1-1-2011

Consumer Search And Switching Behavior: Evidence From The Credit Card Industry

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CONSUMER SEARCH AND SWITCHING BEHAVIOR: EVIDENCE FROM THE CREDIT CARD MARKET

by

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DISSERTATION

Submitted to the Graduate School

of Wayne State University,

Detroit, Michigan

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

2011

MAJOR: ECONOMICS

Approved by:

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Advisor Date

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DEDICATION

Dedicated to my wonderful parents:
Adel and Nadia Abdelrahman

ACKNOWLEDGMENTS

First, I would like to express my deepest gratitude to my advisor Dr. Ralph M. Braid. This dissertation would have never be accomplished if I hadn't had his encouragement and support. He has been very understanding and helpful since the first day he agreed to be my advisor.

I would also like to thank Professors Allen Goodman, Li Way Lee, and Pao-Liu Chow (Mathematics), all of Wayne State University, for their helpful comments and suggestions.

Last but not least, I am indebted to my wife Sakna, for her support, and for her always being there during bad and good times.

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CHAPTER 1

INTRODUCTION

1.1. Background

No one would dispute that credit card use has become an important part of household finance. Credit, in general, allows for transactions over time, making it possible for consumers to borrow against their future incomes. Credit cards are the most popular source of consumer credit. Credit cards serve two distinct functions for consumers: a means of payment and a source of credit (Canner and Luckett, 1992). Credit cards provide a safe, secure, and convenient alternative to cash and checks, reducing the cost and the risk of payment, explaining the growing popularity of credit cards among the elderly (Zywicki, 2000). On the other hand, Consumers resort to credit cards in order to smooth their consumption when their incomes fluctuate. Hence, credit cards give their users the flexibility of revolving some or all of their debt.

While credit card usage constitutes a relatively new phenomenon, it became widespread in 1990s. Not only did more consumers start using credit cards, but also they started carrying more balances forward and paying both high explicit and implicit interest charges on their outstanding balances. Moreover, invoking a credit card revolving credit option has led to personal financial problems, such as personal bankruptcies and bad credit histories, making it difficult and expensive for a person to take a loan later. While borrowing money on a credit card is expensive, approximately half of credit card holders in the United States regularly carry unpaid debt, incurring

interest charges and some other fees not only on existing balances, but also on any new charges made on the card as well.

Even though all of the largest issuers have lowered interest rates on many of their accounts below the high rates maintained during the 1980s and 1990s, the interest rate on credit card plans averaged 14.68 percent in 2007 (FRB, 2008). On the other hand, credit card interest rates are higher than other consumer credit interest rates. Nevertheless, the holding and use of general-purpose credit cards with a revolving feature have increased substantially over the last decade. Furthermore, the revolving credit component of total household debt has increased faster than household disposable income, making both policy makers and the banking community pays more attention to the credit card market (Ekici, 2006). Real revolving consumer credit grew about 1600 percent from 1969 to 1989 (Duca and Whitesell, 1995).

Surprisingly enough, the size of the total consumer revolving and non-revolving debt rose five times in size from 1980 ($355 billion) to 2001 ($1.7 trillion) to almost $2.6 trillion in 2008 (FRB, 2008). The total U.S. consumer revolving debt amounted to $963.5 billion in December 2008 of which 98% was credit card debt (FRB, 2009). According to the Consumer Finance Monthly (CFM) of The Ohio State University, the average credit card balances for those carrying a balance rose from $7,362 in 2006 to $9,336 in 2009 (CFM, 2009).

According to the 2007 Survey of Consumer Finances, balances on bank cards accounted for 87.1 percent of outstanding credit card balances in 2007, up from 84.9 percent in 2004 (FRB, 2009). Approximately 73.0 percent of the U.S. families surveyed in 2007 had credit cards, compared to 46.0 percent in the early 1990's (FRB, 2009). On

the other hand, average and median credit card balances both rose from 2004 to 2007. The average balance for those carrying a balance rose from around $5,100 in 2004 (2004 dollars) to $7,300 (2007 dollars) in 2007. That is almost a 30.0 percent increase from 2004's average balance. The median balance for those carrying credit card balances rose to $3,000 in 2007 from $2,200 in 2004, almost a 25.0 percent increase (FRB, 2009).[1] The noticeable difference between median and average debt is due to some credit card holders carrying very large amounts of debt which skewed the average.

The latest projections in the credit card industry estimate that there were 159 million credit cardholders in the United States in 2000, 173 million in 2006, and the number is projected to grow to 181 million Americans by 2010 (Nilson Report, 2008). According to the 2004 Federal Reserve Survey of Consumer Finances statistics, approximately 74.9 percent of the U.S. families surveyed in 2004 had credit cards, and 58 percent of those families carried a balance (FRB, 2006).

According to 2007 Federal Reserve Survey of Consumer Finances statistics, of the 73.0 percent of the U.S. families surveyed in 2007 who had credit cards, 60 percent had a balance at the time of the interview (FRB, 2009). These so–called "revolvers" exhibit payment behavior that differs from those who repay their entire credit card balance every month. As of the end of 2007, consumers carried a total of about $951.7 billion dollars in outstanding balances on all their revolving accounts (FRB, 2008).

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[1] The Survey of Consumer Finances is a survey of U.S. household sponsored by the Board of Governors of the Federal Reserve System. It is conducted every three years, and the data are collected by the National Research Center at the University of Chicago.

1.2. Purpose of the Study

The purpose of this study is to use monthly random telephone survey data on the household level of credit card usage to identify and estimate the underlying determinants and various factors that influence consumers' credit card switching behavior. In the credit card industry, some critical questions remain unanswered about what influences a consumer decisions whether to switch or not to switch credit card balances (Ekici, 2006). Because there are many firms in the credit card market, competition is supposed to be intense. However, the industry deviates from being perfectly competitive, because the industry fails to offer consumers the benefits resulting from a perfectly competitive market, such as low prices (low interest rates), teaser rates (sweeteners) for consumers to switch, and other incentives and perks associated with credit cards. Consumer-level data consistently show that many consumers carry balances on their credit cards with fairly high interest rates even though they receive offers from cards with lower rates (Stango, 2002). An econometric model and an empirical estimation procedure will be used to predict consumer behavior in the credit card market and to examine whether consumers switch cards (balances) when they are offered to do so. Using recent consumer finance data, this research empirically tests the effects of a variety of variables including some economic, demographic and attitude variables, such as income, interest rates, outstanding balances, employment, and other demographic variables significance in influencing consumer decisions whether to switch or not to switch cards. The existence of consumer switching costs in this industry will be discussed as well.

1.4. Organization of the Dissertation

The organization of this dissertation is as follows. Chapter 1 provides background material for the study, discuses the significance of the study, and outlines the organization of the discussion. This chapter also provides the purpose of the study. Chapter 2 reviews the relevant literature and outlines the theoretical background. Chapter 3 presents a simple version of Klemperer's two–period duopoly model of firms' competition applied to the credit card industry. Chapter 4 describes the data source along with descriptive statistics. It also describes the econometric methods to be used and a number of econometric issues. Chapter 5 presents the estimation methodology and empirical results. Chapter 6 summarizes the key findings, the implications of the study, and presents some suggestions for future research.

CHAPTER

LITERATURE REVIEW

2.1. Overview of Literature

Despite the fact that the first credit cards were issued approximately 50 years ago, research into their usage has been relatively new. The bulk of early research on credit card usage centered on explaining the stickiness of interest rates in the credit card industry and effects of search on interest rates prevalent in the 1980s. Early research has attributed the rate stickiness in the credit card industry to the failure of interest rate competition due to the following three sources: switching and search costs, adverse selection, and consumer irrationality.

The first attempt to explore this industry was pioneered by Ausubel (1991). Ausubel noticed that although there were about 4,000 banks in the US credit card market, the industry was far from being competitive because of high and sticky interest rates during 1980s. He uncovers abnormal returns by firms in this industry. He argues that despite considerable variation in the underlying cost of funds, credit cards interest rates remained sticky and high during 1980's. Ausubel argues that from 1982 to1989, the cost of funds rate fluctuated between 6-15 percent and then declined from 15 percent to 10 percent at the end of this period. Despite this significant reduction in the cost of funds, credit card interest rates remained constantly high at almost 18 percent in the same period. Hence, the credit card industry deviates from being perfectly competitive. Ausubel attributes the failure of competition in the credit card industry to the following reasons: switching and search costs, adverse selection, and consumers' irrationality.

According to Ausubel's theory, consumers underestimate their borrowing potential because they expect to use the cards for convenience, not as a source of credit. Therefore, they accrue outstanding balances and pay unnecessary high interest rates on those unanticipated balances.

In his study, Ausubel categorized borrowers into two groups: low–risk borrowers and high–risk borrowers. Low–risk borrowers underestimate their borrowing potential and are less sensitive (responsive) to the interest rates because they do not intend to borrow in the first place but they end up doing so. High–risk borrowers are interest–responsive and fully intend to borrow. Thus, if a bank unilaterally lowers its interest rate, it will primarily attract the interest sensitive customers whom a bank does not wish to attract. Those customers represent high–risk borrowers. Therefore, when a single bank reduces its credit card rate, it worsens its pool of customers. Ausubel argues that this behavior is compounded by the presence of high switching and search costs. In the presence of this adverse selection problem, credit card issuers face a pool of consumers who differ in their risk degrees. However, good debtors will be overcharged and bad debtors will pay less than what they should, resulting in driving out good debtors from the market. Therefore, card issuers would be discouraged from competing on interest rates. This fear of adverse selection problem encourages card issuers to keep the card rates high and therefore make extraordinary profits. Ausubel provides an additional explanation for the industry failure which is consumers' irrationality. Consumers borrow on their credit cards without realizing that they will not be able to pay their balances in full.

Pozdena (1991) provides an alternate market-based explanation for insensitivity of

credit card interest rates to changes in the market rates. Pozdena argues that the majority of credit card holders are convenience users who routinely pay off their balances in full each month without revolving balances from one billing period to another. Credit card convenience users do not search for lower rates, but they will be primarily sensitive to annual fees and grace periods, an implication that is consistent with Ausubel's theory. This will dissuade cards issuers from lowering their card rates. On the other hand, households resort to borrow at high card interest rates when their financial condition is relatively weak (moral hazard of lending). Because credit card debt is poorly collateralized and costly to service, bank credit card interest rates are sticky (sluggish) and are not responsive to changes in other market rates.

Canner and Luckett (1992) employ information theory to explain that consumer insensitivity to bank card interest rates may be rational if credit cards are used for transaction convenience, rather than for carrying balances. Convenience users do not gain much from searching for lower rates. Therefore, they are rationally insensitive to the interest rate. Hence, credit cards' convenience and service quality become more important than the cost of the funds. Canner and Luckett suggest another reason that consumers might be relatively insensitive to interest rates. Some credit card holders who carry high levels of balances from one month to month may be willing to switch their balances to other cards that offer lower rates. High levels of balances make these consumers less attractive high-risk consumers to issuers offering lower rates, inducing card issuers to keep their interest rates high. This argument is consistent with Calem and Mester (1995), discussed below.

Mester (1994) provides different explanations for high and sticky interest rates on

credit cards by focusing on the non-collateralized features of credit card debt. Mester recognizes that imperfect information about cardholders' risk is the reason behind the high rates in this industry. Because low–risk borrowers who have access to low interest collateralized loans leave the credit card market, card holders are charged high interest rates on the average. If a bank unilaterally lowers its interest rate, it will attract less profitable high–risk borrowers. Mester concludes that credit card rates do not fall one by one when the cost of funds to banks goes down because the demand for credit cards, in turn, may be influenced by the level of the real interest rate in the financial markets.

Calem & Mester (1995) support Ausubel's theory that the credit card industry deviates from a perfectly competitive model because consumers do not conform to the behavioral assumptions of perfect competition, due to the existence of search and switching costs, and due to the likelihood of facing an adverse selection problem by firms who reduce their interest rates unilaterally. They find that the level of credit card debt is greater among consumers who do not search for lower rates. On the other hand, the authors find that consumers with high balances are discouraged from searching because of their greater likelihood of rejection. The authors argue that fear of being denied credit makes the consumers stick to their credit card that has high interest rate. However, the authors find no evidence that consumers underestimate their borrowing potential, which was found by Ausubel's early research. Calem and Mester attribute the industry interest rate competition failure to consumers' lack of search for lower card rates. Using data from the 1989 Survey of Consumer Finances (SCF) to investigate "whether adverse selection problem arises because borrowers face

switching and search costs or because they are reluctant to search and switch because they believe their borrowing will be short–lived," Calem and Mester find there is a positive relationship between switching and search costs and high balances. The higher is the credit card balances are, the higher is the probability of being denied credit. This will discourage high-balance consumers from search and any price cut will attract low-balance consumers who are not profitable to card issuers. Therefore, consumers with high balances will search and switch less, because of their fear of being denied credit due to high balances. These consumers will, therefore, stick to their current high-interest rate credit cards.

