Applied Economics, 2006, **38**, 1469–1475

Routledge
Taylor & Francis Group

Airline choice, switching costs and frequent flyer programmes

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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, the switching costs are estimated for domestic airline routes in Sweden between 1992 and 2002. In addition, the determinants of these switching costs are tested for; in particular, to what extent factors such as frequent flyer programmes and flag carriers have an effect on switching costs. A substantial switching cost is found. Although a large part of this calculated switching cost can be attributed to perceived quality differences, it is also found that frequent flyer programmes contribute a non-negligible part of the switching cost. 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.

I. 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 programmes. The literature on switching costs focuses mainly on the behaviour of firms given that customers face switching costs (Klemperer, 1987, 1995; Farrell and Shapiro, 1988; Beggs and Klemperer, 1992). 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 (Greenstein, 1992; Sharpe, 1997; Kim *et al*., 2001). 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 share. 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 behaviour of firms, then appropriate regulations could reduce the switching costs. One such potential factor is frequent flyer programmes. In many countries, airline

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DOI: 10.1080/00036840500419608

implementation of frequent flyer programmes has been criticized for being anti-competitive and resulting in welfare losses due to switching costs – in particular in markets dominated by one airline (Cairns and Galbraith, 1990; Klemperer, 1995). 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 programmes, and hence test whether these programmes 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.

II. 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. One should be aware of that some of the simplifications that are made do not correspond very well with the airline industry. However, we also try to control for such factor in the empirical part of the paper when we investigate the determinants of our estimated switching costs.

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

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

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

$$n_A = \begin{cases} 0 & \text{if } p_A > p_B + S_A \\ N_A & \text{if } p_B - S_B < p_A < p_B + S_A \\ N_A + N_B & \text{if } p_\mathrm{A} < p_B - S_B \end{cases}$$
$$n_B = \begin{cases} 0 & \text{if } p_B > p_A + S_B \\ N_B & \text{if } p_A - S_A < p_B < p_A + S_B, \\ N_A + N_B & \text{if } p_\mathrm{B} < p_A - S_A \end{cases} \tag{2}$$

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 $N_1 > N_2 > \cdots > N_K$. 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 $\mathrm{K}(S_K)$ are

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

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 programmes, first introduced in the USA at the beginning of the 1980s. With a frequent flyer programme 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 nonlinear, the customer has even more incentives to stay with one airline. In this way a frequent flyer programme can

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)

increase the switching cost for the passengers. Frequent flyer programmes have been criticized for creating barriers to entry and having a negative effect on the competitiveness of airline markets (Cairns and Galbraith, 1990; Klemperer, 1995). In particular such programmes can have negative effects on welfare when one airline dominates the market. For example, if there are two roughly equally sized airlines with similar frequent flyer programmes competitiveness would not be affected to any large extent, although the switching cost would increase with a frequent flyer programme. Still, observing a large switching cost in our case does not necessarily imply that airlines themselves have created these by various measures such as frequent flyer programmes. Other factors that could affect the measured 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 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 V we discuss in more detail the relation between habit and switching costs and the implications this has for the analysis.

III. 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 in their time-tables (Swedish Competition Authority, 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. Note that if the share of business passengers does not differ among the airlines, the calculated switching costs would remain unaffected.

IV. Results

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

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

Table 2. Descriptive statistics

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

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 3500 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 had been used and if the decrease in the ticket price had 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 us 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 analysed. The variables included in the regressions are presented in Table 2.

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 (Janic, 1997; Doganis, 2001). 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 of SAS after 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-centre the switching costs for flight from this airport could be higher. In 1997 SAS introduced its frequent flyer programme, Eurobonus, to the domestic market. However, in 2001 their use of the frequent flyer programme was limited to monopoly routes by a ruling in the Swedish Market Court (Swedish Competition Authority, 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 programme 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 favour 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.

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 travelling with that airline increases, all else being 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

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		

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 programme, Eurobonus, on the switching cost varies among the airlines. For airlines other than SAS, the switching cost was lower in the period when the Eurobonus programme was used without any restrictions. For SAS the net effects were the opposite, i.e. the switching cost was higher during the period when their Eurobonus programme 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 programmes have analysed the choice of airline using either actual travel data (e.g. Morrison and Winston, 1989) or stated preference data (e.g. Proussaloglou and Koppelman, 1999). All of these studies focused on domestic travel in the USA. From these analyses it is possible to estimate travellers' willingness to pay for different attributes of the transport modes. Proussaloglou and Koppelman (1999) find that frequently travelling business passengers value their memberships in frequent flyer programmes at 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.

