Master's thesis in Finance
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Estimating Switching Costs in the Swedish Banking System

- a study on the introduction of ATM fees

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Abstract

Several studies show that the Swedish banks' costs for the services they provide are not always communicated through the prices charged. At present, ATM withdrawals in Sweden lack a correct pricing scheme. One of the commonly referred to explanations for this is the possibility of customers switching banks when being faced with ATM fees. This thesis investigates how consumers would react to the introduction of ATM fees in Sweden. By using a consumer survey in combination with logistical regressions, the authors estimate a model that calculates the probability of a consumer to switch banks at a given ATM fee. The median consumer in the data set has a 26.7% (53.9%) probability to switch banks at an ATM fee of SEK 4 (SEK 8). From the results of this study, the authors believe that an introduction of ATM fees in Sweden would lead to welfare gains through a more efficient use of the cash handling system.

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1. Introduction

It has been shown in several studies that the 4 large Swedish banks' costs for the payment services they provide are not always communicated through the prices charged. Hereby one of the price mechanism's most important features is put out of play – namely to give consumers of ATM services the correct information to make efficient decisions.

Most of the payments made in the economy are quite small, made between households, businesses and the public sector. These are referred to as mass payments, and consist of cash, checks, money transfers, credit/debit card et cetera. The common denominator for the payments that are not made with cash is that they in some way are tied to a bank account. Therefore, the banking system plays an important role in the Swedish payment system as distributors and intermediaries. These banking operations give of course rise to costs for the banks.

One important factor that controls demand for payment services is fees. In order to fully understand how important fees are for the choice of services one can look at the development in Norway. There the card payments and other electronically initiated instruments expanded quickly when banks changed their price setting systems and started to use fees that reflect costs in a better way (Kim & Vale, 2001). In Sweden one can see how the increase of transaction fees for checks in the 1980s lead the consumers to use credit cards, giro payments and ATMs instead.

An example of how the introduction of fees may affect the behavior of consumers is an episode from the Netherlands in 1992. There, an announcement of payment fees for consumers with Rabobank, which would be implemented per 1 May 1992, led to thousands of complaints and thousands of clients closing their accounts at Rabobank. Instead, the clients turned to the Postbank who at that time offered a complete payment package "for free". Postbank estimated an increase of account openings of approximately 50 000 in the two months since the announcement per 1 Jan 1992. Rabobank withdrew their plans end of

February, suffering a huge reputation loss. (Financieele Dagblad, 22-02-1992: “Rabo slikt vergoeding particulier betalen in”)

Ten years later, an interesting event occurred in Austria. Early December 2002, Raiffeisenlandesbank NO-Wien announced the implementation of a fee scheme for cash withdrawals; 0.30-0.55 eurocents for ATMs and 80 cents for personal tellers – the first in Austria. This caused such a public outcry that the bank withdrew their pricing plan already on 16 December 2002. Although the fees were only meant to reflect the actual costs associated with ATM withdrawals, consumer aversion to fees in combination with the possibility to switch banks made it impossible for one single bank to introduce them. This since at any point in time, a bank who introduced ATM fees risked losing many customers. On the press conference, general manager Püspök stated: “Who moves first, has lost”.

Similar events can be found in Sweden. In 2000, FöreningsSparbanken’s CEO Birgitta Johansson-Hedberg received a question on a radio program if she thought that it would cost money to use a credit card in the future. She responded affirmatively, stating that she thought that all of the banks’ services would cost money. After the radio program, a lot of complaints were received, especially after the bank announced that it might cost money for consumers who make many withdrawals per year. Birgitta Johansson-Hedberg later made an announcement where she said no fees would be introduced for any number of withdrawals. (Dagens Nyheter 11-02-2000)

Finally, in the spring of 2000 Skandiabanken’s general manager urged in a letter to the banks’ customers to stop making cash withdrawals under SEK 500. The withdrawals cost Skandiabanken SEK 10 (per withdrawal) independently of the amount withdrawn. After this, a storm of protests erupted and the customers could continue to withdraw any desired amount. (Dagens Nyheter 27-10-2000)

These events depict a willingness to introduce ATM fees from the banks, but also how hard it is to implement. Today, the banks’ costs for each cash withdrawal are approximately SEK 5 in Sweden, and given that there were 337 million ATM cash withdrawals in 2004 (Blue Book 2006), the costs amount to more than 1.6 billion SEK for the Swedish banks. These enormous costs could be transferred to the consumers with a correct pricing system for ATM withdrawals. Also, these costs could also be reduced since a fee would probably lead to fewer withdrawals, but at what price? As can be seen e.g. in the Austrian and Dutch episodes described above, the bank who moves first seems to be bound to loose a lot of its existing customers if it were to introduce ATM withdrawal fees – something that naturally no bank would like to happen. But will the customers switch banks at the mere occurrence of a withdrawal fee or is there a certain amount that causes the customers to switch banks? If so, how large is this amount? And indeed, is there a fee level that would lead to fewer withdrawals without any loss of customers?

The existence of switching costs in the banking sector is well documented but how large is the magnitude of these switching costs? Can ATM withdrawal fees serve as a proxy for these switching costs, and at what cost is it most likely for the customers to switch banks? If such an ATM withdrawal fee can be found that does not impel a large number of consumers to switch banks and at the same time cover the banks' costs, the profit gains will amount to not millions but billions of Swedish Kronor. Furthermore, if the pricing of ATM withdrawals reflects their true costs, people will be able to make efficient choices, thus prompting a switch to electronic means of payment.

1.1 Purpose

The purpose of this master thesis is to investigate whether switching costs exist in the Swedish banking system and if so, try to estimate the amount that would cause consumers to switch banks using the ATM system as a proxy. Also, it aims to investigate whether there are differences between consumer groups and what drives these differences. We will do this by using a consumer survey in combination with a logistic regression model in order to estimate the probability of a consumer to switch banks at a given ATM fee. The thesis is organized as follows:

We start by outlining the current situation in the Nordic payment system by comparing Sweden to its neighboring countries. Second, we give a brief introduction to the existing switching cost theory. After this, we outline the main method used in this study, consisting of survey design and validity, contingency tables and logistic regression analysis with goodness-of-fit tests. Section 5 of the thesis presents the results of the study both in terms of contingency tables and the regression model in order to calculate the switching probabilities of the consumers in our sample. In the final section, we put the results of our study in a greater context by discussing the implications of an introduction of ATM fees in Sweden today.

2. Background

This section contains the background to our study. By comparing cash usage across the Nordic countries as well as the costs for different forms of cash withdrawals, one can see that the Swedish system differs from that of its Nordic neighbors. Swedish consumers use more cash and less card transactions and at the same time have fewer ATM terminals per capita.

In order to understand the current situation in the Swedish payment system we will present the background to our study. In table 1 below one can see that Swedes use cash to a larger extent and cards to a smaller extent than its neighbors in the Nordic countries. The number of cards per capita is low, as well as terminals where cards can be used. This difference is quite surprising considering that payment systems and patterns are very similar across all Nordic countries. According to Guibourg and Segendorf (2002), differences in how payment services are priced could be part of the explanation.

In Norway 2002, you were charged a fee of on average NOK 3.76 per withdrawal if it was made in your own bank after office hours. If it was made in other banks' ATMs you were charged NOK 3.89 during office hours and NOK 4.79 after. Similar fees could be seen in Denmark whereas in Finland you were charged a fee only for withdrawals after office hours. The interesting thing to note is that in Sweden there were very rarely fees for cash withdrawals. This difference between Sweden and its Nordic neighbors applies still today, and it could be part of the explanation behind the differences between the use of cash and credit cards in the Nordic countries.

Table 1. Cash and credit card usage in the Nordic region 2001.

	M0/GDP	Electronic Payments	Card transactions per capita	Cards per capita	Terminals per 1000 inhabitants
Denmark	2.90 %	n.a.	87	0.69	n.a.
Finland	1.84 %	88 %	76	1.31	12.9
Norway	2.75 %	87%	99	1.43	15.9
Sweden	4.48 %	89 %	45	0.85	9.9

Source: Blue Book 2003 and Norges Bank

In the table above, cash usage in an economy is represented by measuring the stock of notes and coins in circulation (M0) to GDP. The reason for using 2001 is that Finland adopted the Euro in 2002 and that the best reliable data is for 2001.

As mentioned above, Swedes use more cash and less card transactions than their Nordic peers, which is quite surprising since there are fewer terminals to withdraw cash from in Sweden.