These finding are consistent with Sharp (1990), who argues that because of an information asymmetry problem in the credit card market, if a high quality borrower tries to switch to a competing (uninformed) bank, he may be pooled with low quality borrowers, inducing card issuers to charge high interest rates. Therefore, card holders are reluctant to switch cards when they are offered to do so. These findings confirm bankers' arguments that credit card rates are sticky because consumers are not responsive to rate cuts and do not switch cards when they are offered to do so.

Calem and Mester (1995) provide an additional explanation of why the credit card industry deviates from being perfectly competitive. They attribute this deviation to their finding that desired consumers with high balances may face higher switching costs than less desired consumers who are revolving low balances, inducing an adverse selection problem in the credit card market. Customers who have a high disutility of search and are highly indebted have much more difficulty switching cards than those who do not. In investigating this possibility, they test whether high credit card outstanding debt will be

correlated with the probability of rejection and they find there is a strong correlation. They also find that banks were rational in rejecting those with large outstanding balances. If a bank unilaterally lowers its interest rate, it will attract borrowers that display a high search effort for interest rates who are revolving low balances and who yield low profits. Borrowers with high balances who are most desired by a bank would not be easily transfer balances between banks, because they are granted a lower credit limit by a bank other than their current bank because of information barriers due to asymmetric information, because their current bank has private information about their previous credit history. The authors suggest that focusing on policies that reduce switching costs in this industry will improve the credit card market industry performance and will probably lead to more competitive industry.

Brito and Hartley (1995) provide theoretical explanations for interest rate stickiness based on the liquidity services offered by credit cards' asymmetric information and consumer transaction costs. They provide different explanations for the observed high level of card interest rates. Their theoretical model predicts that it is rational to borrow on high credit card interest rates and pay interest on outstanding credit card balances rather than the transaction costs associated with alternative financing. Their model predicts that even small costs of arranging for other costs of loans can induce consumers to borrow on higher interest rates. On the other hand, the authors argue that "a rational consumer may also pay interest on credit card debt to avoid some of the costs associated with holding precautionary money balances." Brito and Hartley (1995) also show that inflexible (sticky) credit card interest rates can be consistent with a competitive equilibrium under which a new potential entrant earns zero profits.

Cargill and Wendel (1996), using data from the 1989 Survey of Consumer Finance, empirically show that income negatively affects the likelihood of borrowing on credit cards but is positively related to the amount borrowed. They also show that consumers may rationally avoid search for lower interest rates because small outstanding balances imply a low return to search. Cargill and Wendel argue that there are more credit card convenience users than suggested by early research. These credit card users do not benefit much from searching for lower interest rates; therefore, even modest search costs could keep the majority of these consumers from searching for lower interest rates. Cargill and Wendel (1996) findings suggest "that lack of consumer shopping for interest rates may be an entirely rational household decision." Cargill and Wendel's (1996) study findings are consistent with Canner and Luckett's (1992) and Pozdena's (1991) findings.

Stavins (1996) argues that one would expect banks to drop their interest rates to attract customers in a competitive market. In the class of perfect competition with complete information, price equals marginal cost and changes in the marginal costs must be translated into changes in the price of the product. However, credit-card-issuing banks do not appear to behave in this way in the credit card industry. The industry interest rates have been consistently higher than other types of consumer debt instruments. In her (1996) study, Stavins finds evidence of the adverse selection hypothesis that the level of the bank credit card rates rises with revenues generated from fees and finance charges. On the other hand, Stavins rejects the hypothesis that the demand for credit-card loans is insensitive to the interest rate and finds that defaulters have higher interest rate elasticity. Therefore, lowering interest rates may

attract less creditworthy consumers who are most likely to default on paying back their debt, dissuading some credit-card-issuing firms from lowering their interest rates.

Park (1997) attributes credit card rate stickiness and high profits in the industry to their option–value nature. He argues that high credit card rates reflect the value of the cardholders' option to borrow when they become riskier. "The option value is partly offset by the presence of cardholders who choose credit card loans while they are less risky because of high transaction costs of alternative loans."

Ausubel (1999) finds evidence of adverse selection in the credit card market. Using data from large-scale randomized trials in preapproved credit card solicitations, he finds that respondents to solicitations are substantially worse in terms of credit risk than nonrespondents. Moreover, he finds that solicitations offering inferior terms yield customer pools with worse credit risk than solicitations offering superior terms. Consumers who accept inferior credit card offers tend to have higher delinquency rates. Ausubel concludes that "inferior offer yields an inferior customer."

The later research based on 1998 Survey of Consumer Finances unravels a change in the US credit card market. Most of the recent credit card industry research shows that the industry became more competitive as credit card issuers switched to variable interest rates and more firms entered the industry.

Crook (2002) shows that credit card holders with higher balances do not search less than those with lower balances. Using data from the 1998 Survey of Consumer Finance, Crook finds that households with poor payment histories do not appear to search more or less than those with better payment histories. Hence, search theory based on Ausubel (1991) and Calem and Mester (1995) might be less useful in

explaining credit card pricing in the more recent period. However, search costs may be higher for those households who miss payments due to their life styles. Crook's (2002) study findings support the search theory implications that minorities search more than whites, that better educated households search more than the less well educated, and that search decreases with aging. This major finding by Crook (2002) is not consistent with early research findings, especially what was obtained by Calem and Mester (1995). The positive effect of high balances on search activity implies that if a bank unilaterally lowers its interest rates it would not attract relatively high risk borrowers.

Kerr and Dunn (2002) find that despite their high rejection probability, consumers with high balances search more for better rates than consumers with low balances. Kerr and Dunn argue that "high rejection probabilities do not affect search propensities." Therefore, high interest rate can not be explained by search costs. Moreover, the authors find that credit cardholders are becoming more rational and sensitive to the interest rate terms of a credit card contract. Kerr and Dunn's (2002) study findings demonstrates the important role of the Truth-In-Lending Act of 1988 in lowering the cost of gathering information by cardholders, leading to the decline in credit card interest rates in recent years.

Min and Kim (2003) investigate the socioeconomic determinants of consumer credit card borrowing. Using a two–step estimation procedure to model consumer credit card borrowing, they find that credit-constrained households who are likely to be denied other forms of credit have a higher demand for credit card borrowing. Their empirical findings show that the credit card interest rate is only taken into consideration when borrowers decide whether to borrow or not to borrow. They find that interest rate has no significant

effect on the amount of borrowing, only on the borrowing decision, dissuading card issuers from lowering the credit card interest rates even when the cost of funds drops.

Knittle and Stango (2003) provide a different explanation for interest rate stickiness. Using data from the credit card market during the1980s to test whether a nonbinding price ceiling may serve as a focal tacit collusion, they find that state-level ceilings during the 1980s facilitated tacit collusion by credit card issuers, leading to greater-than normal interest stability, but that national integration of the market reduced the sustainability of tacit collusion by the end of 1980s.

Berlin and Mester (2004) find that many models of consumer search, such as Ausubel (1991) and Calem and Mester (1995), fail to explain recent credit card decline as well as pricing behavior in credit card markets. Moreover, the authors find that a drop in consumer switching costs is not a good explanation for the drop in credit card rates in the 1990s.

Dey and Mummy (2005) use data from the 1998 U.S. Survey of Consumer Finances (SCF) to examine the association between borrower quality and the offered menu of credit card borrowing limits and interest rates. Their empirical findings show that there is a negative relationship between the credit card limit and the interest rate. On the other hand, they find that an increase in the credit card interest rate will increase the default rate of the borrower. Moreover, they find that the difference between actual borrowing and the offered credit card limit will generate an information asymmetry problem, making the credit card market tend to be incomplete.

Yang et al. (2007) provide an alternative explanation of the long debated puzzle on the stickiness of credit card interest rates. They argue that consumers' unrealistic

optimism about their future borrowing estimates will make them less sensitive to the APR and more sensitive to the annual fee. Because these customers are very profitable, they are offered credit cards with features such as a high APR and a low fee, inducing card issuers to keep their interest rates high. On the other hand, the authors provide empirical support to Ausubel's view that the rigidity of credit card interest rates is the product of consumer irrationality, "because they do not intend to borrow on their credit cards, but find themselves doing so anyway."

Telyukova and Wright (2008) provide a cost-based explanation of why consumers maintain credit card debt and pay interest despite the associated high interest rates. They argue that consumers may carry high-interest credit card debt and pay high interest while maintaining balances in their low-interest bearing bank accounts to avoid the expected costs of not holding precautionary balances or transactions balances.

2.2. The Nature of the Credit Card Industry

Credit in general is of two types: collateralized (secured) and non-collateralized (non–secured). Credit cards are a non–collateralized means of credit with an interest-free grace period. Moreover, credit cards are noninstallment consumer debt or open–ended credit in which consumers do not have to reapply each time a credit transaction is made. The amount owed can be repaid monthly in equal or unequal payments (Garman and Forgue, 2000).

In recent years, the use of credit cards and other forms of credit has increased tremendously. In particular, credit cards have become a major instrument for financing purchases in the U.S.

Credit cards are one of many ways through which people borrow money. Users

make the purchase today using their future incomes. The credit card issuer pays for the transactions, but the card users have to repay the money plus any interest accrued.

Interest is the cost of borrowing money and is calculated as a fixed fraction of the total outstanding balances. Because of the uncertainty problem in this industry, the interest rates on the credit cards are higher than for regular credit.

Credit card issuers use credit bureau consumer reports and other publicly available information about borrowers' creditworthiness to evaluate borrower riskiness so that they can alleviate some of the information asymmetry. However, the unsecured status of credit card loans makes them riskier than secured consumer loans, and more difficult to collect if a consumer defaults. The uneconomic nature of collecting loans in case of credit card loans defaults makes lending on consumer credit card a very risky credit operation.

Zywicki (2000) argues that the presence of uncertainty in the credit card industry provides an explanation for the stickiness of credit card interest rates and their indifference to changes in the cost of funds. First, because of the problem of adverse selection in the industry, low-risk borrowers can't signal reliability and credibility to lenders, because it is easy for high-risk borrowers to signal themselves as low-risk borrowers. Therefore, it is rational for lenders to charge the highest rates assuming that all borrowers fall in the high-risk category. Second, the unsecured nature of the credit card loans sufficiently increases the probability of consumer default with no cost-feasible means of loan collection. These costs are assumed not to be affected by changes in the cost of funds.

Users of credit cards fall into two broad categories: convenience users (liquid) and

revolvers (illiquid). The convenience users (almost 30 to 40 percent of the entire credit card users) are those who pay their credit cards balances off every month and thereby avoid finance charges. They also view their cards simply as a transaction medium to substitute for cash and checks, and along with transactions, they often receive extra benefits from various perks programs such as cash back and frequent flier miles. Interest rates might not mean much to them, but if they see a lower rate on another card, they might still switch.

Revolvers are those credit card holders who view a credit card as a debt instrument and a source of credit. They regularly roll over most of their outstanding balances to future billing periods, incurring interest charges and sometimes other fees in order to do so. In addition, most revolvers jump from one card to another, taking advantage of the introductory “teaser” rate but then switching to yet another card when the low-interest introductory period ends.

“Teaser” rates are much lower than the prevailing interest rate for a limited period of time, encouraging consumers to transfer balances to the new card offering the lower interest rate. Apparently, a cardholder who revolves regularly is more credit constrained than other cardholders and wishes to utilize the credit function as a source of credit as opposed to other card’s attributes (Carow and Staten, 2002).

Liquid consumers benefit from credit cards because they are granted a grace period with other enhancements, such as frequent-user awards. Most credit cards provide a grace period. If payment is made in full, the consumer does not incur finance charges. Illiquid consumers benefit from credit cards because they become able to borrow against their future incomes (Chakravorti and Ted, 1999). Because credit card

convenience users use credit only for convenience, they are not very profitable to the credit card issuers. However, the interest-free grace period for convenience users is financed by the revolvers (Chakravorti and Emmons, 2003).

Economic information theory predicts that revolvers are more likely to be sensitive to interest rates and credit card solicitations than convenience users. On the other hand, convenience users are more likely to be sensitive to the amount of the annual fee and the length of the interest free grace period than revolvers (Canner and Luckett, 1992).

In terms of consumer risk, industry researchers distinguish four types of cards users: (1) low-risk convenience users who use cards for convenience purpose only with no intention to revolve balances; (2) low-risk users who revolve balances; (3) high-risk users who carry balances and (4) high-risk users who do not carry balances (Kim, Dunn and Mumy, 2005).

Researchers have traditionally tried to examine the underlying determinants of consumer credit card borrowing despite the availability of other low-cost financing debt instruments. Among many factors affecting card adoption include a fair interest rate, cash bonuses, no annual fee, and quality customer services.

