habitual (see e.g. Gärling and Axhausen, 2003, for an overview) or even addictive (Reser, 1980). In a recent study by Carrasco et al. (2002) the authors empirically test for habits in different consumption goods using a household panel data, and the authors find evidence of habit formation in transport. The reason why there is so little empirical evidence of habit formation is partly due to difficulties in measuring habit. One could also see inertia, which is often found to be present in mode choice studies, as an indication of habit. We also believe that estimates of the switching costs are a measure of habit as well. If there is habit formation, then the switching cost will be positive. The problem is of course that the opposite might not hold, i.e. there could be a positive switching cost but no habit formation.

Then what are the potential policy implications of the link between habit formation and switching costs? If we believe that the choice of airline is partly driven by habit, and that this habit is deliberate (rational), then this would imply that the welfare loss of switching costs is overstated. This is not true if we believe that habits are non-

deliberate. A habit that is rational does not in itself give rise to a welfare loss, due to the fact that individuals take into account that they are subject to habit formation (Löfgren, 2003). This is of course not to say that there are no welfare losses when switching costs arise because of rational habit formation. Since a rational habit formation can have external effects through for example a limitation of the competition in the market, there could still be an argument for policy intervention due to high switching costs. The regulation would then be implemented to correct for the externality and not the habit per se.²

6. Conclusions

Using the simple method proposed by Shy (2002) we have estimated the switching cost for domestic air travel in Sweden. Our calculations show that the switching costs, as a share of the ticket price, are quite substantial. We are also able to show that the switching costs are affected by factors such as the number of departures, which airport is used, the airline itself and whether or not a frequent flyer program is present. Our results thus provide some support for the court ruling which limits SAS's use of their frequent flyer program to monopoly routes. We find that the increase in switching cost for SAS during the time there were no restrictions in the use of their frequent flyer program was approximately 12% of the average ticket price. We also find that the switching cost for SAS is, all else equal, higher than other airlines' switching costs. The latter result confirms the picture of SAS as the dominant airline in the Swedish market. However, we also argue for some caution regarding the interpretation. If we take habit into account then the ruling to limit SAS's use of their frequent flyer program to monopoly routes might be too strong. If there is a strong rational habit formation, switching costs will be high, and according to our reasoning in Section 5 this need not imply high welfare costs. On the other hand, if we embrace the definition of habit as non-deliberate, the ruling to allow SAS use the frequent flyer program on monopoly routes might be too loose. The reason for this is the effect that monopoly has on habit. A frequent flyer program would strengthen the habit and hence increase switching costs if another airline would enter the route in the future. We can conclude that switching costs

² Note that the regulation could still be affected, for example in terms of level, by habit formation.

are affected by frequent flyer programs, but the policy recommendations one can draw from the observed high switching costs are not obvious.

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