We will now look at the costs of cash withdrawals and especially ATMs in Sweden. Considering that the four largest banks in Sweden together comprise of 92% of the card and credit transfer markets and 96% of the cash distribution market, we follow Guibourg & Segendorf (2002) and use a weighted average of the reporting banks' costs labeled "average bank". Here, each individual bank's market share is weighted to calculate the costs for the Swedish payment system. In other words, the resulting "average bank" is simply a weighted average based on each individual bank's market share, and this is used to get a good approximation of the cost structure of a typical major bank in Sweden. The cost structure for 2002 is presented below in table 2.

Table 2. The Average Bank's costs per payment transaction 2002.

Payment Service		Costs (SEK)			Volumes (thousands)
		Fixed/Unit	Var/Unit	Unit costs	
Cash Withdrawals	OC/OT	4.50	1.37	5.87	38301
	OC/FT	0.08	5.61	5.69	30841
	FC/OT	5.15	-3.18	1.97	30841
	OTC	10.98	0.06	11.04	11170

Source: Guibourg & Segendorf (2002).

- OC/OT = Own Card/Own Terminal
- OC/FT = Own Card/Foreign Terminal
- FC/OT = Foreign Card/Own Terminal
- OTC = Over the Counter

As we can see from the cost structure above, the median unit cost of an ATM withdrawal in Sweden is SEK 5.69 in 2002 (card transactions is SEK 1.88). This could be compared to the fees charged in Norway, which amounted to approximately NOK 4, and this converts to approximately SEK 4.7. In other words, the cost for a cash withdrawal in an ATM in Sweden is quite close to the fee charged for a similar transaction in Norway.

So why do not the Swedish banks implement ATM fees like its Norwegian counterparts? Several observers have suggested a prisoner's dilemma situation where the welfare-maximizing situation i.e. all banks use ATM fees cannot be achieved due to the possible loss of customers when acting as a first-mover. The examples mentioned in the introduction of this text seem to support this theory, but can there be something else that explains the behavior of the banks and their customers?

One alternative explanation could be that banks view payment systems as complementary with each other and perhaps even other business activities. Banks maximize profits by establishing customer relationships by selling low-priced payment services and use these relationships to sell more profitable services such as mortgage loans, financial services and saving products just to name a few. This cross-subsidization could be seen in the fact that students have free banking services while saving in e.g. mutual funds for pensions are associated with high costs for adults.

Frisell and Bolt (2006), show that differential switching costs between generations can lead to ATM fees being subsidized. However, the development in Norway suggests that a zero pricing scheme is not optimal. In contrast to this, looking at the episodes from the Netherlands and Austria where banks tried to introduce ATM fees but as a result lost customers and received a lot of protests there is a certain amount of sensitivity to ATM fees amongst the European consumers.

Could it also be that even small ATM fees would cause some consumers to switch banks? If so, which consumers? Would it be feasible to subsidize these sensitive consumers or is this group too large?

3. Theoretical Framework

We will in this section give an introduction to the theoretical framework of existing switching cost literature. This will serve as a basis for further understanding of our results and the conclusions drawn in sections later on.

3.1 Switching cost theory

A consumer who has purchased a product from one firm may have (or perceive) costs of switching to a competitor's product, even when the products offered by the two firms are functionally identical. According to Klemperer (1995), these switching costs give firms a certain degree of market power over customers who purchase the products repeatedly, so-called repeat customers. This means that the firms' current market shares are important determinants of their future profits. The firms face a trade-off between investing in market share by charging a low price that attracts new customers (who can become valuable repeat-customers in the future), and harvesting profits by charging high prices that capitalize on but also decrease the firms current market share.

Switching costs result from the consumer's desire for compatibility between the current purchase and a previous investment. This investment might be *physical*, such as equipment or setting up a relationship, *informational*, such as finding out how to use a certain product or service or retrieving information about a product's characteristics, *artificially-created*, such as buying a high-priced first unit that allows you to purchase subsequent units to a lower price and finally *psychological*, such as brand-loyalty. (Klemperer 1995)

Especially the *physical* investment can be seen in today's society. For instance, your digital camera must be compatible with its memory stick. Furthermore, two banks may offer identical current accounts, but there are high transaction costs (both actual and perceived) in closing an account and opening the same with a competitor. These types of *physical* investments in the form of setting up new relationships with suppliers can also be seen in the mobile telephone industry, where customers face transaction costs of e.g. transferring their telephone number to a new supplier.

Also, the *psychological* costs of switching can be seen in many industries. Even where there are no clearly identifiable economic reasons for exhibiting brand loyalty, there might be psychological costs of switching brands. Social psychologists show evidence of people changing their preferences towards products in favor of products that they have previously chosen or been given. This is done in order to reduce "cognitive resonance" (Brehm, 1956), an example of which might be that we like our own mother's cooking since we are used to it and grew up with it, thereby learning to like it. In the same way, many younger people have the same bank as their parents, since they accompanied their parents to a certain bank when they were young and grew accustomed to it.

All different types of switching costs are sufficient to make ex-ante homogenous products to become, after the purchase of any one of them, ex-post heterogeneous. One must note however, that switching costs can arise from a number of reasons but it is common to focus on the start-up cost that is associated with the initial investment of purchasing a product from another brand than was used at an earlier purchase of the same product. Klemperer (1995) uses a two-period model to describe how switching costs can yield market power. We will not go into the details of this model, only give a brief summary of the results.

First of all, in the absence of switching costs there is no connection between the two periods. A firm offers lower prices in the first period than in the second period. The intuition behind the model is that firms' first-period prices are lower than if they were simply maximizing first-period profits, because they are competing for market share which will be very valuable in the second period.

Klemperer (1995) seems to suggest that there is a strong presumption that switching costs indeed raise prices to both new and old customers. In this framework, the market is seen as an oligopoly, and in this setting, market power induces the firms to set price above the perfect competition price, and this means that switching costs raise the oligopoly's profits.

Sharpe (1997) extends Klemperer's model to include more than two firms. Sharpe as Klemperer claims that switching costs are especially important in markets where significant information or transaction costs exist, and where such costs give rise to long-term relationships and repeated transactions. One example of these is according to Sharpe banking services. Sharpe finds using panel data that the proportion of switching customers has a significantly positive effect on the money market deposit accounts only in less concentrated markets. Hence, customer loyalty associated with switching costs and market concentrations behave as substitute sources of market power.

While Klemperer and Sharpe shows the existence and give the definitions of switching costs, neither one of them offer a framework of how to estimate the magnitude of switching costs in an industry such as banking. Kim, Kliger and Vale (2001) introduce a model with the ability of extracting information on both the magnitude and the significance of switching costs. The model uses panel data to assess the average switching costs in the market for bank loans. They find that the average switching cost for bank loans in Norway is 4.1% – about one-third of the market average interest rate on loans during the measurement period.

A feature of this model is that it enables consumers to switch between firms at any period as the market share varies. Previous theoretical models assume a two-period framework where switching is not possible in the second period. This implies that firms only compete for customers in the first period. Kim et al. (2001) use highly aggregated data and not customer-specific information in order to obtain their results. However, the basic underlying notion of a threshold value for each consumer still applies.

4. Methodology

The method that has been used to collect the data is a consumer survey investigating whether consumers will switch banks or not when being faced with a transaction fee for each withdrawal. The data was tested with contingency tables and logistic regressions to obtain the probability of an average consumer switching banks both at high and low ATM levels.

In order to look for switching costs and to try to estimate these among Swedish consumers we conducted a consumer survey. This consisted of a number of background variables such as demographics as well as two dependent variables. The first dependent variable was aimed at investigating the propensity of respondents to switch banks at a low ATM fee (SEK 4), and the second at a high ATM fee (SEK 8). The survey was conducted in the Stockholm area between May and June 2006 and was aimed at all persons above the age of 18.

4.1 Survey design

Using *structured data collection,* a formal questionnaire was prepared and questions were asked in a pre-arranged order. This is one of the most popular data-collection methods since it is non-disguised in that the purpose of the project is disclosed to the respondents or is otherwise obvious to them from the questions asked. According to Malhotra (2004), one of the advantages of this method is that it is simple to administer. Second, the data obtained are reliable since responses are limited to the alternatives stated. The use of fixed-response questions reduced the variability in the results that may be caused by differences in interviewers (comparison to qualitative interview method). Finally, coding, analysis and interpretation of data are relatively simple.

Disadvantages include respondents being unwilling or unable to provide the desired information. For instance, respondents might be unwilling to respond if the information requested is sensitive or personal. Also, structured questions and fixed-response alternatives may result in loss of validity of certain types of data such as beliefs and feelings. Despite these disadvantages, Malhotra (2004) states that the survey approach is by far the most common method of collecting primary quantitative data in e.g. marketing research.