Canner and Luckett (1992) argue that credit cards have become an indispensable source of identification and a convenient means for making reservations in hotels, plane tickets, and the like. Carow and Staten (2002) find that convenience and rebates are the primary reasons for using a bank credit card. Brito and Hartley (1995) argue that in revolving balances, a rational consumer would pay interest on outstanding card balances to avoid transaction costs associated with arranging other loans, while

minimizing the costs associated with holding precautionary money (Brito and Hartley, 1995).

Sprenger and Stavins (2008), using data collected in the 2005 Survey of Consumer Payment Preferences, find that credit card revolvers are significantly more likely to use debt and less likely to use credit than convenience users who repay their balances each month. They provide two reasons for the expensive credit card borrowing, the cost-based explanation and the behavioral explanation. Under the cost-based explanation, consumers may view credit card borrowing to be less expensive than other borrowing alternatives when the take the costs associated with insufficient liquidity and alternative financing arrangements into consideration. Under the behavioral reasoning, credit card borrowing may be attractive for those individuals who overvalue present consumption and undervalue future costs associated with repaying the debt, given the credit card usage decoupling of separating the pleasure received from consumption from the pain of paying for it.

2.3. The Evolution of the Credit Card Market

In 1887, in his novel “Looking Backward,” Edward Bellamy, an American author and socialist, speculated about buying commodities with a card. The introduction of the credit card in the mid-twentieth century revolutionized and transformed how people live.

Credit, in general, is as old as human society. However, the concept of a general-purpose credit card came to existence in 1949 when Frank McNamara dined in a New York restaurant and discovered he could not pay for his meal. Later, he founded and named Diners Club, which would issue cards to consumers and sign merchants to accept those cards (Evan and Schmalensee, 1999).

In 1958, the first widely accepted plastic charge card was introduced by American Express having the marketing tagline as “Do not Leave Home without It.” BankAmericard introduced the first revolving general–purpose credit card in 1959, which became Visa in 1977. In 1966, the Interbank Card Association introduced “Master Charge” which became MasterCard in 1979.

To make bank cards appealing to consumers who already had department store cards, bank card issuers granted those consumers an interest-free “grace period” of 20-25 days, the same grace period that was granted by department stores (Canner and Luckett, 1992).

Visa and MasterCard have been dominating the U.S. general purpose credit card market. Both issuers combined accounted for an estimated 602 million cards in 2008, up from an estimated 599.4 million cards in 2007. In addition, American Express and Discover issued an estimated of 111.1 million cards in 2008, up from an estimated 109 million cards in 2007 (Nilson Report, 2009).

The credit card industry in the United States experienced high and sticky interest rates in 1980s. During this period, the average credit card rate was almost 19.8 percent, while the rate for the perfectly competitive market with zero profit was estimated to be around 13.2 percent (Ausubel, 1991). In his major investigation of the US credit card industry, Ausubel (1991) attributed the industry deviation from being a perfectly competitive industry to three reasons: consumer irrationality, search costs, and switching costs.

Much has changed in the credit card industry. In particular, the Truth-in-Lending Act of1988 has produced a major shake-up in the industry. The Fair Credit and Charge

Card Disclosure Act of 1988 intends to improve informational efficiency in order to increase competition in the credit card industry. Under the Truth-in-Lending Act, creditcard issuers are required to disclose all information regarding interest rate, annual fees,and grace period in their solicitations, thereby forcing card issuers to report up-front their most important contract terms (Kerr and Dunn, 2002). Beginning in the mid-1990s, the U.S. credit card market started to become more competitive. Interest rates became more competitive and variable as price competition increased. There was a wide dispersion of interest rates, ranging from zero percent introductory rates up to rates well above 20 percent. Debt-carrying credit card users started to search more for better rates which enhanced competition in the in the industry (Kerr and Dunn, 2002). On the other hand, advances in technology in terms of credit security technology and data quality reduced the economic significance of information–based barriers to prescreening and solicitation of card applicants. In addition, information innovation such as widespread access to the internet reduced the search and switching costs of customers (Calem, Gordy and Mester, 2005).

2.4. The Nature of Price Competition in the Credit Card Industry

The nature of Price Competition in the Credit Card Industry has been unusual. The structure of the market is competitive in that the industry comprises of thousands of card issuers. Nevertheless, card issuers maintain high credit card interest rates and make high profits. During the 1970s through the1980s and the early 1990s, the U.S. credit card market interest rates remained extremely high, hitting their all-time high of an average of almost 18.0 percent for almost two decades from 1974-1991. Beginning inthe early-1990s, credit card interest rates started to decline, becoming much more

responsive to changes in the cost of funds. Thereafter, they fluctuated between 14.0 and 16.0 percent.[2] During the early 1990s, Ausubel (1991) noticed that even though there were many firms in the market, the industry was far from being perfectly competitive, because of high and sticky industry interest rates. Ausubel also argues that as a result of this absence of adequate competition, credit card issuers have earned extraordinary profits, causing them to extend credit to risky consumers. The credit card issuers attributed the high interest rates to the high default rates.

Stango (2000) investigates pricing and competition in the credit card market. He shows that the stronger presence of variable-rate firms offering variable-rate cards wasassociated with more aggressive competition for new customers. He also finds empirical support of a positive relationship between prices and market share in the credit card market.

Stango (2002) empirically examines the relationship between pricing for commercial banks and switching costs. He argues that a given credit card issuer's price is an increasing function of the indebtedness of its customers, the indebtedness of its competitors' customers, the annual fee charged by an issuer's competitors, and the market share of an issuer in its home state. Using data from the Card Industry Directory, an annual publication that lists data for the largest 250 credit card Issuers over the period 1984-1994, Stango finds a strong relationship between switching costs of an issuer's customers and credit card prices (interest rates).

Chacravarti and Emmons (2003) argue that card issuers, in competing to attract profitable customers, may offer incentives to convenience users, because some of them

[2]Board of Governors of the Federal Reserve Board, FRB Annual Report "The Profitability of Credit Card Operations of Depository Institutions," June 2001.

may become revolvers in the future. Gross and Souleles (2002) attribute the increased competition in the credit card industry to greater consumers' sensitivity to credit card interest rates.

The credit card industry is highly concentrated. The top 10 credit card issuers controlled approximately 88 percent of the market share with $972.73 billion in general-purpose card debt outstanding in 2008. That includes Visa, MasterCard, American Express, and Discover and is up from approximately 85% in 2007 (Nilson Report, 2009). Moreover, the industry has no barriers to entry and exit, consistent with contestable market theory. The Contestable Market Theory is a theoretical analysis focusing on perfectly free entry and exit. The theory suggests that the special case of perfectly free, absolute, reversible entry is the basis for defining efficient allocation.[3] The theory rests on the following three assumptions:

1. Entry is free and without limit. With no costs, the new entrant can replace the incumbent.
2. Entry is absolute. With a slight price difference, the entrant can displace the existing firm.
3. Entry is perfectly reversible. Firms can exit the market at no cost. Sunk cost is zero.

The credit card industry is comprised of 6000 atomistic competitors that sell similar services to millions of customers nationwide. Currently, there are around 10,000

[3]This section draws on William G. Shepherd, "Contestability versus Competition," American Economic Review, vol. 74, pp. 572-587, September 1984. The main sources on contestability are W. J. Baumol, "Contestable Markets: An Uprising in the Theory of Industry structure," American Economic Review vol. 72, pp. 1-15, March 1982. Baumol et al. Contestable Markets.

depository institutions act as agents for credit card issuers, issuing general purpose visa and MasterCard credit cards to the public and distributing credit cards to consumers. In addition, two large nonbank firms, American Express Co. and DiscoverFinancial Services, issue independent general purpose credit cards to the public.

Tables 1 and 2 below illustrate the holdings of credit debt by the type of financial Institution.

Table 1: Major Holders of Consumer Total Credit Outstanding Debt (Billions of Dollars)

Year	2004	2005	2006	2007	2008
Total	2219.4	2313.9	2418.3	2551.9	2596.9
Commercial Banks	704.3	707.0	741.2	804.1	878.5
Finance Companies	492.3	516.5	534.4	584.1	575.8
Credit Unions	215.4	228.6	234.5	235.7	235.0
Federal Government	86.1	89.8	91.7	98.4	111.0
Saving Institutions	91.3	109.1	95.5	90.8	86.3
Nonfinancial Business	58.6	58.8	56.8	55.2	55.6
Pools of Securitized Assets	571.5	604.0	664.2	683.7	654.7

[4]**Source FRB**

Table 2: Major Holders of Consumer Revolving Credit Outstanding Debt (Billions of Dollars)

Year	2004	2005	2006	2007	2008
Revolving	823.7	850.0	902.3	969.6	992.3
Commercial Banks	314.6	311.2	327.3	353.4	390.6
Finance Companies	50.4	66.3	79.9	86.0	74.4
Credit Unions	23.2	24.7	27.4	31.1	33.4
Federal Government	n.a	n.a.	n.a.	n.a.	n.a.
Saving Institutions	27.9	40.8	42.5	44.8	39.5
Nonfinancial Business	2.4	11.6	7.8	4.2	4.2
Pools of Securitized Assets	395.2	395.4	417.5	450.0	450.2

[4]**Source FRB**

[4]Board of Governors of the Federal Reserve Board, FRB Annual Report "The Profitability of Credit Card Operations of Depository Institutions," June 2008.

2.5. Switching Costs in the Credit Card Market

Switching costs refer to the hidden costs a consumer is faced with when switching from one producer to another in the marketplace. Switching costs are developed by companies in order to establish consumers' lock-in (Klemperer, 1987a).

Switching costs are incurred when consumers switch suppliers; as such ex-ante homogeneous products become ex-post heterogeneous. The basic theoretical assumption about switching costs is that once a consumer purchases a product, he is locked in it.

The vast theoretical literature on switching costs is summarized by Klemperer (1987a, b, and c). Klemperer (1987a) shows that the existence of switching costs leads to market segmentation, and reduces the elasticity of demand facing each firm. Klemperer also shows that non-cooperative equilibrium in an oligopoly model with switching costs may be the same as the collusive outcome in an otherwise identical market without switching costs. There are three major types of consumers' switching costs:

A) Transaction costs that are associated with changing identical products or services, such as returning rented equipment to one firm and renting identical equipment from an alternative supplier.

B) Learning costs that are associated with learning how to use a service or how new product works, such as learning new computer software.

C) Contractual costs that are present because of special programs, discounts, or contracts requiring the customer to pay a penalty to switch suppliers, such as home loan penalty fees required to switch home loan providers.

The credit card market is a potential market where both search and switching costs are likely to be present. The basic theoretical assumptions about switching costs can be applied to the credit card industry. Kim et al. (2003) argue that banking is one of the major sectors of the economy in which switching costs appear to be prevalent. In this market, switching costs (costs of obtaining a new card) would mean that consumers may view credit cards as functionally identical before they get a card, but might not immediately switch from their current card to a card with a lower rate (Stango, 2002). Stango suggests the following three assumptions about switching costs in the credit card industry:

1. New and existing customers pay different rates on their cards in the credit card market.
2. Consumers have different values of switching costs (low vs. high switching costs).
3. Credit card issuers face pools of customers that vary in their degree of lock-in.

There is considerable evidence supporting the existence of the switching costs in the credit card industry. The pricing structure of the market in which card issuers offer low introductory rates to new potential customers is consistent with the existence of switching costs. There are some one-time inconveniences, expenses, and efforts incurred each time a consumer switches from one card to another. Consumers also face information costs in searching for the best rates offered by banks on their credit cards. Some consumers maintain a loyalty toward a product they have been using for a long time. They may also build up frequent-fliers miles on their cards, have their utility bills automatically charged, or enjoy the familiarity of having the same account for a long

time. Because consumers have different motives for holding credit cards, they have different incentives to incur certain costs of searching for lower interest rate terms (Kim, Dunn, and Mumy, 2005).

Ausubel (1991) and Stango (2002) argue that some credit card fees, such as the card annual fee, may prevent consumers from switching cards as it becomes costly for customers to switch or to carry more than one card. These added costs for switching may explain why consumers do not switch cards when they are offered to do so, which contributes to the failure of competition in this industry as theorized by Ausubel (1991).

2.6. The Importance of Consumers' Switching Costs

Switching costs have far reaching consequences on the working of the credit market. They increase borrowers' lock-in and grant the incumbent bank an ex post monopoly power over its customers. Switching costs may also explain why banks may prefer to maximize their current market share. Having a large base of borrowers today will increase future profits given customers' lock-in. Klemperer (1987a) shows that, in general, the existence of switching costs lead to market segmentation, and reduces the elasticity of demand facing each firm. Even with non-cooperative behavior, the switching costs lead to an outcome similar to the collusion solution, with the derivative of price with respect to marginal cost being less than one. When the derivative of price with respect to marginal cost is less than one, the industry deviates from being perfectly competitive, especially when some important perfect competition assumptions are dropped.