V. Habit Formation, Switching Costs and Policy Recommendations

We have found a rather substantial switching cost and that frequent flyer programmes contribute 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 programmes was limited to 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 Loewenstein, 1992 and Rabin, 1998, for extensive overviews). The psychological definitions of habit rule out *deliberate* repeated actions as habits (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 programmes 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 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, 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]

VI. 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 programme is present. Our results thus provide some support for the court ruling which limits SAS's use of their frequent flyer programme 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 programme 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 programme 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 V 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 programme on monopoly routes might be too loose. The reason for this is the effect that monopoly has on habit. A frequent flyer programme would strengthen the habit and hence increase switching costs if another airline entered the route in the future. We can conclude that switching costs are affected by frequent flyer programmes, but the policy recommendations one can draw from the observed high switching costs are not obvious.

Acknowledgements

We have received valuable comments and assistance from Håkan Brobeck, Mikael Ingemarsson and Olof Johansson-Stenman. Financial support from the Swedish Civil Aviation Administration and the Swedish Agency for Innovation Systems is gratefully acknowledged.

References

Beggs, A. and Klemperer, P. (1992) Multiperiod competition with switching costs, *Econometrica*, **60**, 651–66.

Cairns, R. and Galbraith, J. W. (1990) Artificial compatibility, barriers to entry and frequent-flyer Programmes, *Canadian Journal of Economics*, **23**, 807–16.

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

Carrasco, R., Labeago Azcona, J. M. and López Salido, J. D. (2002) Consumption and habits: evidence from panel data, Centre for Economic Policy Research, Discussion Paper No. 3520, November.

Doganis, R. (2001) *The Airline Business in the Twenty-First Century*, Routledge, London.

Farrel, J. and Shapiro, C. (1988) Dynamic competition with switching costs, *Rand Journal of Economics*, **19**, 123–37.

Greenstein, S. M. (1992) Lock-in and the costs of switching mainframe computer vendors: what do the buyers see? Working Paper, University of Illinois Urbana-Champaign.

Gärling, T. and Axhausen, K. W. (2003) Introduction: habitual travel choice, *Transportation*, **30**, 1–11.

Gärling, T. and Garvill, J. (1993) Psychological explanations of participation in everyday activities, in *Behaviour and Environment: Psychological and Geographical Approaches* (Eds) T. Gärling and R. G. Golledge, Elsevier/North-Holland, Amsterdam.

Janic, M. (1997) Liberalisation of European aviation: analysis and modelling of the airline behaviour, *Journal of Air Transport Management*, **3**, 167–80.

Kim, M., Kliger, D. and Vale, B. (2001) Estimating switching costs and oligopolistic behaviour. Discussion Paper, Department of Economics, University of Haifa.

Klemperer, P. (1987) The competitiveness of markets with switching costs, *Rand Journal of Economics*, **18**, 138–50.

Klemperer, P. (1995) Competition when consumers have switching costs: an overview with applications to industrial organization, macroeconomics and international trade, *Review of Economic Studies*, **62**, 515–39.

Loewenstein, G. (1992) The fall and rise of psychological explanations in the economics of intertemporal choice, in *Choice Over Time* (Eds) G. Loewenstein and J. Elster, Vol. 65, Russell Sage Foundation, New York, pp. 3–34.

Löfgren, Å. (2003) The effect of addiction on environmental taxation in a first and second-best world, Working Papers in Economics No. 91, Department of Economics, Göteborg University.

Morrison, S. and Winston, C. (1989) Enhancing the performance of the deregulated air transport system, *Brookings Papers on Economic Activity. Microeconomics*, Special issue, 61–112.

Nako, S. (1992) Frequent flyer programmes and business travellers: an empirical investigation, *Logistics and Transportation Review*, **28**, 395–414.

Pollak, R. A. (1970) Habit formation and dynamic demand functions, *Journal of Political Economy*, **78**, 745–63.

Proussaloglou, K. and Koppelman, F. (1999) The choice of air carrier, flight, and fare class, *Journal of Air Transport Management*, **5**, 193–201.

Rabin, M. (1998) Psychology and economics, *Journal of Economic Literature*, **36**, 11–47.

Reser, J. P. (1980) Automobile addiction: real or imagined?, *Man Environment Systems*, **10**, 279–87.

Ronis, D. L., Yates, J. F. and Kirscht, J. P. (1989) Attitudes, decisions, and habits as determinants of repeated behaviour, in *Attitude Structure and Function* (Eds) A. R. Pratkanis, S. J. Breckler and A. G. Greenwald, Erlbaum, Hillsdale, NJ.

Sharpe, S. (1997) The effect of consumer switching costs on price: a theory and its application to bank deposit market, *Review of Industrial Organization*, **12**, 79–94.

Shy, O. (2002) A quick-and-easy method for estimating switching costs, *International Journal of Industrial Organization*, **20**, 71–87.

Swedish Competition Authority (2003) There is no such thing as a free lounge – a report on frequent flyer programmes, Swedish Competition Authority Report 2003:1.

Verbeek, M. (2000) *A Guide to Modern Econometrics*, Wiley, New York.