Survey *response rate*, broadly defined as the percentage of the total attempted interviews that are completed. Personal or intercept interviews yield the highest response rate (typically higher than 80%), while internet surveys have the poorest response rates, even lower than e-mail surveys (Malhotra, 2004). In order to get as high response rate as possible, we used the personal or intercept interviews when conducting our survey.

A *nominal scale* was used for the questions. Here, the numbers serve only as labels or tags for identifying and classifying objects. When a nominal scale is used for the purpose of identification, there is a strict one-to-one correspondence between the numbers and the objects. Nominal scales are often used for identifying respondents, brands, attributes and other objects. In our study, we have used both nominal and ordinal scales for classification purposes. For example, we classified our respondents by income or number of withdrawals. The classes are mutually exclusive and collectively exhaustive, and the objects in each class are viewed as equivalent with respect to each characteristic represented by the nominal or ordinal number.

In line with the *structured data collection* method, we used structured questions which specify the set of response alternatives and the response format. A structured question may be *multiple choice*, *dichotomous* or *scale*. In multiple choice questions, all possible choices are included in the set of alternatives. The general guideline is also to include an alternative labeled “other” or “do not know”. When using multiple choice questions, one should be aware of *order* or *position bias* i.e. the tendency of the respondents to check an alternative merely because it occupies a certain position or is listed in a certain order. According to Malhotra (2004), respondents tend to check the first or the last statement in a list, particularly the first.

A *dichotomous* question has only two response alternatives. Often the two alternatives are supplemented by a neutral alternative such as “don’t know”. The reason for this is that if it is not included, respondents are forced to answer e.g. “yes” or “no” even though there is uncertainty, and in our survey we have chosen to include a neutral alternative for this reason.

Lastly, the *sample size* was determined. *Sample size* refers to the number of elements (observations) to be included in the study. Malhotra (2004), states that the minimum sample size for this type of study should be 200 observations and preferably in the range 300-500 observations.

4.2 Validity

When conducting an experiment, the researcher has two goals: draw valid conclusions about the effects of independent variables on the study group and make valid generalizations to a larger population of interest. The first goal concerns *internal* validity, the second *external* validity.

Internal validity refers to what extent the manipulation of the independent variables actually caused the observed effects on the dependent variables. If the observed effects are influenced by extraneous variables, it is difficult to draw valid inferences about the relationship between the independent and dependent variables. Internal validity is the basic minimum requirement in an experiment before any conclusion can be drawn. We have no reason to believe that we do not have the independent variables to explain the behavior in the dependent variables and we conclude that our study fulfills the necessary condition of internal validity.

External validity refers to whether the cause-and-effect relationships found in the study can be generalized. Threats to the external validity arise when the specific set of experimental conditions does not realistically take into account the interactions of other relevant variables in the real world. Even though it is desired to have both internal and external validity in an experiment, this is often very hard to achieve. In our study, we have not examined actual behavior but stated behavior, and therefore the real world relationships might differ from those that this thesis proposes.

4.3 Data

We aimed at obtaining a data sample that reflected all the consumers in Sweden over the age of 18. We tried to do this by asking random consumers in the central areas of Stockholm at first. However, we soon discovered that many of the potential respondents found the information to be sensitive and did not want to participate in the survey. In order to obtain a sufficiently large sample we therefore decided to focus our efforts on students at the Royal Institute of Technology and the Stockholm School of Economics.

As we realized that this would skew the data sample towards younger consumers we tried to mitigate the problem by also conducting the survey at companies where we had previously been employed. The effect of these actions is that our sample can not be considered to be a perfect representation of the desired population. Due to time restrictions and the reasons described above, we decided to continue with this data sample, knowing that this bias exists in our data.

The total number of distributed surveys amounted to 400. We managed to obtain 247 (61.75%) responses to our survey (see Appendix for the complete survey). The response ratio of 61.75% was obtained using the method described above. If the survey would have been conducted solely on random consumers in the streets of Stockholm, the response ratio would have been significantly lower.

In addition to this, we decided to eliminate the responses that were incomplete, i.e. the ones that had left questions unanswered completely or ticked more than one alternative to each question. After this, we were left with 232 responses after 6% of unprocessable responses were taken away from the data set which left us with a final response ratio of 58%.

4.4 Variable Description

In order to describe our respondents' demographic backgrounds as well as their behavior in relation to the two dependent variables, we used a number of background variables to see whether there could be patterns in the behavior of consumers when using ATMs in Sweden. As stated above, the two dependent variables were: Propensity to switch at a low cost (SEK 4) and Propensity to switch at a high cost (SEK 8).

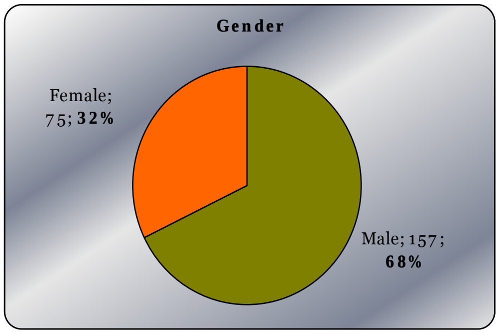
The low cost variable (SEK 4) was chosen on the basis of the actual median cost of cash withdrawals in Sweden as stated in the background section. Also, it is in proximity of the ATM fee charged in Norway, and therefore it would be interesting to see how Swedish consumers would react to an ATM fee similar to that of a nearby country.

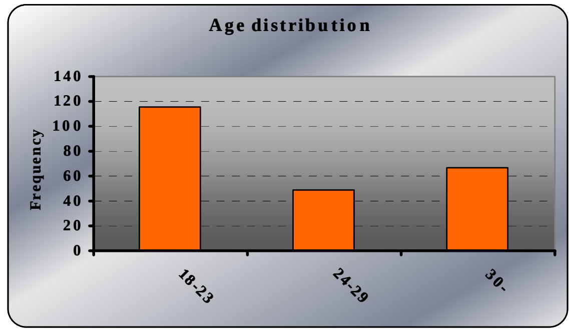
The high cost variable (SEK 8) was chosen because it was twice the low fee and since we did not want to have a fee above SEK 10. This simply because we believed that there is a psychological threshold of using two digits. A two digit fee could in our view be perceived as expensive per se compared to a one digit fee.

The first background variable was *Age*. In order to get a good view of our data set we needed to know the age distribution of the same. Looking at the age distribution in figure 2 below, where we depict the respondents' age in the ranges 18-23, 24-29 and 30-, where the youngest category is the largest one. It makes out almost 50% of our total respondents. Approximately one third of the data set consisted of people above the age of 30.

The second background variable was also a demographic variable, *Gender*. As can be seen from figure 1 below, we have a clear bias towards male respondents in our survey with 68% male and 32% female. Since the respondents were chosen at random this is hard to explain, but one explanation is probably that the survey partly was conducted at the Royal Institute of Technology in Stockholm where there is a clear majority of male students. However, since we expect no differences between men and women we do not believe this bias will affect our results.

Figure 1 & 2. Gender and Age distribution.





After having chosen two commonly-used demographic background variables, we also chose background variables that could tell us more about the distribution of our respondents in terms of behavior when using the Swedish payment system. The first variable for this purpose was *Gross Monthly Income*. The respondents were asked to state this choosing from four different ranges of income. Our belief was that it would be easier for a consumer to respond to this delicate question if we asked for a reply in a range instead of the *exact* income. Still, we realized that this was a delicate question indeed, and so we chose to include a "do not want to state" alternative.

The second variable for investigating the consumers' backgrounds in terms of payment system behavior was *Primary Bank*. We knew that many consumers today have several banks and so we formulated the question to be aimed at the primary bank only, i.e. the bank in which the consumer makes his or her day-to-day transactions. The alternatives included the four large banks in Sweden as well as three smaller niche banks and one alternative for another bank not stated in the question labeled "other".

Since this study was aimed at investigating whether consumers would switch banks, we found it interesting to see to what extent the consumers had switched banks before. Hence, the third variable for the purpose stated above was whether the consumers had switched banks in the past three years, labeled *Switched Banks*.

The last two variables with the purpose of investigating consumer behavior in the payment system were related to the actual cash withdrawals in ATMs. The first ($Number\ of\ Withdrawals$) aimed at describing how many cash withdrawals a consumer makes on a weekly basis, and the second ($Size\ of\ Withdrawal$) asked the respondent to estimate the size of these cash withdrawals on average. We expect respondents who make a large number of withdrawals to be more prone to switch banks. This is due to the fact that in our framework, an ATM fee is charged for every withdrawal. Thus, the total cost for the individual consumer will be higher the more withdrawals he or she makes.