Consumers' switching costs have important strategic implications for firms who compete vigorously to build market share before consumers attach themselves to suppliers. Among those implications are:

1. Switching costs provide a basis for the differentiation of a competing offering in a given market place for a given period of time.
2. Switching costs influence future consumer behavior, such as increasing loyalty by making it difficult for the customer to switch.
3. Reducing switching costs for potential customers may make it easier to acquire new customers. Moreover, switching costs can create a barrier to entry for new supplying firms (Klemperer, 1987c).
4. Switching costs generally raise prices, discourage new entries, and reduce market competitiveness (Klemperer, 1995).

Empirical evidence investigating the existence of consumers' switching costs in the credit card market is limited. This is because switching costs are intangible costs which are difficult to measure. There is little empirical literature concerning this issue.

Ausubel (1991) researched the possibility that consumers' switching costs may exist in the credit card market, thus explaining the extraordinary profits of card issuers. He provides some information that shows that switching and search costs may explain the high interest rates on credit card balances, and he was the first to research the possibility that consumers' switching costs may explain the extraordinary profits of card issuers. However, Ausubel (1991) finds that switching costs are not large enough to explain the deviation of the industry from being perfectly competitive due to the industry rate stickiness.

Canner and Luckett (1992) argue that consumers with high levels of balances have difficulty switching balances to credit card plans that offer reduced rates. High balances make these consumers less attractive to card issuers as the probability of their default increases.

Calem and Mester (1995) show that search and switching costs result in adverse selection in the credit card market. Specifically, if a bank unilaterally lowers its interest rate, it will mainly attract cardholders who search most for interest rates. Cardholders with large balances who yield high profits would be less able to transfer their balances to a new card issuer due to asymmetric information between card issuers. They also show that consumers carry balances on their cards with fairly high interest rates, despite receiving offers from cards with fairly low interest rates. The reason behind doing so is that consumers with high balances have difficulty switching cards. According to Calem and Mester there are two explanations for this problem. First, consumers with high balances are reluctant searchers for better rates as the probability of being denied credit increases with high outstanding balances. Second, consumers with high credit card balances would search for the lowest rates to switch cards. However, these consumers are less likely to be approved credit as card issuers use consumer debt-to-income ratios to determine whether card applicants will be approved.

Park (1997), using a sample of major credit card issuers, finds that “the low elasticity of demand for credit card loans implies consumer irrationality and imperfect information.” Park’s (1997) study findings are consistent with those of Ausubel (1991) and Calem & Mester (1995). Park argues that cardholders sluggishly respond to changes in card rates. Park argues that cardholders with high balances have high

switching costs, while cardholders with small balances do not care much about credit card rates.

Stango (2002) adopts the basic assumption of switching costs models to the credit card market. He shows that switching costs are an important influence on pricing for commercial banks, suggesting that there is a relationship between default rates and switching costs, and that credit card issuers' pricing is positively correlated with some proxies for switching costs. He empirically examines the relationship between switching costs and prices, which can be written as a function of the switching costs of an issuer's and a competitor's customers. Stango also shows that extending credit to risky students on college campuses, for example, may be profitable because these customers have high switching costs. Stango also points out that there are consumers who carry balances on their credit cards with fairly high interest rates, despite receiving offers for cards with lower rates.

Based on these findings, it seems to be rational for credit card issuers to view high balances as bad signals. If search and switching costs exist in the credit card industry, then lowering interest rates will attract consumers with a high probability of default.

The following common facts in the credit card market may be consistent with the existence of switching and search costs in this industry:

1. Consumers carry balances on their credit cards with fairly high interest rates, despite receiving offers for cards with lower rates. Of course, there are other groups of consumers who consistently switch cards, moving from one card to another to take advantage of the offered teaser rates (Stango, 2002).
2. Banks often offer incentives (teaser rates) to attract convenience users (30-40%

of the credit card users) who pay their balances in full every billing period because some of them may become interest–paying credit card users (revolvers) in the future (Chakravorti and Emmons, 2003).

3. Consumer–level data consistently show that many consumers carry balances on their credit cards with fairly high interest rates, indicating that consumers are becoming more insensitive to interest-rate selection as they feel they will never get a better rate (Stango, 2002).
4. Banks tend to price discriminate between their pre-existing customers and rivals' borrowers by offering low introductory rates to the latter (poaching strategies). Introductory offers take two forms: discounts on new purchases and discount on balance transfers for a fixed period of time (usually 6-12 months). The interest rate usually reverts to the cards' standard variable rate after the introductory period expires.
5. Consumers with high outstanding balances are reluctant to engage in search for a lower price, because they are less likely to be approved for a new card.

Chen (1997) argues that card issuers actually pay customers to switch using introductory teaser rates on purchases and balance transfers which is an indicator of the presence of switching costs in the credit card market. Competing firms routinely provide discounts (monetary payments) to new customers for switching from a competitor(s), and thus charge lower prices to those customers. In standard economic terms, this is obviously a form of third-degree price discrimination. This is due to banks being aware of the existence of switching costs, therefore having to tease new customers by offering low introductory rates. Chen shows that in a two-period

homogeneous-good duopoly model, the equilibrium amount of discounts offered by card issuers increases continuously in the expected switching costs of a typical consumer. Chen also finds that “firms are worse off engaging in the discriminatory pricing, while consumers need not necessarily benefit from it”. In general, because switching costs exist, banks will offer low introductory rates to the rival’s customers with respect to the interest rates charged to their old borrowers (Barone, Felici and Pagnini, 2006).

Recognizing the importance of reducing search and switching costs faced by cardholders who are willing to switch cards for better rates, credit card issuers have spent large amounts on advertising to induce consumers to switch cards by reducing search and switching costs for the consumers they seek (Zywicki, 2000). Marketing techniques to induce consumers to switch their current credit cards include: offering low introductory rates on balance transfer and new purchases, issuing gold and platinum cards with substantial benefits, increasing consumer information about their new products benefits, and waiving annual fees. The solicitations calls from the card issuers have increased tremendously in the last two decades. An important consequence of these solicitations has been the offer of low introductory rates on balance transfers, encouraging card holders to carry balances from one billing period to another, and making balance switching a routine matter as it has become much easier for consumers to search for better rates in the credit card market.

CHAPTER 3

A THEORETICAL MODEL

3.1. Introduction

The purpose of this chapter is to use a simple version of Klemperer's (1987a) two-period model of Bertrand–type price competition applied to the credit card industry in order to show that in the presence of switching costs (or "brand loyalty"), firms will charge lower prices in the first period (than they otherwise would) to gain market share and then charge higher prices in the future. This will happen if firms have perfect foresight, and it may lead to either higher or lower equilibrium profits than if firms behave myopically.

Klemperer (1987a) employs a two-period Bertrand–type price competition model to show that firms compete aggressively in the early stages of the market development to gain market share that will be valuable to them in the second period (the mature market).

Stango (2000) presents a dynamic model of price competition to explain the emphasis that credit card issuers place on building market shares. Credit card issuers charge lower rates in the first period and higher rates in the second period utilizing the market shares they have gained in the first period.

Credit card issuing banks face a trade-off between offering low introductory rates in the first period (the primary market) to attract consumers and lock them in and charge high rates in the second period to extract higher profits (rents) from its already locked–in

customers (Kim et al., 2003). This is the case where credit card issuers are acting with perfect foresight.

3.2 The Theoretical Model

This model consists of a single industry within a country consisting of two duopolists selling to domestic consumers. Consider two banks, A and B, producing functionally identical products, such as credit cards. They are competitively offering non-collateralized lines of credit in two different markets: a first-period 'primary market', and a second-period 'mature market'. The primary market is the first level of competition between banks to capture market share that will be valuable to them in the second period (the mature market). Because market share is valuable to these banks in the future, they compete more aggressively than they otherwise would to capture the highest market share possible. The mature market (the second market) is the second level of competition where credit card issuers compete for each other's existing customers. Firms will choose their strategic variables (P_1, P_2) to maximize their total discounted future profits. For example, they may choose to offer lower prices (interest rates) in the first period to attract consumers who come to this market seeking credit for the first time, such as college students. On the other hand, firms also recognize that their second-period profits depend on their first-period sales and therefore they have an incentive to invest in their market shares. Since demand is symmetric between the two banks, it is sufficient to analyze the behavior of one of the banks as the first main step of deriving the equilibrium outcome. In the following, I analyze it from the viewpoint of bank A.

Bank A's first-period (primary market) and second-period (mature market) profits functions under Bertrand competition are

$$\pi_{1A}(P_{1A}, P_{1B}) = (P_{1A} - C)S_{1A}(P_{1A}, P_{1B}) - F \quad \textbf{(1)}$$

and

$$\pi_{2A}(P_{2A}, P_{2B}, P_{1A}, P_{1B}) = (P_{2A} - C)S_{2A}(P_{2A}, P_{2B}, S_{1A}(P_{1A}, P_{1B})) - F \quad \textbf{(2)}$$

where the first subscript denotes the period (market) and the second subscript denotes the firm, and

π_{1A} is bank A's first-period profits,

π_{2A} is bank A's second-period profits,

P_{1A} is bank A's first-period price (interest rate),

P_{1B} is bank B's first-period price (interest rate),

S_{1A} is the demand function for bank A's credit cards in the first period,

S_{1B} is the demand function for bank B's credit cards in the first period,

C is the (constant) marginal cost for each bank,

P_{2A} is bank A's second-period price (interest rate),

P_{2B} is bank B's second-period price (interest rate),

S_{2A} is bank A's second-period demand function,

S_{2B} is bank B's second-period demand function,

F is fixed cost.

Bank A's total discounted profits are given by

$$\pi_A = \pi_{1A} + \lambda\pi_{2A} \quad \textbf{(3)}$$

where λ is a discount factor.

The symmetric demand functions for the two firms (duopolists) in the first period as functions of the prices (P_{1A} , P_{1B}) are

$$S_{1A}(P_{1A}, P_{1B}) = \alpha - \beta P_{1A} + \gamma P_{1B} \quad \textbf{(4)}$$

$$S_{1B}(P_{1A}, P_{1B}) = \alpha - \beta P_{1B} + \gamma P_{1A} \quad \textbf{(5)}$$

where α, β, and γ are the parameters of the demand function. The natural restrictions are that $\alpha > 0$, $\beta > 0$ and $\beta \geq \gamma \geq 0$. Equation (4) states that market demand for bank A's product (credit card) is downward sloping in its own price (law of demand) and increases with increases in its competitor's price (since the goods are substitutes). When $\gamma = 0$, the products are independent or unrelated and each firm has monopolistic market power. Whenever $\gamma > 0$, the products are substitutes. If $\gamma = \beta$, the total demand for the two goods is fixed (as seen by adding (4) and (5)). The economic meanings of the above demand functions parameters are as follows. α is a positive constant (the y-axis intercept). It measures quality in a vertical sense. Other things being equal, an increase in α increases the marginal utility of consuming the good. β is the slope of the demand curve. It captures the degree of 'own price sensitivity', indicating how quantity demanded is affected by a change in own price. γ measures the substitutability between the products, indicating how quantity demanded is affected by a change in the cross-price of related goods (bank B's price).

Each firm competes by setting its price (Bertrand competition) and letting the market clear. The oligopolistic structure is one of Bertrand price setters in a differentiated product market. In period 1, bank A chooses its first-period price P_{1A} to maximize its total discounted future profits, taking bank B's first-period price as given.

Substituting (4) in (1), bank A's first-period profit function becomes

$$\pi_{1A} = (P_{1A} - C)(\alpha - \beta P_{1A} + \gamma P_{1B}) - F \quad \textbf{(6)}$$

The second–period demand function faced by bank A's is assumed to be given by

$$S_{2A}(P_{2A}, P_{2B}, S_{1A}(P_{1A}, P_{1B})) = A - \beta P_{2A} + \gamma P_{2B} + \delta S_{1A}(P_{1A}, P_{1B})$$

$$= A - \beta P_{2A} + \gamma P_{2B} + \delta(\alpha - \beta P_{1A} + \gamma P_{1B}) \quad \textbf{(7)}$$

where A is a positive constant, δ is a parameter that measures the extent to which consumers who previously used bank A's product in the first-period are locked into the firm's product in the second period, and where the second equality follows from (4). Substituting (7) in (2), the second period (the mature market) profits become

$$\pi_{2A} = (P_{2A} - C)(A - \beta P_{2A} + \gamma P_{2B} + \delta(\alpha - \beta P_{1A} + \gamma P_{1B})) - F \quad \textbf{(8)}$$

Assume first that each firm acts myopically and ignores the effect that its first-period price has on its second-period profits. Differentiating (6) with respect to $P_{1A,}$ the first order condition for bank A's profit maximizing problem is given by

$$\frac{\partial \pi_{1A}}{\partial P_{1A}} = \alpha - 2\beta P_{1A} + \gamma P_{1B} + C\beta = 0 \quad \textbf{(9)}$$

Setting $P_1 = P_{1A} = P_{1B}$ and solving, we have the first–period symmetric equilibrium price in the myopic case

$$P_1 = P_{1A} = P_{1B} = \frac{\alpha + C\beta}{2\beta - \gamma} \quad \textbf{(10)}$$

Differentiating (8) with respect to P_{2A}, the first order condition for bank A's profit maximization problem in the second period is given by

$$\frac{\partial \pi_{2A}}{\partial P_{2A}} = A - 2\beta P_{2A} + \gamma P_{2B} + \delta\alpha - \beta P_{1A}\delta + \delta\gamma P_{1B} + C\beta = 0 \quad \textbf{(11)}$$

Setting $P_1 = P_{1A} = P_{1B}$, and $P_2 = P_{2A} = P_{2B}$ and then solving for P_2, we get the second-period symmetric equilibrium price

$$P_2 = P_{2A} = P_{2B} = \frac{A + \delta(\alpha - P_1(\beta - \gamma)) + C\beta}{2\beta - \gamma} \quad \textbf{(12)}$$

Substituting (10) in (12), we obtain the second-period symmetric equilibrium price in the myopic case

$$P_2 = P_{2A} = P_{2B} = \frac{A + \delta\left(\alpha - \left(\frac{\alpha + C\beta}{2\beta - \gamma}\right)(\beta - \gamma)\right) + C\beta}{2\beta - \gamma} \quad \textbf{(13)}$$

Consider now a perfect foresight analysis where each firm sets its first-period price, taking into account not only the effect of doing so on its first-period profitability, but also the effect on its first-period market share and hence the second-period profitability. Bank A chooses its prices to maximize its total future discounted profit. If firms care about the future, then they will compete more fiercely for new customers since these customers will become valuable repeat-purchasers in the second period. In the two-period model of Klemperer (1987a, b) this implies charging lower prices in the first period than in the absence of this effect. In period 1, bank A chooses its first-period price P_{1A} to maximize its total discounted future profits, taking bank B's first-period price as given.

Combining (6) and (8), bank A's total discounted future profits are given by

$$\pi_A = (P_{1A} - C)(\alpha - \beta P_{1A} + \gamma P_{1B}) - F + \lambda[(P_{2A} - C)((A - \beta P_{2A} + \gamma P_{2B}) + \delta(\alpha - \beta P_{1A} + \gamma P_{1B}) - F] \quad \textbf{(14)}$$

Differentiating (14) with respect to P_{1A}, we get

$$\frac{\partial \pi_A}{\partial P_{1A}} = \alpha - 2\beta P_{1A} + \gamma P_{1B} + C\beta - \lambda P_{2A}\delta\beta + C\delta\beta\lambda = 0 \quad \textbf{(15)}$$

In a symmetric equilibrium where $P_1 = P_{1A} = P_{1B}$ and $P_2 = P_{2A} = P_{2B}$

$$P_1 = P_{1A} = P_{1B} = \frac{\alpha + C\beta(1 + \lambda\delta) - \lambda\delta\beta P_2}{2\beta - \gamma} \quad \textbf{(16)}$$

Differentiating (14) with respect toP_{2A}, w*e get*

$$\frac{\partial \pi_A}{\partial P_{2A}} = \lambda A - 2\lambda\beta P_2 + \lambda\gamma P_2 + \lambda\delta\alpha - \lambda\delta\beta P_1 + \lambda\delta\gamma P_1 + \lambda C\beta = 0 \quad \textbf{(17)}$$

and making the same symmetry assumptions stated before (16), we get

$$P_2 = P_{2A} = P_{2B} = \frac{A + \delta\alpha - \delta\beta P_1 + \delta\gamma P_1 + C\beta}{2\beta - \gamma} \quad \textbf{(18)}$$

Rearranging (16) and (18), yields

$$(2\beta - \gamma)P_1 + (\lambda\delta\beta)P_2 = \alpha + C\beta + C\beta\delta\lambda \quad \textbf{(19)}$$

$$(\delta\beta - \delta\gamma)P_1 + (2\beta - \gamma)P_2 = A + \delta\alpha + C \quad \textbf{(20)}$$

Using Cramer's rule, we can solve for P_1 and P_2 to derive the non-cooperative price-setting equilibrium in both periods in the perfect foresight case:

$$P_1 = \frac{\begin{vmatrix} \alpha + C\beta + C\beta\delta\lambda & \lambda\delta\beta \\ A + \delta\alpha + C\beta & 2\beta - \gamma \end{vmatrix}}{\begin{vmatrix} 2\beta - \gamma & \lambda\delta\beta \\ \delta(\beta - \gamma) & 2\beta - \gamma \end{vmatrix}}$$

$$= \frac{(\alpha + C\beta + C\beta\delta\lambda)(2\beta - \gamma) - (A + \delta\alpha + C\beta)(\lambda\delta\beta)}{(2\beta - \gamma)(2\beta - \gamma) - (\delta\beta - \delta\gamma)(\lambda\delta\beta)} \quad \textbf{(21)}$$

and

$$P_2 = \frac{\begin{vmatrix} 2\beta - \gamma & \alpha + C\beta + C\beta\delta\lambda \\ \delta\beta - \delta\gamma & A + \delta\alpha + C\beta \end{vmatrix}}{\begin{vmatrix} 2\beta - \gamma & \lambda\delta\beta \\ \delta(\beta - \gamma) & 2\beta - \gamma \end{vmatrix}}$$

$$= \frac{(2\beta - \gamma)(A + \delta\alpha + C\beta) - (\delta\beta - \delta\gamma)(\alpha + C\beta + C\beta\delta\lambda)}{(2\beta - \gamma)(2\beta - \gamma) - (\delta\beta - \delta\gamma)(\lambda\delta\beta)} \quad \textbf{(22)}$$

3.3. Comparisons between the Myopic and Perfect-Foresight Equilibria

3.3.1. The Case C = 0 and δ = 0

From (10) and (13) with δ = 0, it follows that equilibrium prices in the first and second periods in the myopic case are

$$P_1 = P_{1A} = P_{1B} = \frac{\alpha + C\beta}{2\beta - \gamma} \quad (23)$$

$$P_2 = P_{2A} = P_{2B} = \frac{A + C\beta}{2\beta - \gamma} \quad (24)$$

Similarly, from (21) and (22) with δ = 0, it follows that the equilibrium prices in the perfect foresight case are

$$P_1 = P_{1A} = P_{1B} = \frac{\alpha + C\beta}{2\beta - \gamma} \quad (25)$$

$$P_2 = P_{2A} = P_{2B} = \frac{A + C\beta}{2\beta - \gamma} \quad (26)$$

I will consider the following parameter values for numerical example 1.

$$\alpha = 10,\ A = 10,\ \lambda = 0.7,\ \beta = 2,\ \delta = 0,\ \gamma = 1,\ C = 0,\ F = 0. \quad (27)$$

Inserting C = 0 and the other values in (27) into equations (23) and (24), the myopic prices are

$$P_1 = P_{1A} = P_{1B} = \frac{\alpha}{2\beta - \gamma} = 3.333 \quad (28)$$

$$P_2 = P_{2A} = P_{2B} = \frac{A}{2\beta - \gamma} = 3.333 \quad (29)$$

Inserting C = 0 and the other values in (27) in equations (25) and (26), the perfect-foresight prices are

$$P_1 = P_{1A} = P_{1B} = \frac{\alpha}{2\beta - \gamma} = 3.333 \quad (30)$$

$$P_2 = P_{2A} = P_{2B} = \frac{A}{2\beta - \gamma} = 3.333 \quad (31)$$

We have, from (23) – (26), or from (28) – (31),

Proposition 1: If $\delta = 0$, so there are no switching costs (or “brand loyalty") in the second period, then the first-period equilibrium price in the myopic case is equal to the first-period equilibrium price in the perfect foresight case, and the second-period equilibrium price in the myopic case is equal to the second-period equilibrium price in the perfect foresight case.

Using equations (6), (8), $P_1 = P_{1A} = P_{1B}$, $P_2 = P_{2A} = P_{2B}$, and (27), the equilibrium profits of each firm in periods 1 and 2 are

$$\pi_1 = \pi_{1A} = \pi_{1B} = P_1(\alpha - \beta P_1 + \gamma P_1) \quad \textbf{(32)}$$

$$\pi_2 = \pi_{2A} = \pi_{2B} = P_2(A - \beta P_2 + \gamma P_2) \quad \textbf{(33)}$$

From (3), (32) and (33), each firm’s present value of profits is

$$\pi_A = \pi_B = \pi_1 + \lambda\pi_2 \quad \textbf{(34)}$$

First consider profits in the myopic case. Using equations (27), (28), and (32), profits in the first period are

$$\pi_1 = \pi_{1A} = \pi_{1B} = P_1(\alpha - \beta P_1 + \gamma P_1) = \frac{\alpha^2\beta}{(2\beta - \gamma)^2} = 22.221 \quad \textbf{(35)}$$

Using equations (27), (29), and (33), profits in the second period are

$$\pi_2 = \pi_{2A} = \pi_{2B} = P_2(A - \beta P_2 + \gamma P_2) = \frac{A^2\beta}{(2\beta - \gamma)^2} = 22.221 \quad \textbf{(36)}$$

Using equations (27), (34), (35) and (36), it follows that the total discounted future profits are:

$$\pi_A = \pi_B = 22.222 + .7(22.221) = 37.775 \quad \textbf{(37)}$$

Now consider the perfect foresight case. Using (27), (30), and (32), profits in the first period are

$$\pi_1 = \pi_{1A} = \pi_{1B} = P_1(\alpha - \beta P_1 + \gamma P_1) = \frac{\alpha^2\beta}{(2\beta-\gamma)^2} = 22.221 \quad \textbf{(38)}$$

Using (27), (31), and (33), profits in the second period are

$$\pi_2 = \pi_{2A} = \pi_{2B} = P_2(A - \beta P_2 + \gamma P_2) = \frac{A^2\beta}{(2\beta-\gamma)^2} = 22.221 \quad \textbf{(39)}$$

From (27), (34), (38) and (39), each firm's present value of profits is

$$\pi_A = \pi_B = 22.221 + .7\,(22.221) = 37.775 \quad \textbf{(40)}$$

We therefore have:

Proposition 2: If $\delta = 0$, so there are no switching costs (or "brand loyalty") in the second period, then the profits of each firm (first period, second period, and total) are the same under myopic behavior as under perfect foresight.>

3.3.2. The Case C = 0 and δ > 0

From (10) and (13) with C = 0, it follows that equilibrium prices in the two periods in the myopic case are

$$P_1 = P_{1A} = P_{1B} = \frac{\alpha}{2\beta-\gamma} \quad \textbf{(41)}$$

$$P_2 = P_{2A} = P_{2B} = \frac{A + \delta\left(\alpha - \left(\frac{\alpha}{2\beta-\gamma}\right)(\beta-\gamma)\right)}{2\beta-\gamma} \quad \textbf{(42)}$$

Using (21) and (22) with C = 0, it follows that equilibrium prices in the two periods in the perfect foresight case are

$$\mathrm{P}_1 = \mathrm{P}_{1\mathrm{A}} = \mathrm{P}_{1\mathrm{B}} = \frac{\alpha(2\beta-\gamma) - \lambda\delta\beta(A+\delta\alpha)}{(2\beta-\gamma)(2\beta-\gamma) - (\delta\beta-\delta\gamma)(\lambda\delta\beta)} \quad \textbf{(43)}$$

$$\mathrm{P}_2 = \mathrm{P}_{2\mathrm{A}} = \mathrm{P}_{2\mathrm{B}} = \frac{(2\beta-\gamma)(A+\delta) - \alpha\delta(\beta-\gamma)}{(2\beta-\gamma)(2\beta-\gamma) - (\delta\beta-\delta\gamma)(\lambda\delta\beta)} \quad \textbf{(44)}$$

I will consider the following parameter values for numerical example 2.

$$\alpha = 10,\ A = 10,\ \lambda = 0.7,\ \beta = 2,\ \delta = 0.2,\ \gamma = 1,\ C = 0,\ F = 0. \quad \textbf{(45)}$$

Inserting the values in (45) in equations (41) and (42), prices in the myopic case are

$$\mathrm{P}_1 = \mathrm{P}_{1\mathrm{A}} = \mathrm{P}_{1\mathrm{B}} = \frac{\alpha}{2\beta-\gamma} = 3.333 \quad \textbf{(46)}$$

$$\mathrm{P}_2 = P_{2A} = P_{2B} = \frac{A+\delta\left(\alpha - \left(\frac{\alpha}{2\beta-\gamma}\right)(\beta-\gamma)\right)}{2\beta-\gamma} = 3.777 \quad \textbf{(47)}$$

Inserting the values in (45) in equations (43) and (44), prices under perfect foresight case are

$$\mathrm{P}_1 = \mathrm{P}_{1\mathrm{A}} = \mathrm{P}_{1\mathrm{B}} = \frac{\alpha(2\beta-\gamma) - (A+\delta\alpha)(\lambda\delta\beta)}{(2\beta-\gamma)(2\beta-\gamma) - (\delta\beta-\delta\gamma)(\lambda\delta\beta)} = 2.978 \quad \textbf{(48)}$$

$$\mathrm{P}_2 = \mathrm{P}_{2\mathrm{A}} = \mathrm{P}_{2\mathrm{B}} = \frac{(2\beta-\gamma)(A+\delta) - \alpha\delta(\beta-\gamma)}{(2\beta-\gamma)(2\beta-\gamma) - (\delta\beta-\delta\gamma)(\lambda\delta\beta)} = 3.197 \quad \textbf{(49)}$$

Hence we have the following proposition

Proposition 3: From (46)–(49), it follows that in the presence of switching costs (or "brand loyalty"), since $\delta > 0$, then firms will charge lower prices in the first period than if there were no switching costs (or "brand loyalty"), that is $\delta = 0$. Firms acting myopically set an equilibrium price in the first period that is independent of how big δ is. Firms typically set lower prices in the first period in order to capture the market share that will be valuable to them in the future and charge higher prices in the second period. A first-period price cut that increases a firm's first-period market share (demand) foretells a second-period price rise.