Regarding the size of the withdrawals, we expected respondents who make smaller withdrawals to be more prone to switch banks, as the ATM fee will constitute a larger percentage of the withdrawal. The alternatives were chosen on the basis of the average cash withdrawal in Sweden which amounted to approximately SEK 800 (Bankföreningen). The distribution of these five variables is shown below in tables 3-7.

Tables 3-7. Data.

Gross Monthly Income (SEK)	Frequency
<15 000	143
15 001-30 000	53
30 001- 50 000	19
> 50 001	8
Do not want to state	9
Total	**232**

Primary Bank	Frequency (%)
SEB	40 (17)
SHB	44 (19)
Nordea	62 (27)
FSB	63 (27)
Other	23 (10)
Total	**232**

Number of withdrawals	Frequency
0	36
1-2	156
3	31
4+	9
Total	**232**

Size of Withdrawal (SEK)	Frequency
0-300	126
400-500	56
600-700	14
800-900	10
1000-1100	11
1200-1300	2
>1400	10
Do not want to state	3
Total	**232**

Switched Banks in past 3 yrs	Frequency
Yes	31
No	201
Total	**232**

4.5 Contingency tables

The use of contingency tables when comparing observations in a population across a number of attributes is a commonly-used tool. In our study, we will use this tool as a method to analyze patterns within our data sample. Newbold et al. (2003) use this method in the manner described below.

Suppose that a sample is taken from a population, each of whose members can be uniquely classified according to a pair of attributes, A and B. The hypothesis to be tested is of no association or dependence in the population between possession of attribute A and B. Assume that there are r categories for A and c categories for B, resulting in a total of rc possible cross-classifications. The number of sample observations belonging to both the ith category of A and the

jth category of B will be denoted O_{ij}. This tabulation is called an r x c **contingency table** and can be seen in table 3 below. Also, row and column totals is added for convenience and these are labeled $R_1, R_2 \ldots R_r$ and $C_1, C_2 \ldots C_c$ respectively.

Table 8. Contingency Table.

	Attribute B				
Attribute A	1	2	...	c	**Totals**
1	O_{11}	O_{12}	...	O_{1c}	R_1
2	O_{21}	O_{22}	...	O_{2c}	R_2
⋮	⋮	⋮	...	⋮	⋮
r	O_{r1}	O_{r2}	...	O_{rc}	R_r
Totals	C_1	C_2	...	C_c	n

To test the null hypothesis of no association between attributes A and B, we ask how many observations we would expect to find in each cross-classification if that hypothesis were true. Given no association, we would expect the observations to be distributed in proportion to the total number of observations for each row and column. Hence, the expected number of observations in the cross-classifications can be computed according to:

$$E_{ij} = \frac{R_i C_j}{n} \qquad \text{for } (i = 1,2,\ldots r;\ j = 1,2,\ldots c)$$

The test of the null hypothesis of no association is based on the magnitudes of the discrepancies between the observed numbers and those that would be expected if that hypothesis were true. It can be shown that under the null hypothesis the random variable associated with

$$\chi^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{\left(O_{ij} - E_{ij}\right)^2}{E_{ij}}$$

has, to a good approximation, a chi-square distribution with (r-1)(c-1) degrees of freedom. The approximation works well if each of the estimated expected numbers E_{ij} is at least 5.

Now, we can formulate a test for the association in contingency tables. Suppose that a sample of *n* observations is cross-classified according to two attributes in an *r* x *c* contingency table. If the null hypothesis is

H_0: No association exists between the two attributes in the population.

A test of association at a significance level α is based on the following decision rule:

$$\text{Reject } H_0 \text{ if } = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{\left(O_{ij}-E_{ij}\right)^2}{E_{ij}} > \chi^2_{(r-1)(c-1),\alpha}$$

As stated above, one requirement of using the chi-square distribution in contingency tables is that the estimated expected numbers of the observations has to be at least 5. Therefore, in line with theory, we chose to eliminate the alternatives that resulted in an expected number of less than 6. Another alternative that was used to overcome this problem was bundling adjacent alternatives together into one alternative. This explains why we for some variables have more alternatives in our survey than in our presented results. The elimination of alternatives also reduced the number of respondents to 204 when performing the background variable tests. However, our results from the main part of the study, namely the investigation on switching costs is presented for the full sample.

4.6 Logistic regression

The second method that was used for investigating switching costs in the Swedish banking system was logistic regression. Here, we will give a brief background to the terminology and estimation procedures.

The dependent variable is assumed to follow one of the distributions from the exponential family such as the normal, binomial or inverse Gaussian. Logistic analyses for binary outcomes attempt to model the odds of an event's occurrence and to estimate the effects of independent variables on these odds. The odds for an event is a quotient that conveniently compares the probability that an event occurs (success) to the probability that it does not occur (failure). When the probability of success is greater than the probability of failure, the odds are greater than 1. If the two outcomes are equally likely the odds are 1, and if the probability of success is less than the probability of failure, the odds are less than 1.

To examine the impact on the odds of an independent variable, such as G*ender* or A*ge*, we construct the odds ratio (OR), which compares the odds for different values of the explanatory variable. Odds ratios are bounded below 0, but have no upper bound; that is they can range from 0 to infinity. An OR of 1 indicates that an explanatory variable has no effect on the odds of success. In our framework, success is defined as the respondent switching banks. As an example for *Gender*, the odds for succeeding are the same for men and women. Small values of the OR (<1) indicate that the odds of success for persons with the value of x=0 (i.e. females) are greater than the odds of success for the persons with the higher value of x (x=1 males).

Suppose that the dependent variable is a linear function of K factors ("determining variables"), whose values, for individual i are X_{ik}, (k=1,...K). This means that the dependent variable can be represented as:

$$D_i = \alpha_i + \sum_{k=1}^{K} \beta_k X_{ik} + \varepsilon_i \quad (1)$$

where β_k is the coefficient associated with the k^{th} variable. An increase in the value of k^{th} factor for a particular person will cause his or her propensity to switch banks to rise if $\beta_k > 0$ and fall if $\beta_k < 0$. However, because the relationship between the dependent and the independent variables is not an exact one – for example there may be factors left out of the equation or factors might be measured inaccurately – an error term ε_i is included in the equation to capture this inexactitude.

There is a direct relationship between the coefficients and odds ratios. In a logit model one produces coefficients while in a logistic model one produces results in terms of odds ratios. A logit is defined as the log base e of the odds ratio. This can be seen in equation (4) where L_i (the logit) is the log of the odds ratio $P_i/1\text{-}P_i$ and this equals $\beta_1 + \beta_2 X_i$ – giving us a relationship between coefficients and the odds ratios. Hence, a logistic regression is in reality an ordinary regression using the logit as the dependent variable.

To compute the probability of a certain outcome, we use the (cumulative) logistic distribution function:

$$P_i = \frac{1}{1+e^{-Z_i}} \text{ where } Z_i = \beta_1 + \beta_2 X_i \qquad (2)$$

Z_i ranges from $-\infty$ to $+\infty$, P_i ranges between 0 and 1 and P_i is nonlinearly related to Z_i (i.e. X_i). We can observe that P_i is nonlinear not only in X_i but also in the β's as can be seen in (2) above. This means that we cannot use the ordinary OLS procedure to estimate the parameters. In the notation above, the odds ratio (OR) i.e. the ratio of the probability of success to the probability of failure is expressed as:

$$\frac{P_i}{1-P_i} = \frac{1+e^{Z_i}}{1+e^{-Z_i}} = e^{Z_i} \qquad (3)$$

If we take the natural log of (3), we obtain:

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \beta_1 + \beta_2 X_i \qquad (4)$$

Now, L_i the log of the odds ratio is linear not only in X_i but also in the parameters. L_i is called the *logit*, and the name Logit Model refers to this number. Here, we cannot estimate L_i by the standard OLS routine. This can be seen if we put in value $P_i = 1$ for success and $P_i = 0$ for failure in (4) above. This would result in

$$L_i = \ln\left(\frac{1}{0}\right) \text{ for } P_i = 1$$

$$L_i = \ln\left(\frac{0}{1}\right) \text{ for } P_i = 0$$

which clearly will not yield any result at all. Instead, we resort to the maximum-likelihood (ML) method to estimate the parameters. If we rewrite

$\Pr(Y_i=1) = P_i$ [success]

$\Pr(Y_i=0) = (1-P_i)$ [failure]

and let $f_i(Y_i)$ denote the probability that $Y_i = 1$ or 0 in a random sample of n observations, the joint probability of observing the n Y values i.e. $f(Y_1, Y_2, \ldots, Y_n)$ is given as:

$$f(Y_1, Y_2, \ldots, Y_n) = \prod_1^n f_i(Y_i) = \prod_1^n P_i^{Y_i}(1-P_i)^{1-Y_i} \qquad (5)$$

The joint probability in (5) is known as the likelihood function. In ML, the objective is to maximize the likelihood function, i.e. to obtain the parameters in such a manner that the probability of observing given Y's is as high as possible.

4.7 Equation Specification

The determining variables used in the logistic regression to "explain" whether a consumer would switch banks or not at the two levels of ATM fees were:

- $D4_i$ = 1 if the person switch banks at SEK 4, $D4_i$ = 0 otherwise;
- $D8_i$ = 1 if the person switch banks at SEK 8, $D8_i$ = 0 otherwise;
- Age_i in years;
- $Gender_i$ = 1 if the person was male, $Gender_i$ = 0 otherwise;
- $Income_i$ = 1 if the person had a Gross Monthly Income < SEK 15 000, $Income_i$ = 0 otherwise;
- $Bank_i$ = 1 if the person used one of the four large banks as primary bank, $Bank_i$ = 0 otherwise;
- $Switched_i$ = 1 if the person had switched banks in the past three years, $Switched_i$ = 0 otherwise;
- $Nrwith_i$ = in number of withdrawals per week;
- $Sumwith_i$ = in SEK per withdrawal;

Consequently, in the context of equation (1), our equations were specified as:

$$D4_i = \alpha_i + \beta_1 \times Age_i + \beta_2 \times Gender_i + \beta_3 \times Income_i + \beta_4 \times Bank_i + \beta_5 \times Switched_i + \beta_6 \times Nrwith_i + \beta_7 \times Sumwith_i + \varepsilon_i$$

$$D8_i = \alpha_i + \beta_1 \times Age_i + \beta_2 \times Gender_i + \beta_3 \times Income_i + \beta_4 \times Bank_i + \beta_5 \times Switched_i + \beta_6 \times Nrwith_i + \beta_7 \times Sumwith_i + \varepsilon_i$$

4.8 Goodness-of-fit

In order to check the fit of our model we test for sufficient replication within subpopulations which is required to infer that the model fits the data. When there are one or more continuous predictors in the model, the data are often too sparse to use these statistics. Hosmer and Lemeshow (1989) proposed a statistic that they show, through simulation, is distributed as chi-square when there is no replication in any of the subpopulations. This test is only available for binary response models.

4.9 Delimitations

When conducting a study of this kind, there are often a lot of caveats that could be added. Therefore, we will here give our view on the limitations of the study and its methodology. First, we wish to stress that the intention of the authors is to give as good a picture of reality as possible, bearing in mind that reality might be different from our results. Using a quantitative method such as a survey can be questioned, and one could debate whether a complementary qualitative study such as e.g. interviews with focus groups should have been conducted. This would have given a more fair view of the mind sets of the consumers and could have helped to discover any patterns of bias towards different alternatives.

Second, the survey itself could possibly have been formulated in an alternative manner. To use sensitive demographic variables such as *Age* and *Income* in the beginning is questionable ex-post. The reason for this is that few consumers found this information as a part of their personal integrity and chose therefore not to participate in the study.

Third, by conducting the study in the Stockholm area we have limited ourselves to a quite narrow geographic region considering that the study is aimed towards all consumers over the age of 18 in Sweden. However, for practical reasons it was not possible to perform the study in the whole country, which naturally would have been desirable. The total number of participants (247) could be argued to be too low, but as a starting point for further discussion we consider this to be an acceptable number.

Fourth, regarding our data set of respondents, one could argue whether this is a good representation of the actual market. Considering that the four large banks' representation in our sample was above 90% and that this is line with their current market share, we believe that our sample is a good enough random sample of the total market.

Finally, we wish to note that we have limited our study on switching costs to two fixed alternatives (SEK 4 and SEK 8). The desired result could possibly have been obtained with a method where one pinpoints the exact number rather than trying to lock-in the switching cost in a range. Since the complexity of such an investigation would increase dramatically we have settled for two alternatives. Also, one could possibly obtain different results with other alternatives than the ones used (SEK 4 and SEK 8) for the switching cost. Again, if the switching costs for the majority of the respondents lie somewhere in the range SEK 4 to SEK 8, then we have managed to capture a level that allows us to draw conclusions from our study.

5. Results

In this section we present the results from the survey with contingency tables as well as our logistic regression model for both high and low ATM fees. We test for multicollinearity and conduct the Hosmer Lemeshow goodness-of-fit test. The final results are presented as probabilities for an Average consumer from our data sample to switch banks.

5.1 Contingency tables

Looking at the contingency table between *Age* and *SEK 4* in table 9, we can see that 58.3% of the respondents who stated that they would switch banks at an ATM fee of SEK 4 are young (below median age) consumers and 41.7% are adult consumers (above median age). This gives some support for our theory that older consumers are less sensitive towards an introduction of an ATM fee of SEK 4.

Table 9. Contingency table Age vs. SEK 4.

			Age		
			Adult	Young	Total
Low cost SEK 4	Do Nothing	Count	28	16	44
		% within Low cost SEK 4	63.6%	36.4%	100.0%
	Fewer Withdrawals	Count	46	54	100
		% within Low cost SEK 4	46.0%	54.0%	100.0%
	Switch Banks	Count	25	35	**60**
		% within Low cost SEK 4	**41.7%**	**58.3%**	100.0%
Total		Count	99	105	204
		% within Low cost SEK 4	48.5%	51.5%	100.0%

We also depict a contingency table for the *Income* variable against the low cost *SEK 4* variable in table 10. Here, we can see that 73.3% of the respondents who stated that they would switch banks at SEK 4 were low-income consumers, whereas only 26.7% were high-income consumers. This strengthens our stated hypothesis of low-income consumers being more sensitive to an introduction of a low cost ATM fee of SEK 4.

Table 10. Contingency table Income vs. SEK 4.

			Income		
			<15000	>15000	Total
Low cost SEK 4	Do Nothing	Count	19	25	44
		% within Low cost SEK 4	43.2%	56.8%	100.0%
	Fewer Withdrawals	Count	68	32	100
		% within Low cost SEK 4	68.0%	32.0%	100.0%
	Switch Banks	Count	44	16	**60**
		% within Low cost SEK 4	**73.3%**	**26.7%**	100.0%
Total		Count	131	73	204
		% within Low cost SEK 4	64.2%	35.8%	100.0%

Comparing the contingency table results from SEK 4 with those of SEK 8 in table 11 and 12 below, we see that 120 out of the 204 respondents stated that they would switch banks at SEK 8, which can be compared to 60 out of 204 respondents at SEK 4. In other words, at SEK 8 the number of respondents who stated that they would switch banks doubles as we move from an ATM fee of SEK 4 to SEK 8.

Furthermore, at SEK 8 the discrepancy between young and adult respondents decreased, which we interpret as SEK 8 being closer to the actual switching cost threshold for all respondents. The same pattern can be found when looking at income i.e. the discrepancy decreased between the high-income and low-income group. However, low-income respondents are still more prone to switch banks at both SEK 4 and SEK 8 than their high-income peers.

Table 11. Contingency table Age vs. SEK 8.

			Age		
			Adult	Young	Total
High cost SEK 8	Do Nothing	Count	12	12	24
		% within High cost SEK 8	50.0%	50.0%	100.0%
	Fewer Withdrawals	Count	31	29	60
		% within High cost SEK 8	51.7%	48.3%	100.0%
	Switch Banks	Count	56	64	**120**
		% within High cost SEK 8	46.7%	53.3%	100.0%
Total		Count	99	105	204
		% within High cost SEK 8	48.5%	51.5%	100.0%

Table 12. Contingency table Income vs. SEK 8.

			Income		Total
			<15000	>15000	
High cost SEK 8	Do Nothing	Count	12	12	24
		% within High cost SEK 8	50.0%	50.0%	100.0%
	Fewer Withdrawals	Count	37	23	60
		% within High cost SEK 8	61.7%	38.3%	100.0%
	Switch Banks	Count	82	38	120
		% within High cost SEK 8	68.3%	31.7%	100.0%
Total		Count	131	73	204
		% within High cost SEK 8	64.2%	35.8%	100.0%

5.2 Logistic regression

When one conducts a logistical regression, one can look at either the coefficient or the odds ratio of an explanatory variable. These measure the same thing but are merely two different ways of displaying results from a logistical regression. For instance if the coefficient is low, the odds ratio will be close to one, and if the coefficient is high the odds ratio will be different from one. This can be seen in table 13 below, as we have chosen to present both measures in our study.