Using equations (6), (8), $P_1 = P_{1A} = P_{1B}$, $P_2 = P_{2A} = P_{2B}$, and (45), the equilibrium profits of each firm in the first and second periods are

$$\pi_1 = \pi_{1A} = \pi_{1B} = P_1(\alpha - \beta P_1 + \gamma P_1) \quad \textbf{(50)}$$

$$\pi_2 = \pi_{2A} = \pi_{2B} = P_2(A - \beta P_2 + \gamma P_2) \quad \textbf{(51)}$$

From (3), (50) and (51), each firm's present value of profits is

$$\pi_A = \pi_B = \pi_1 + \lambda\pi_2 \quad \textbf{(52)}$$

First consider profits in the myopic case. Using equations (45), (46), and (50), profits in the first period are

$$\pi_1 = \pi_{1A} = \pi_{1B} = P_1(\alpha - \beta P_1 + \gamma P_1) = 22.222 \quad \textbf{(53)}$$

Using equations (45), (47), and (51), profits in the second period are

$$\pi_2 = \pi_{2A} = \pi_{2B} = P_2(A - \beta P_2 + \gamma P_2) = 28.544 \quad \textbf{(54)}$$

Using equations (45), (52), (53) and (54), it follows that the total discounted future profits under myopic case are

$$\pi_A = \pi_B = 22.222 + .7(28.544) = 42.200 \quad \textbf{(55)}$$

Now consider the perfect foresight case. Using (45), (48), and (50), profits in the first period are

$$\pi_1 = \pi_{1A} = \pi_{1B} = P_1(\alpha - \beta P_1 + \gamma P_1) = 20.913 \quad \textbf{(56)}$$

Using (45), (48), and (51), profits in the second period are

$$\pi_2 = \pi_{2A} = \pi_{2B} = P_2(A - \beta P_2 + \gamma P_2) = 26.239 \quad \textbf{(57)}$$

From (45), (52), (56) and (57), each firm's present value of profits under perfect foresight case is

$$\pi_A = \pi_B = 20.913 + .7(26.239) = 39.727 \quad \textbf{(58)}$$

We therefore have:

Proposition 4: From (53) through (58), we see that A's total discounted profits in the perfect foresight case is less than the total discounted profits in the myopic case. In the myopic case, bank A makes more profits in both periods than it makes in the perfect foresight case. Therefore, in the presence of switching costs, firms will have a degree of monopoly power over their customers, leading to higher prices and profits in the future.

3.3.3. The Case γ = 0

From (10) and (13) with $\gamma = 0$, it follows that the myopic prices in the first and second periods are

$$\mathrm{P}_1 = \mathrm{P}_{1\mathrm{A}} = \mathrm{P}_{1\mathrm{B}} = \frac{\alpha + C\beta}{2\beta} \tag{59}$$

$$\mathrm{P}_2 = \mathrm{P}_{2\mathrm{A}} = \mathrm{P}_{2\mathrm{B}} = \frac{A + \frac{\delta\alpha}{2} + C\beta\left(1 - \frac{\delta}{2}\right)}{2\beta} \tag{60}$$

Using (21) and (22) with $\gamma = 0$, we obtain the perfect-foresight prices in the first and second periods.

$$\mathrm{P}_1 = \mathrm{P}_{1\mathrm{A}} = \mathrm{P}_{1\mathrm{B}} = \frac{2\alpha + 2C\beta + \lambda\delta C\beta - A\lambda\delta - \lambda\delta^2\alpha}{4\beta - \lambda\delta^2\beta} \tag{61}$$

$$\mathrm{P}_2 = \mathrm{P}_{2\mathrm{A}} = \mathrm{P}_{2\mathrm{B}} = \frac{2A + \alpha\delta + 2C\beta - C\beta\delta - C\beta\delta^2\lambda}{4\beta - \lambda\delta^2\beta} \tag{62}$$

I will consider the following parameter values for numerical example 3.

$$\alpha = 10,\ A = 10,\ \lambda = 0.7,\ \delta = 0.2,\ \beta = 2,\ \gamma = 0,\ C = 0,\ F = 0. \tag{63}$$

Inserting C = 0 and other values in (63) in equations (59) and (60), prices in the myopic case are

$$P_1 = P_{1A} = P_{1B} = \frac{\alpha}{2\beta} = 2.500 \quad \textbf{(64)}$$

$$P_2 = P_{2A} = P_{2B} = \frac{A + \frac{\delta\alpha}{2}}{2\beta} = 2.750 \quad \textbf{(65)}$$

Inserting C = 0 and other values in (63) in (61) and (62), the perfect-foresight prices in the first and second periods are

$$P_1 = P_{1A} = P_{1B} = \frac{2\alpha - A\lambda\delta - \lambda\delta^2\alpha}{4\beta - \lambda\delta^2\beta} = 2.306 \quad \textbf{(66)}$$

$$P_2 = P_{2A} = P_{2B} = \frac{2A + \alpha\delta}{4\beta - \lambda\delta^2\beta} = 2.769 \quad \textbf{(67)}$$

Hence, we have:

Proposition 5: Equations (64) through (67) state equilibrium prices under the assumption of no substitutability, that is γ = 0, so that the demands for the two firms are unrelated or independent. This means that demand for bank A's product does not depend at all on bank B's product price, so each firm is a monopoly in its market.

Using equations (6), (8), $P_1 = P_{1A} = P_{1B}$, $P_2 = P_{2A} = P_{2B}$, and (63), the equilibrium profits of each firm in periods 1 and 2 are

$$\pi_1 = \pi_{1A} = \pi_{1B} = P_1(\alpha - \beta P_1) \quad \textbf{(68)}$$

$$\pi_2 = \pi_{2A} = \pi_{2B} = P_2(A - \beta P_2 + \delta(\alpha - \beta P_1)) \quad \textbf{(69)}$$

From equation (3), each firm's present value of profits is

$$\pi_A = \pi_B = \pi_1 + \lambda\pi_2 \quad \textbf{(70)}$$

Using equations (63), (64), and (68), profits in the myopic case in the first period are

$$\pi_1 = \pi_{1A} = \pi_{1B} = P_1(\alpha - \beta P_1) = \frac{\alpha^2}{4\beta} = 12.500 \quad \textbf{(71)}$$

Using equations (63), (65), and (69), profits in the myopic case in the second period are

$$\pi_2 = \pi_{2A} = \pi_{2B} = \frac{(A + \frac{1}{2}\delta\alpha)^2}{4\beta} = 15.125 \quad \textbf{(72)}$$

Using equations (63), (70), (71) and (72), the myopic total discounted profits are

$$\pi_A = \pi_B = 12.500 + 0.7(15.125) = 23.088 \quad \textbf{(73)}$$

Using (63), (66), and (68), the perfect-foresight profits are in the first period are

$$\pi_1 = \pi_{1A} = \pi_{1B} = \frac{(2\propto + A\lambda\delta)(2\alpha - A\lambda\delta - \lambda\delta^2\alpha)}{\beta(4 - \lambda\delta^2)^2} = 12.425 \quad \textbf{(74)}$$

Using (63), (66), (67), and (69), the perfect-foresight profits are in the second period are

$$\pi_2 = \pi_{2A} = \pi_{2B} = \frac{(2A + \alpha\delta)(2A\beta + \beta\alpha\delta)}{(4\beta - \lambda\delta^2\beta)^2} = 15.339 \quad \textbf{(75)}$$

Using equation (63), (70), (74), and (75), the perfect-foresight total discounted profits are

$$\pi_A = \pi_B = 12.425 + 0.7(15.339) = 23.162 \quad \textbf{(76)}$$

Hence we have the following proposition:

***Proposition* 6:** If firms ignore each other's pricing behavior, in this case $\gamma = 0$, we have lower prices and profits in both periods in both the myopic case and the perfect foresight case than if goods were substitutes or related, that is $\gamma > 0$. In addition the result tells

that both firms' equilibrium profits are lower when goods are independent and products are totally differentiated in both the first and second periods. Moreover, bank A makes less first-period profits in the perfect foresight case than it does in the myopic case. On the other hand, bank A's second period and total discounted profits are higher in the perfect foresight case than they are in the myopic case.

3.3.4. Case where C = 0 and β = γ

From (10) and (13) with $\beta = \gamma$ and $C = 0$, it follows that the myopic prices are

$$P_1 = P_{1A} = P_{1B} = \frac{\alpha}{\beta} \quad \textbf{(77)}$$

$$P_2 = P_{2A} = P_{2B} = \frac{A + \alpha\delta}{\beta} \quad \textbf{(78)}$$

From (21) and (22) with $\beta = \gamma$ and $C = 0$, it follows that the perfect-foresight prices are

$$P_1 = P_{1A} = P_{1B} = \frac{\alpha - \lambda\alpha\,\delta^2 - A\lambda\delta}{\beta} \quad \textbf{(79)}$$

$$P_2 = P_{2A} = P_{2B} = \frac{A + \alpha\delta}{\beta} \quad \textbf{(80)}$$

I will consider the following parameter values for numerical example 4.

$$\alpha = 10,\ A = 10,\ \lambda = 0.7,\ \delta = 0.2,\ \beta = 2,\ \gamma = 2,\ C = 0,\ F = 0. \quad \textbf{(81)}$$

Inserting the values in (81) in equations (77) and (78), the myopic prices are

$$P_1 = P_{1A} = P_{1B} = \frac{\alpha}{\beta} = 5.000 \quad \textbf{(82)}$$

$$P_2 = P_{2A} = P_{2B} = \frac{A + \alpha\delta}{\beta} = 6.000 \quad \textbf{(83)}$$

Inserting the values in (81) in equations (79) and (80), prices in the perfect foresight case are

$$P_1 = P_{1A} = P_{1B} = \frac{\alpha - \lambda\alpha\,\delta^2 - A\lambda\delta}{\beta} = 4.160 \quad \textbf{(84)}$$

$$P_2 = P_{2A} = P_{2B} = \frac{A + \alpha\delta}{\beta} = 6.000 \quad \textbf{(85)}$$

Therefore, we have the following proposition.

Proposition 7: Given that the total demand for the goods is fixed, that is $\beta = \gamma$, then we have higher prices in both periods in both the myopic case and the perfect foresight case than in the case where demand for the goods is independent, that is $\gamma = 0$.