As can be seen from the STATA printout in table 13 below, $Bank$ is the only significant variable at the 5% level. However, Number of withdrawals ($Nrwith$) is significant at the 10% level, and Sum of withdrawal ($Sumwith$) is significant at the 15% level. The constant is not significant even at a higher significance level, and we can conclude that it does not contribute to our model.

In general, we note that very few variables are significant at a satisfactory level, but conclude that a larger sample perhaps could have omitted this problem. One could also speculate if there are omitted variables that could have had an effect on our results. For instance, we could have used a dummy variable explaining whether or not the respondent have loans in the bank. This since loans can act as barriers to switch banks.

Table 13. STATA printout for SEK 4.

D4	Coefficient	Odds Ratio	P-value
Age	-0.021	0.979	0.303
Gender	-0.105	0.901	0.767
Bank	-1.126	0.324	0.019
Switched	0.287	1.333	0.517
Nrwith	0.378	1.459	0.078
Sumwith	0.001	1.001	0.131
Income	0.553	1.739	0.231
Constant	-0.765	n.a.	0.453

5.3 Regression model

We can now set up our complete regression equation for the ATM fee of SEK 4:

$$L4_i = -0.765 - 0.021 \times Age_i - 0.105 \times Gender_i + 0.553 \times Income_i - 1.126 \times Bank_i$$
$$+ 0.287 \times Switched_i + 0.378 \times Nrwith_i + 0.001 \times Sumwith_i$$

For the low cost ATM fee (SEK 4), we believed that younger consumers were more sensitive to the implementation of a withdrawal fee than older consumers. The reason for this is the same assumption that could be seen in the discussion on income – younger consumers are assumed to have a lower income than older consumers. However, when being faced with the high cost ATM fee we believed that there is no longer a difference between the groups. The *Age* coefficient of -0.021 is not significant at the 5% level, and the negative sign is interpreted as the older you are, the less prone you will be to switch banks at an ATM fee of SEK 4. In other words, an increase in age of one year makes you 2% less likely to switch banks at this ATM fee. The odds ratio for age is 0.98, which could mean that age has no effect on the odds of switching banks.

Regarding *Gender*, we did not believe that we would find any differences in behavior across men and women. However, if this would be the case, one possible explanation could be that differences in disposable income between men and women still exist. Also, many married couples have joint bank accounts, which would make it hard to identify any true differences. We did not find this variable to be significant at the 5% level, and the coefficient of -0.105 is not that noteworthy keeping in mind an odds ratio of 0.901 makes it a variable that cannot be said to explain a lot of the change in behavior.

The third variable $Bank$, compared consumers who use one of the four large banks in Sweden to the ones who use a niche bank. We believed that consumers who use a niche bank should be more likely to switch banks, since they have switched before. The coefficient of -1.126 is significant at the 5% level with an odds ratio of 0.324. This means that the odds of switching banks for people who use a niche bank (Dummy = 0) are greater than the odds for people using one of the large four banks (Dummy = 1).

Also, we believed that consumers who have switched banks before are more likely to switch again. Here, the coefficient was 0.287 and not significant at the 5% level. The odds ratio was 1.33, which means that the odds of switching banks is indeed greater for consumers who have switched banks in the past three years than the ones who have not. Even though the coefficient was not significant at the 5% level, we believe that the sign of the coefficient as well as the odds ratio are in line with our prior beliefs for this variable.

As stated above, we believed that there would be a difference between consumers who make many but small withdrawals and consumers who make fewer but large withdrawals. The p-values for $Nrwith$ and $Sumwith$ were 0.078 and 0.131 which means that they are significant at the 10% and 15% significance levels. The coefficient and odds ratio for $Nrwith$ was 0.378 and 1.459 respectively, which means that consumers who make many withdrawals are more likely/have greater odds of switching banks at an ATM fee of SEK 4. For $Sumwith$, the same numbers were 0.001 and 1.001 which means that this variable has almost no impact on the odds of switching banks.

The last variable was $Income$, and the hypothesis was that low-income consumers would be more sensitive to an implementation of an ATM fee of SEK 4. This variable compared respondents who had stated an income of less than SEK 15 000 per month with all other respondents. The coefficient of 0.553 was not significant at the 5% level though (p-value 0.231) and the odds ratio was 1.739.

This means that the odds for low-income consumers to switch banks at SEK 4 are greater than high-income consumers, just as we expected. The high significance level could yet again be explained by the lack of sufficient number of respondents. Here, it clearly would have been desirable with more high-income consumers to level our data set. We believe that more high-income consumers (as well as more respondents in general) would have yielded better significance levels but the same results.

We can now start analyzing the results from the regression of the high cost ATM fee of SEK 8:

Table 14. STATA printout for SEK 8.

D8	Coefficient	Odds Ratio	P-value
Age	-0.010	0.990	0.542
Gender	-0.380	0.684	0.217
Bank	-0.781	0.458	0.117
Switched	0.229	1.258	0.585
Nrwith	0.266	1.304	0.188
Sumwith	0.000	1.000	0.514
Income	0.293	1.340	0.444
Constant	0.897	n.a.	0.327

For the high ATM fee of SEK 8, we can see in table 14 above that now, all of the variables are insignificant at the 5% level. This however, was expected since we now are closer to the switching cost of most respondents. We wish to underline that we do not consider this as being a flaw of the model. On the contrary, since we expected the switching cost for most respondents to be attained at SEK 8 we expected many of the independent variables to be less significant. This since they should now not be able to explain the behavior of different respondents.

Comparing the results for each variable between the two ATM fees, we see that *Age*'s p-value increases from 0.303 to 0.542 when moving from SEK 4 to SEK 8. The coefficient for SEK 8 is -0.01 and the odds ratio is 0.990. This means that *Age* has no effect on the odds of switching banks at the ATM fee SEK 8. These results are in line with that we expected, since we believed that the threshold for most consumers would have been reached at SEK 8, independent of age.

For *Gender*, we have the same reasoning for SEK 8 as we had for SEK 4, namely that the propensity to switch banks at either ATM fee would be independent of gender. In line with this assumption, the coefficient for *Gender* at SEK 8 is not significant at the 5% level. However, the coefficient of -0.380 as well as the odds ratio of 0.684 mean that we can notice a small effect in *Gender* that strengthened at SEK 8 compared to SEK 4. This effect is that of females having greater odds of switching banks compared to males, but since it is insignificant at both SEK 4 and SEK 8 we do not believe it is a conclusive and stabile effect.

For *Bank*, we found a significant difference in behavior between consumers who use a niche bank and those who do not at SEK 4, but at SEK 8 the p-value is increased to 0.117, which further strengthens our assumption of SEK 8 being a too high ATM fee for most consumers. The odds ratio is now 0.458, which still can be interpreted as a higher propensity to switch banks for consumers who use a niche bank, but this effect is weaker at SEK 8 than at SEK 4. This conclusion can be drawn since the odds ratio increases towards 1 at SEK 8 compared to SEK 4.

At SEK 4, we found that consumers who have switched banks in the past three years have a higher propensity to switch banks, although the coefficient was insignificant at the 5% level. At SEK 8, the p-value increases to 0.585 but the coefficient is still not significant at the 5% level. The coefficient's magnitude decreases from 0.287 to 0.229 and the odds ratio decreases from 1.33 to 1.258. We interpret this as the odds are still greater at SEK 8 for consumers who have switched banks in the past three years to switch, than consumers who have not switched banks in the past three years.

For the two variables relating to withdrawal behavior, *Nrwith* and *Sumwith*, we found significance at the 10% and the 15% significance levels respectively at SEK 4. At SEK 8, *Nrwith*'s p-value is 0.188 and *Sumwith's* p-value is 0.514, meaning that the number of withdrawals could be used to explain the consumers' behavior at SEK 8 whereas the sum of these withdrawals is more questionable. The coefficient and odds ratio for *Nrwith* at SEK 8, are 0.226 and 1.304. This means that there is a positive relation between number of withdrawals and propensity to switch banks. The more withdrawals you make, the more likely you are to switch banks at both ATM fees. For *Sumwith*, the coefficient is now approximately zero (-0.0003) with an odds ratio of 1.000, which is interpreted as no effect of the sum of the withdrawals on the odds of switching banks at SEK 8. Again, this is what we expected, since we believed that the ATM fee of SEK 8 would be too high for most consumers.

In line with prior reasoning above, we believed that the same would apply for the variable *Income*. We expected an ATM fee of SEK 8 as being too high for most consumers, independent of income, and the coefficient decreases to 0.293, not significant at the 5% level. The odds ratio decreases to 1.340, which means that the odds of switching banks are still greater for consumers with a low income.