Consider profits. Using equations (6), (8), (81), $P_1 = P_{1A} = P_{1B}$, $P_2 = P_{2A} = P_{2B}$, and $\beta = \gamma$, profits in the first period are

$$\pi_1 = \pi_{1A} = \pi_{1B} = P_1(\alpha - \beta P_1 + \gamma P_1) = P_1\alpha \quad \textbf{(86)}$$

Using equations (6), (8), (81), $P_1 = P_{1A} = P_{1B}$, $P_2 = P_{2A} = P_{2B}$, and $\beta = \gamma$, profits in the second period are

$$\pi_2 = \pi_{2A} = \pi_{2B} = P_2(A - \beta P_2 + \gamma P_2 + \delta(\alpha - \beta P_1 + \gamma P_1))$$

$$= P_2(A + \delta\alpha) \quad \textbf{(87)}$$

Using equation (3), the total discounted profits are

$$\pi_A = \pi_B = \pi_1 + \lambda\pi_2 \quad \textbf{(88)}$$

Using (77), (81), and (86), profits in the myopic case in the first period are

$$\pi_1 = \pi_{1A} = \pi_{1B} = P_1\alpha = \frac{\alpha^2}{\beta} = 50.000 \quad \textbf{(89)}$$

Using (78),(81), and (87), profits in the myopic case in the second period are

$$\pi_2 = \pi_{2A} = \pi_{2B} = P_2(A + \delta\alpha) = \frac{(A+\alpha\delta)^2}{\beta} = 72.000 \quad \textbf{(90)}$$

Using (81), (88), (89), and (90), each firm's total discounted profits under myopic case are

$$\pi_A = \pi_B = 50.000 + 0.7(72.000) = 100.400 \quad \textbf{(91)}$$

Now consider the perfect-foresight case. Using (81), (84), and (86), profits in the perfect foresight case in the first period are

$$\pi_1 = \pi_{1A} = \pi_{1B} = \frac{\alpha^2 - \lambda\alpha^2\delta^2 - \alpha A\lambda\delta}{\beta} = 41.600 \quad \textbf{(92)}$$

Using (81), (85), and (87), profits in the perfect foresight case in the second period

$$\pi_2 = \pi_{2A} = \pi_{2B} = \frac{(A + \delta\alpha)^2}{\beta} = 72.000 \quad \textbf{(93)}$$

Using (81), (88), (92), and (93), each firm's total discounted profits in the perfect foresight case are

$$\pi_A = \pi_B = 41.000 + 0.7(72.000) = 91.400 \quad \textbf{(94)}$$

Thus we have the following proposition

***Proposition* 8:** In this case, the total demand for the two goods is fixed, that is $\beta = \gamma$. The first period, and total discounted profits are higher in the myopic case than they are in the perfect foresight case. However, the second-period profits are the same in the myopic case and the perfect foresight case.

3.4. Conclusions

This chapter shows that there is a relationship between pricing and consumer switching costs (or "brand loyalty"). Moreover, it suggests that in the presence of switching costs, firms will charge lower prices in the first period to gain market share that will be valuable to them in the future and therefore charge higher prices in the

future, utilizing the market shares they have gained in the first period. This will give firms a degree of monopoly power over their existing customers, leading to higher prices and profits in the future. For example, credit card issuers may choose to offer lower prices (card interest rates) to risky consumers – students on college campuses – who may be profitable to them, because these consumers have high switching costs. This will happen if firms have perfect foresight, and it may lead to either higher or lower equilibrium profits than if firms behave myopically.

References

Kim, M., Klinger, D., Vale, B., 2003. Estimating Switching Costs: The Case of Banking. Journal of Financial Intermediation 12, 25-56.

Klemperer, P., 1987a. Markets With Consumer Switching Costs. Quarterly Journal of Economics. 102, 375-394.

Klemperer, P., 1987b. The competitiveness of Markets With Consumer Switching Costs. Rand Journal of economics 18, 137-150.

Stango V, 2000. Competition in the Credit Card Market. Review of Economics and Statistics 82, 499-508.

CHAPTER 4

METHODS

4.1. Data Source and Variables

The unique data set used in this research comes from the Center for Human Resource Research (CHRR) at The Ohio State University and is known as the Consumer Finance Monthly (CFM). The Consumer Finance Monthly (CFM) is an on-going national survey that asks unique questions on credit card usage that are not available in any major national surveys.

The CFM was instituted in 2005 and has been conducted each month with a random sample of adult household members. A minimum of 300 surveys are completed each month. The random–digit–dialing method of sample selection is used to select a nationwide sample. By the end of 2009, about 16,000 cases have been completed and are available for research. Compared with the Survey of Consumer Finances (SCF), that takes place once every three years, and sponsored by the Board of Governors of the Federal Reserve System, the CFM provides more detailed and up-to-date data on consumer finances to reflect the most recent changes in consumer behavior in the credit card industry in terms of credit card usage. The CFM includes a variety of variables on credit card use, such as balance switching, monthly charges, revolving balances, annual percentage rate, number of cards maxed out, and monthly payments. The CFM also includes detailed questions on credit knowledge, credit stress, bill payment, demographic information, expectations about the future, household

debts, savings, and assets. Moreover, besides detailed questions of household credit card use, the CFM includes a complete series of questions on household assets and liabilities that allows researchers to analyze consumers' behavior in relation to credit cards in the context of their overall financial situations.

The variables used in the analysis can be grouped into three broad categories: credit card related variables, balance switching variables, and socioeconomic variables. Annual percentage rate (APR), amount owed on all credit cards, and borrowing limit are important contractual variables in the credit card section. Balance switching section variables include whether or not any balances have been switched in the past 6 months, introductory teaser rates, balance switching fee, number of household credit cards, APR on the card switched away from, and APR on the card switched to. Socioeconomic variables can be divided into two subgroups: demographic variables and financial variables. Demographic variables include age and marital status. Financial variables include homeownership.

The following are the credit card questions from the CFM that are used in this paper.

1. Do you have any credit cards? How many credit cards do you have.

2. In the past 6 months, have you switched any balances between cards or to a new card?

3. What was the old interest rate on the card you switched away from?

4. What was the interest rate on the card you switched to?

5. If you had an unpaid balance on the card you charge the most on, what interest

rate would you have to pay.

6. Please think about the credit card on which you owe the most. What is the interest rate for unpaid balances on this card?

7. Are there any attractive reward features on this card?

8. In the past 6 months, what was the lowest credit card interest rate offer you got in the mail?

9. For all your credit cards taken together, after any payments you have made or will make on your most recent bills, how much you still owe on them?

10. Is your house/ apartment in which you live is either owned or being bought?

11. Do you currently have Home Equity Line of Credit (HELOCs)?

12. What year you were born?

13. What is your current marital status?

The original sample in 2006, 2007, 2008, and 2009, CFM includes 12,962 households. On average, 75% of the households in the U.S. population have at least one credit card, and among all cardholders about 40 percent have unpaid balances on their credit cards. The average balance for those carrying a balance amounted to about $8,000. In this study, those who have at least one credit card are considered, which will give us a sample of 1,101 households including only revolvers (those who do not pay in full each month) of whom 186 cardholders switched cards and 915 did not. Figure 4.1 and Figure 4.2 present detailed statistics on switchers and non-switchers in the sample. Detailed variables definitions and summary statistics (actual and percentage values) are provided in Table 4.1. The means and standard deviations in the table are computed using sample weights so that the descriptive statistics are representative of the U.S

population. Only households who have at least one credit card are considered in the calculation of the descriptive statistics.

4.2. Logit Model Specification

The structural method employed in this study resembles models discussed by Maddala (1992), Pindyck & Rubinfeld (1976), Greene (2003), and Ashenfelter et al. (2003 pp. 235-240). To examine the consumer decision of whether or not to switch a credit card (balances), logistic regression analysis is the most appropriate type of examination. The general formulation of the logit model is given by Greene (2003 pp. 669). The consumer's switching decision is modeled as

$$Y_i^* = X_i'\beta + \varepsilon_i \qquad \textbf{(4.1)}$$

with

$$Y_i = 1 \qquad if \;\; Y_i^* > 0$$

$$Y_i = 0 \qquad if \;\; Y_i^* \leq 0$$

The subscript i refers to cardholders. $Y_i \in \{0,1\}$ denotes the absence or presence of switching (Y_i = 1 if the consumer switches and Y_i = 0 if he/she does not switch). In this formulation, $X_i'\beta$ is called the index function (Greene 2003 pp. 669), where Y_i^* is a latent (unobserved) variable for credit card switching and the dichotomous variable Y_i is the observed variable. The vector of covariates X_i' controls for a variety of socioeconomic variables (financial and demographic) that may correlate with a household's decision whether or not to switch a credit card. These include age, APR, fee, balances, homeownership, and HELOC. The explanatory variables can themselves be binary or dummy or quantitative or a mixture thereof. This is because logistic regression makes no assumptions about the distribution of the independent variables. Table 4.1 presents

the definitions of all variables used in this analysis. β is a vector of regression coefficients of the predictor variables and ε_i is the error term, assumed to have a log-Weibull (double exponential) distribution with a reverse extreme value distribution, that is asymmetric and has a long tail to the right, with c.d.f: (Greene 2003, pp. 720):

$$F(\varepsilon_i) = exp^{-e^{-\varepsilon_i}} \quad \textbf{(4.2)}$$

In this notation e represents the base of natural logarithms which is approximated at 2.718.

When using dummy variables, the dependent variable is not continuous but binary or dichotomous (a category variable that has two values such as “yes” and “no”). In this case, the dependent variable takes the two values (1, 0). Positive or (yes) response would be assigned a value of one, while a negative response would be assigned a value of zero. Since a positive outcome occurs only when the latent variable exceeds the threshold, the logit specification of a positive outcome is of the following form

$$Prob[Y_i = 1] = \frac{exp(X_i'\beta)}{1+ exp(X_i'\beta)} = \frac{1}{1+ exp-(X_i'\beta)} \quad \textbf{(4.3)}$$

$$Y_i = \begin{cases} 1 & \text{if the offer to switch is accepted} \\ 0 & \text{if the offer to switch is rejected} \end{cases}$$

Equation (4.3) represents what is known in statistics as the (cumulative) logistic probability distribution function. Where Y_i is the binary dependent variable indicating whether or not cardholder i switches a credit card. exp is the exponential function, sometimes written as e. When cardholder i switches balances, Y_i takes the value 1; otherwise Y_i is equal to 0.

If Prob[Y = 1] is the probability of switching a credit card as given by (4.3), then the

probability of not switching a credit card. It is given by:

$$Prob[Y_i = 0] = 1 - Prob[Y_i = 1] = 1 - \frac{exp(X_i^{'}\beta)}{1+ exp(X_i^{'}\beta)} = \frac{1}{1+ exp(X_i^{'}\beta)} \quad \textbf{(4.4)}$$

The general formulation of the logit model for the general case of (4.3) and (4.4) is given by Greene (2003 pp. 663-755). The estimation method for the logit model is maximum likelihood. The maximum likelihood function for a sample of n observations can be conveniently written as:

$$L(\beta|Data) = \prod_{i=1}^{n}\left[F\left(X_i^{'}\beta\right)\right]^{Y_i}\left[1 - F\left(X_i^{'}\beta\right)\right]^{1-Y_i} \quad \textbf{(4.5)}$$

for $Y_i = 0,1$. If $Y_i = 0$, we obtain equation (4.3), and if $Y_i = 1$, we obtain equation (4.4). The log-likelihood function is

$$\begin{aligned} \ln[L(\beta|\, X_i)] &= ln\, L(\,\beta|X_i) = \sum_{i=1}^{n}\{Y_i ln\, F(X_i'\beta) + (1 - Y_i)\, ln[1 - F(X_i'\beta)]\} \\ &= \sum_{i=1}^{n}\{\, Y_i \ln[\frac{exp(X_i'\beta)}{1+ exp(X_i'\beta)}] + (1 - Y_i) \ln[1 - \frac{exp(X_i^{'}\beta)}{1+ exp(X_i^{'}\beta)}]\} \\ &= \sum_{i=1}^{n}\{Y_i \ln[\frac{exp(X_i'\beta)}{1+ exp(X_i'\beta)}] + (1- Y_i) \ln[\frac{1}{1+ exp(X_i^{'}\beta)}\,]\} \\ &= \sum_{i=1}^{n}\{Y_i X_i'\beta - ln(1 + exp(X_i'\,\beta))\} \end{aligned} \quad \textbf{(4.6)}$$

To examine the effect that a particular independent variable (X_n) has on the probability of switching cards, we need to calculate the marginal effect that an independent variable (X_n) has on the probability of switching for cardholder i. The marginal effect that an independent variable (X_n) has is calculated by taking the partial derivative of $Prob(Y_i = 1)$ with respect to $(X)_n$. Hence, in the logit model we can see that the estimated marginal effect of an independent variable (X_n) on the credit card switching probability $Prob[Y_i = 1]$ is given as follows:

$$\frac{\partial\, Prob(Y_i=1)}{\partial X_n} = \frac{\partial F(X_i'\beta)}{\partial X_n}\beta_n$$

$$= \frac{exp(X_i'\beta)}{1+exp(X_i'\beta)}\left[1-\frac{exp(X_i'\beta)}{1+exp(X_i'\beta)}\right]\beta_n$$

$$= \beta_n[P(Y_i=1)(1-P(Y_i=1))] \quad \textbf{(4.7)}$$

The derivative in (4.7) is often evaluated at the mean of the explanatory variable and the marginal effects are calculated for a representative cardholder with sample mean characteristics (the proportion of cases with the same attribute of interest in the sample). The result approximates the effect of the covariate near the mean of the response. On the other hand, it is clear that the effect of (X_n) predictor on the probability of switching cards is not linear and depends on: the coefficient β_n, the value of the probability, and the value of the independent variable (X_n). For continuous independent variables, the marginal effect is the estimated effect on the probability of switching cards per unit change in the given independent variable. For dummy or category variables, the marginal effect is the estimated effect on the probability of switching cards when the dummy variable of interest switches from 0 to 1.