The regression equation for SEK 8 was as follows:

$$L8_i = 0.897 - 0.010 \times Age_i - 0.380 \times Gender_i + 0.293 \times Income_i - 0.781 \times Bank_i$$
$$+ 0.229 \times Switched_i + 0.226 \times Nrwith_i - 0.000 \times Sumwith_i$$

5.4 Multicollinearity

Before we can continue with the interpretations of these results, we look for multicollinearity. One quite natural conclusion that could be drawn as a critique towards our regression is generally that older people have a higher income than younger people. Therefore, there could be a certain degree of multicollinearity between the two variables *Age* and *Income*. We also believe that a natural consequence of making fewer withdrawals is that these probably are larger than if a consumer would have made many withdrawals. In other words, is there a negative correlation between *Nrwith* and *Sumwith*? Finally, we believe that there is a difference between older and younger people in terms of withdrawal behavior i.e. younger people make many small withdrawals while older people make fewer large withdrawals. This leads us to investigate whether there might be a correlation between Age and $Sumwith$ on the one hand, and Age and $Nrwith$ on the other.

In the correlation matrix below, we can see that the correlation between Age and $Income$ is only 0.118, not what one can expect in general. We believe that this positive correlation would be higher if we would have extended our sample.

However, there are quite high negative correlations between both $Sumwith$ and $Nrwith$ with Age. This means that an older consumer would probably make fewer withdrawals than a younger consumer. This could be due to the fact that the ATM system was introduced in Sweden in the late 1970s, resulting in older consumers not fully adapting to the system and perhaps being accustomed to cash withdrawals at the bank offices. On the other hand, younger consumers have lived all their lives with the ATM system and have not been forced to go through this adaptation process.

Contrary to our expectations, the correlation between $Sumwith$ and $Nrwith$ is positive (0.146). We expected consumers to make either many small withdrawals or few large withdrawals – hence a negative correlation. One explanation for the positive correlation could be that we do not have a perfect representation of all consumers in our sample. We still believe that if the sample would be extended so that it perfectly represents all consumers in Sweden, we would get a negative correlation between $Sumwith$ and $Nrwith$.

All in all, we do not believe that any variable have such a high correlation with another variable that it needs to be taken away from the regression.

Table 15. Correlation Matrix.

Correlation Matrix

	AGE	*GENDER*	*BANK*	*SWITCHED*	*NRWITH*	*SUMWITH*	*INCOME*
AGE	1	0.005	-0.279	-0.131	-0.47	-0.556	0.118
GENDER	0.005	1	0.005	-0.154	-0.201	-0.204	-0.403
BANK	-0.279	0.005	1	0.162	-0.333	-0.158	-0.428
SWITCHED	-0.131	-0.154	0.162	1	-0.086	0.007	-0.003
NRWITH	**-0.47**	-0.201	-0.333	-0.086	1	0.146	-0.156
SUMWITH	**-0.556**	-0.204	-0.158	0.007	**0.146**	1	0.233
INCOME	**0.118**	-0.403	-0.428	-0.003	-0.156	0.233	1

5.5 Goodness-of-fit test

We tested our model using the Hosmer Lemeshow test. As the results below show, we cannot reject the null hypothesis of our model adequately fitting the data using this test. This leads us to believe that we have not found any obvious evidence of misspecification. The p-values of the chi-square measures for the two models are:

Tables 16 & 17. Hosmer Lemeshow test.

SEK 4

Step	Chi-square	df	**Sig.**
1	7.852	8	**0.448**

SEK 8

Step	Chi-square	df	**Sig.**
1	3.134	7	**0.872**

5.6 The Average Consumer

We can now continue by calculating the probabilities of switching banks at the SEK 4 and SEK 8 ATM fees for every respondent. This is done by first calculating $L4$ and $L8$ for each consumer with the regression coefficients and then the probability. We choose to present our results by stating the probabilities for the average consumer in our data set.

Table 18. The Average Consumer.

The Average Consumer		
Variable	*(Average)*	*(Median)*
Age	29.0	23.5
Gender	Male	Male
Income	15 000 - 30 000	<15 000
Bank	Large bank	Large bank
Switched bank in the past three years?	No	No
Nr of withdrawals per week	1.78	1.5
Size of withdrawals (SEK)	421	200
Probability to switch banks at SEK 4	**26.7 %**	**25.3 %**
Probability to switch banks at SEK 8	**54.8 %**	**53.9 %**

As we can see above, there is a large difference in probabilities between the two ATM fees – the average consumer has a probability of 26.7% to switch banks at an ATM fee of SEK 4 while the corresponding number rises to 54.8% for an ATM fee of SEK 8. These results can be compared to the results from the contingency tables where the proportion of respondents who stated that they would switch banks amounted to 29.4% at SEK 4 and 58.8% at SEK 8. The results from both methods are similar although not identical. In our view, this strengthens the validity of the results since two different methods yield similar results.

In table 19 below, we present a scenario analysis where we change one explanatory variable at a time and calculate a new probability to switch banks at both ATM fees for the average consumer in our sample. As can be seen from the results of this analysis, if the average consumer would become one year older (younger) he would be less (more) prone to switch banks compared to the original result. However, this effect is reduced at SEK 8 compared to SEK 4. Regarding withdrawal behavior, the more withdrawals the average consumer makes – the larger the probability to switch banks at both ATM fees, and the same reasoning applies for withdrawal sum.

The results from this scenario analysis are consistent with our line of reasoning as we expected younger consumers to be more prone to switch banks. Also, since the ATM fee is charged per withdrawal, we expected an increase in the number of withdrawals to yield a higher probability to switch since the total cost for the consumer will be higher. We note that the largest effect on the switching probability is $Nrwith$, but this large effect could be attributed to the fact that one additional withdrawal constitutes a large increase as the average number of withdrawals in our sample was 1.78.

Table 19. Scenario Analysis.

Scenario Analysis			
Variable	*Change*	*Prob. to switch at SEK 4 (%)*	*Prob. to switch at SEK 8 (%)*
Age	+1 yr	26.3	54.6
	- 1 yr	27.1	55.0
Nrwith	+1	34.4	61.0
	-1	20.2	48.5
Sumwith	+100 SEK	28.3	54.1
	-100 SEK	25.2	55.6
Original Result		**26.7**	**54.8**

Comparing across all consumers, the probability to switch banks is higher at SEK 8 than at SEK 4 for all of the 232 respondents in our sample, resulting in that everyone in our sample would indeed have a higher probability to switch banks at an ATM fee of SEK 8 compared to an ATM fee of SEK 4.

In other words, the *median* consumer is 23.5 years old, male, has an income below SEK 15 000 per month and uses one of the large Swedish banks. He has not switched banks in the past three years and makes 1.5 withdrawals per week – each amounting to SEK 200. An ATM fee of SEK 4 would result in a monthly (yearly) cost of SEK 24 (288) and an ATM fee of SEK 8 would naturally be twice as much. The fee would be 2% (4%) out of the total withdrawal at SEK 4

(SEK 8). The fee would also amount to at least 0.16% (0.32%) out of the total monthly income of SEK 15 000.

6. Discussion

There is no doubt that the Swedish ATM system differs from that of its Nordic neighbors. As shown in the background section, Swedish consumers use by far more cash and less card payments compared to Denmark, Finland and Norway. Also, the number of ATM terminals is lowest in Sweden.

By investigating the behavior of a sample population, we found that many Swedish consumers will alter their behavior when being faced with a transaction fee for ATM withdrawals already at a cost of SEK 4. As can be seen in table 20 below, 27% of the respondents stated that they would switch banks at an ATM fee of SEK 4. At SEK 8, this number increases to 55%. In other words, a higher ATM fee increases the propensity for consumers to switch banks. Furthermore, at SEK 4 50% of the respondents stated that they would make fewer withdrawals whereas the same number decreases to 27% at SEK 8.

From a bank's perspective, this is an interesting finding. Since we have assumed that banks are interested in reducing the total costs associated with cash handling i.e. ATM withdrawals, they would like their consumers to switch from the costly ATM withdrawals to other forms of payments such as the less-costly credit card payments.

According to our results, an ATM fee of just SEK 4 would induce such a behavior; 50% stated that they would act in this manner. However, the drawback of an introduction of ATM fees is the possible loss of customers to the bank – an effect that is clearly not desirable for any bank.

Looking at the total number of respondents that would alter their behavior in any way, we see that this remains fairly constant (increase of 5%) between the two fee levels. As our numbers below show, although roughly 4/5 of the total sample chooses to alter their behavior as a consequence of an introduction of an

ATM fee, the proportion of consumers that actually chooses to switch banks more than doubles at an ATM fee of SEK 8 compared to SEK 4.

Table 20. Stated behavior after introduction of ATM fees.

ATM fee / Action (%)	*SEK 4*	*SEK 8*
Fewer withdrawals	50	27
Switch banks	27	55
Alter behavior (total)	77	82
Do nothing	21	11
Don't know	2	7

In our study, we have taken into account several characteristics of a consumer e.g. age, gender, income and withdrawal behavior. Using a logistic regression model, we calculated the probability of any consumer switching banks at an ATM fee of SEK 4 and SEK 8. In order to be able to draw more general conclusions from our findings, we have chosen to present these results by calculating the average and median consumer's probability to switch banks. The probabilities for the median consumer amounted to 25.3% for SEK 4 and 53.9% for SEK 8 using our model. We wish to stress that these probabilities are generated by our model – in reality you either switch banks or not i.e. the actual probabilities are 100% or 0%. Although both ATM fees give rise to fairly high frequencies of consumers switching banks, we can conclude that the magnitude of the ATM is indeed an important factor when determining the probability of consumers switching banks.

In our framework, we have used ATM fees as a proxy for switching costs and concluded that at an ATM fee of SEK 8, the median consumer has 53.9% probability to switch banks. The yearly cost would amount to SEK 576. We have hereby managed to estimate the magnitude of the yearly cost that would induce a probability to switch banks of over 50%. We believe that this number is sufficiently high to deter banks from introducing ATM fees at this level, and that this range can serve as a good proxy for switching costs.

We are now able to compare this to the results of Kim, Kliger and Vale. Using the Norwegian market for bank loans, they estimate the switching cost to 4.1% of the total bank loan. In order to compare this with our results, we look at the Swedish market for bank loans and estimate the average household's debt to SEK 270 000 by dividing the total outstanding household debt by the number of "kosthushåll" – a proxy for the total number of households in Sweden. The numbers were taken from Statistiska Centralbyrån in Sweden (SCB). In Kim, Kliger & Vale's framework, the switching cost would amount to approximately SEK 11 000 per annum – which is considerably higher than our estimate of no more than SEK 576 per annum.

Although it is hard to draw any definite conclusions from the comparison above, we can still see that there is a clear discrepancy between our results and the Norwegian study. Given that we have taken into account customer-specific data and not used generalized data as in the Norwegian study, we believe that our results are closer to reality. Furthermore, we have shown how ATM fees indeed can be used as a proxy for switching costs and that the market for bank loans is possibly not the best proxy when trying to estimate switching costs.

As can be seen from the Dutch, Austrian and Swedish episodes described in the beginning of this text, many banks would like to introduce ATM fees to offset costs. However, the behavior that the consumers display in our study at SEK 8 is probably one of the main reasons for the large four Swedish banks not introducing ATM fees – the risk of losing customers is too high.

Also, our results indicate that there are differences in behavior between consumer groups. The four major banks in Sweden are most certainly aware of these differences, and if an introduction of ATM fees would mean that a large proportion of younger consumers would switch banks then it would become difficult to maintain the cross-subsidization. Bear in mind, the banks offer students free banking services for a couple of years only, hoping they will during this time period develop a *psychological* switching cost such as brand loyalty.

In addition to this, if the average consumer would become one year younger, the probability to switch banks increases. This strengthens our assumption of younger consumers being more prone to switch banks. In line with Frisell & Bolt (2006), we believe that valuable young customers have a higher probability to switch banks. Due to the differential switching costs between generations one should therefore target these customers with subsidization in order to minimize the number of lost customers when introducing ATM fees.

Another explanation to why none of the banks introduce transaction fees is the situation described in the introduction where the first mover loses. If it is evident that you will loose customers if you introduce ATM fees then no bank will act as the first-mover, even though a situation where all banks introduce ATM fees would be the best possible outcome.

One solution to this problem could be to introduce transaction fees at one specific set date. This was tried in Norway, where all banks were allowed to coordinate on an inter bank pricing scheme after Norwegian banks were granted dispensation from the Competition Act. This was one innovative way of solving the first-mover disadvantage, and led to the simultaneous introduction of ATM fees across all banks.

In a recent statement by Stefan Ingves, Governor of the Bank of Sweden, different payment services should bear its associated costs. This would lead to more efficient cash handling through the pricing scheme that would arise. (Aftonbladet 26-04-2006)

Bearing in mind this statement as well as the development in Norway, we believe that a similar development in Sweden would lead to welfare gains. This could also be a solution to the possible sensitivity of Swedish consumers reacting to the mere occurrence of fees.

7. References

1. Blue Book 3rd edition (2003), *"Payment and securities settlement systems in the European Union"*, European Central Bank.
2. Brehm, J. W. (1956), *"Post-decision changes in the desirability of choice alternatives"*, Journal of Abnormal and Social Psychology, Vol 52, 384-389.
3. Frisell L. and Bolt W. (2006), "*The Subsidization of Payment fees: Habit Formation and Gridlock*", Mimeo, ECB.
4. Guibourg G. and Segendorf B. (2002), *"Do Prices Reflect Costs? A study of the price- and cost structure of retail payment services in the Swedish banking sector 2002"*, Bank of Sweden Working Paper Series, No. 172.
5. Hosmer D.W. and Lemeshow S.(1989), *"Applied Logistic Regression"* Wiley-Interscience; 2nd edition.
6. Kim M., Kliger D. and Vale B. (2001) *"Estimating Switching Costs: the Case of Banking"*, The Journal of Financial Internediation, Vol 12, 25-56.
7. Klemperer, Paul (1995) *"Competition when Consumers have Switching Costs: An overview with applications to Industrial Organization, Macroeconomics and International Trade",* The Review of Economic Studies, Vol 62, No. 4, 515-539.
8. Malhotra, Naresh (2004) *"Marketing Research: an applied orientation"*, Prentice Hall International.
9. Newbold P., Carlson W.L. and Thorne B. (2003) *"Statistics for business and economics"*, Prentice Hall: Pearson Education International.
10. O'Connell, Ann A. (2006) *"Logistic regression models for ordinal response variables"*, Thousand Oaks: Sage.
11. Nilsson, Christian (2006) *"Banker i Sverige: faktablad om svensk bankmarknad"*, Svenska Bankföreningen.
12. Sharpe, Steven A (1997) *"The Effect of Consumer Switching Costs on Prices: A theory and its Application to the Bank Deposit Market"*, The Review of Industrial Organization, Vol 12, 79-94.

8. Appendix

Enkätundersökning om uttagsavgifter i Sverige

Som en del av Civilekonomutbildningen vid Handelshögskolan i Stockholm utför vi i samarbete med forskare på Riksbanken en studie om det svenska banksystemet. Denna enkät kommer att ligga som underlag för vår studie och kommer inte att användas i kommersiellt syfte. Enkäten tar cirka 1 minut att fylla i. Vi vill tacka för din medverkan.

1. Ålder:______________

2. Kön: Kvinna ○ Man ○

3. Månadsinkomst (innan skatt):

- ❑ 0 – 15 000 kr
- ❑ 15 001 – 30 000 kr
- ❑ 30 001 – 50 000
- ❑ > 50 001
- ❑ Vill ej uppge

4. Vilken är din primära bank?

○ SEB	○ Handelsbanken	○ Nordea	○ Föreningssparbanken (Swedbank)
○ Skandiabanken	○ ICA-banken	○ Östgöta Enskilda	○ Annan__________

5. Har du bytt bank de senaste 3 åren? Ja ❑ Nej ❑

6. Hur många kontantuttag i bankomat gör du per vecka?

○	○	○	○
0	1-2	3	4+

7. Uppskatta hur mycket du tar ut i genomsnitt.

❑ -300 kr

❑ 400 - 500 kr

❑ 600 - 700 kr

❑ 800 - 900 kr

❑ 1000 - 1100 kr

❑ 1200 - 1300 kr

❑ 1400+ kr

❑ Vill ej uppge/Vet inte

8. Tänk dig att *enbart* din bank börjar ta ut en uttagsavgift på 4 kr per uttag. Vad gör du? Välj det alternativ som passar dig bäst.

❑ Jag ändrar ingenting.

❑ Jag gör nog färre uttag och betalar mer med kort eller gör större uttag åt gången.

❑ Jag byter bank.

❑ Vet ej.

9. Samma fråga som 8.) fast uttagsavgiften din bank inför är nu 8 kr per uttag. Vad gör du? Välj det alternativ som passar dig bäst.

❑ Jag ändrar ingenting.

❑ Jag gör nog färre uttag och betalar mer med kort eller gör större uttag åt gången.

❑ Jag byter bank.

❑ Vet ej.