4.3. Methodology: A Simple Consumer Choice Model

Consider the following simple model of consumer choice. To simplify the notations, I have avoided using subscripts of i, which could be added to represent different consumers. There is a time period of length L. During this time period, a consumer earns income at the rate of M per unit of time. The consumer has a credit card with interest rate r_0, and balances B. At the beginning of the time period of length

L, the consumer gets an offer of a credit card with interest rate r_1, which is less than r_0. Suppose that this interest rate lasts until the end of the period of length L, which is short enough that we don't have to consider discounting the future, and that at the end of the period L, the interest rate the consumer has to pay is r_0 again (whether or not the consumer accepted offer). The consumer has a transactions cost (or switching cost) of T if and only if he/she accepts the offer. The consumer's two choices are: do not accept the offer or accept the offer. The two possible net incomes for the consumer are

$$I_0 = (M - r_0 B)L \tag{4.8}$$

$$I_1 = (M - r_1 B)L - T \tag{4.9}$$

where

I_0 is consumer's net income if she does not accept the new offer,

I_1 is consumer's net income if she accepts the new offer.

The two corresponding utility levels for the consumer are

$$\begin{aligned} U_0 &= \beta(M - r_0 B)L + \varepsilon_0 \\ &= \beta ML - \beta r_0 B\, L + \varepsilon_0 \end{aligned} \tag{4.10}$$

$$\begin{aligned} U_1 &= \beta((M - r_1 B)L - T) + \varepsilon_1 \\ &= \beta ML - \beta r_1 BL - \beta T + \varepsilon_1 \end{aligned} \tag{4.11}$$

where

U_0 is consumer's utility if she rejects the new offer,

U_1 is consumer's utility if she accepts the new offer,

ε_0 is the error term affecting utility in period 0,

ε_1 is the error term affecting utility in period 1.

The consumer will accept the new offer if and only if $U_1 > U_0$ and will reject it if $U_1 \leq U_0$.

Y = 1 means that the consumer will accept the offer.

Using (4.12) and (4.13), we get

$$Prob\ [Y = 1] = Prob[U_1 > U_0]$$

$$= Prob[\beta ML - \beta r_1 BL - \beta T - \beta ML + \beta r_0 BL + \varepsilon_1 - \varepsilon_0 > 0]$$

$$= Prob[-\beta r_1 BL - \beta T + \beta r_0 BL + \varepsilon_1 - \varepsilon_0 > 0]$$

$$= Prob[-\beta(r_1 - r_0)BL - \beta T + \varepsilon_1 - \varepsilon_0 > 0]$$

$$= Prob[\varepsilon_1 - \varepsilon_0 > \beta(r_1 - r_0)BL + \beta T] \quad \textbf{(4.12)}$$

The term on the right-hand side of the inequality in the last line of (4.12) is equivalent to the negative of the term $X_i\beta'$ in (4.3), except that we have not included the subscript i in (4.8)-(4.12).

Thus we have

$$Prob[Y = 1] = \frac{1}{1 + e^{\beta(r_1 BL - r_0 BL + T)}} \quad \textbf{(4.13)}$$

Y = 0 means that the consumer will reject the new offer. Therefore,

$$Prob[Y = 0] = 1 - Prob[Y = 1] = 1 - \frac{1}{1 + e^{\beta(r_1 BL - r_0 BL + T)}} \quad \textbf{(4.14)}$$

The odds ratio in favor of switching a credit card, that is the ratio of the probability that cardholder i will switch her credit card to its complement (the probability of not switching cards) is

$$\frac{Prob[Y = 1]}{1 - Prob[Y = 1]} = \frac{\frac{1}{1 + e^{\beta(r_1 BL - r_0 BL + T)}}}{1 - \frac{1}{1 + e^{\beta(r_1 BL - r_0 BL + T)}}} = \frac{1}{e^{\beta(r_1 BL - r_0 BL + T)}} \quad \textbf{(4.15)}$$

Taking logarithms and calculating the logit or log-odds, we gain the log of the odds ratio,

that is called the logistic transformation, or logit for short

$$\text{Logit (Y) = ln(odds)} = \ln\left(\frac{Prob[Y_i = 1]}{1 - Prob[Y_i = 1]}\right)$$

$$= \ln\left(\frac{1}{e^{\beta(r_1 BL - r_0 BL + T)}}\right)$$

$$= -\beta(r_1 BL - r_0 BL + T), \quad \textbf{(4.16)}$$

where ln is the natural log function. The marginal effect of switching costs on the probability of switching is calculated by taking the partial derivative of the probability of switching with respect to T. The estimated marginal effect of switching cost on the probability of switching is given by

$$\frac{\partial Prob[Y = 1]}{\partial T} = \frac{-\beta e^{\beta(r_1 BL - r_0 BL + T)}}{(1 + e^{\beta(r_1 BL - r_0 BL + T)})^2} < 0 \quad \textbf{(4.17)}$$

Proposition 1: The likelihood of switching cards decreases with increasing switching costs.

The marginal effect of the old interest rate (the interest rate on the current card) on the probability of switching is calculated by taking the partial derivative of the probability with respect to r_0. The estimated marginal effect of r_0 on the probability of switching is given by

$$\frac{\partial Prob[Y = 1]}{\partial r_0} = \frac{\beta BL e^{\beta(r_1 BL - r_0 BL + T)}}{(1 + e^{\beta(r_1 BL - r_0 BL + T)})^2} > 0 \quad \textbf{(4.18)}$$

Proposition 2: The likelihood of switching cards (balances) increases with an increasing current interest rate.

The marginal effect of new interest rate (the introductory or teaser rate on the new card) on the probability of switching is calculated by taking the partial derivative of the

probability of switching with respect to r_1. The estimated marginal effect of the new rate on the probability of switching is given by

$$\frac{\partial Prob[Y=1]}{\partial r_1} = \frac{-\beta BL e^{\beta(r_1 BL - r_0 BL + T)}}{(1 + e^{\beta(r_1 BL - r_0 BL + T)})^2} < 0 \qquad \textbf{(4.19)}$$

Proposition 3: The likelihood of switching cards (balances) decreases with an increasing new interest rate.

The marginal effect of credit card debt (balances) on the probability of switching is calculated by taking the partial derivative of the probability of switching with respect to B. The estimated marginal effect of credit card balances on the probability of switching, assuming that the interest rate on the credit card that is switched to is less than the interest rate on the credit card that switched away from is given by

$$\frac{\partial Prob[Y=1]}{\partial B} = \frac{-\beta(r_1 L - r_0 L + T) e^{\beta(r_1 BL - r_0 BL + T)}}{(1 + e^{\beta(r_1 BL - r_0 BL + T)})^2} > 0 \qquad \textbf{(4.20)}$$

Proposition 4: Assuming that $r_0 > r_1$, then the likelihood of switching cards increases with increasing credit card outstanding balances.

The marginal effect of the introductory rate duration (length of time) on the probability of switching is calculated by taking the partial derivative of the probability of switching with respect to L. The estimated marginal effect of L on the probability of switching, assuming that $r_1 < r_0$, is given by

$$\frac{\partial Prob[Y=1]}{\partial L} = \frac{-\beta(r_1 B - r_0 B + T) e^{\beta(r_1 BL - r_0 BL + T)}}{(1 + e^{\beta(r_1 BL - r_0 BL + T)})^2} > 0 \qquad \textbf{(4.21)}$$

Proposition 5: The likelihood of switching balances increases with an increasing introductory rate time period.

4.4. The Econometric Model

4.4.1. Model Specification

Based on consumer choice theory, the individual decision for credit card switching, CCS_i, among cardholders can be specified as:

$$CCS_i = f(P_i, M_i, G_i, E_i) \quad \textbf{(4.22)}$$

where P_i is the price of credit as measured by annual percentage rate (APR); M_i is a vector of socioeconomic (demographic and financial) variables; G_i is a vector of credit card related variables; and E_i is a vector of dummy variables.

To control for socioeconomic (demographic and financial) individuals' differences, the vector of explanatory variables under M_i includes age, marital status, and homeownership.

Analyzing consumer behavior in the credit card market by tracking changing consumer switching behavior among consumers who revolve balances (do not pay balances in full each month) allows us to look at consumer behavior from broader prospective. Figure 4.3 compares the mean reduction in the new Annual Percentage rate (APR_1) switchers and non-switchers. Figure 4.4 compares the percentage reduction of the new Annual Percentage Rate (APR_1) for switchers and non-switchers. Figure 4.5 shows that large number of non-switchers received offers with lower rates than what they already had but they did not switch, because these rates are introductory and associated with high switching fees. On the other hand, understanding the determinants of consumer ability to switch balances from cards that have high interest

rates to the ones with low introductory interest rates will allow us to understand how consumers maximize their utilities by switching balances.

4.4.2. The Econometric Model

On the basis of the theoretical considerations, the following two regression equations are run, logit models will be estimated using logistic regression models for estimating the probability of a cardholder's credit card (balances) switching:

Model 1:

$$Y_{1i}^{*} = \beta_0 + \beta_1(\mathrm{APR}_0)_\mathrm{i} + \beta_2(\mathrm{APR}_1)_\mathrm{i} + \beta_3(\mathrm{INTRO})_\mathrm{i} + \beta_4(\mathrm{BAL})_\mathrm{i} + \beta_5(\mathrm{NCC}))_\mathrm{i} + \beta_6(\mathrm{AGE})_\mathrm{i} + \beta_7(\mathrm{MS})_\mathrm{i} + \beta_8(\mathrm{HO})_\mathrm{i} + \mathcal{E}_\mathrm{i} \quad \textbf{(4.23)}$$

and

Model 2:

$$Y_{2i}^{*} = \beta_0 + \beta_1(\mathrm{BENEFITS})_\mathrm{i} + \beta_2(\mathrm{NCC})_\mathrm{i} + \beta_3(\mathrm{AGE})_\mathrm{i} + \beta_4(\mathrm{MS})_\mathrm{i} + \beta_5(\mathrm{HO})_\mathrm{i} + \mathcal{E}_\mathrm{i} \quad \textbf{(4.24)}$$

where $Y_i = 1$ if a consumer switches and $Y_i = 0$ if the consumer does not switch. β_1, β_2, β_3, β_4, β_5, β_6, β_7, and β_8 are unknown parameters to be estimated. Finally, ε_i is the error term. Switching benefits in equation (4.24) is obtained according to the following formula: $(r_0 - r_1)BL$ for each observation in the sample. where r_0 is the old interest rate (APR_0), r_1 is the new offer interest rate (APR_1), B is the outstanding balances, and L is the duration of the new offer introductory rate (APR_1). Maximum likelihood estimation is used to estimate the above proposed econometric models. The logit model is based on the cumulative logistic probability of switching as explained by the explanatory variables included in the proposed econometric models and defined in Table 4.1 below. Table 4.1 presents the definitions of all explanatory variables used in this study. Means and standard deviations for the financial, socioeconic and demographic variables used in

this study for the total sample are presented in table 4.2 below. Table 4.3 compares the sample characteristics of switchers and non-switchers.

Variables	Type	Definition of Variables
Y_i	Binary	1 – If switched 0 – Otherwise
APR_0[5]	Continuous	Interest rate on card switched from
APR_1	Continuous	Interest rate on card switched to
Intro Rate Period	Continuous	Number of months APR_1 is an introductory rate
Balance	Continuous	Balances of all credit cards
NCC	Continuous	Number of household credit cards
Age	Continuous	Age of respondent
Marital Status	Binary	1 – If married 0 – Otherwise
Home Ownership	Binary	1 – If owns a home 0 – Otherwise
Benefits of Switching	Continuous	Amount Saved By Switching according to the formula: $[(APR_0 - APR_1) \times Balance \times Intro\ Rate\ Period]$

Table 4.1: Definition of Variables

[5] Note: APR_0 and APR_1 for those who did not switch was determined by the interest rate on the card on which they owe the most and the lowest rate the consumer was offered through the mail.

Variables	Sample Mean	Sample Standard Deviation
Y_i	0.17	0.26
APR_0	12.75	6.23
APR_1	3.67	5.57
Intro Rate Period	9.03	9.62
Balance	7606.13	10775.92
NCC	3.40	2.28
Age	48.55	15.60
Marital Status	0.68	0.49
HomeOwnership	0.83	0.41
Switching Benefits ($)[6]	604.37	1348.09

Table 4.2: General Sample Characterstics (N = 1,101)

[6]**Note:** Amount Saved By Switching according to the formula: $[(APR_0 - APR_1) \times Balance \times Intro\ Rate\ Period]$

Variables	Sample mean		Sample Standard Deviation	
	Non-Switchers (n=915)	Switchers (n=186)	Non-Switchers (n=915)	Switchers (n=186)
y_i	0.00	1.00	0.00	0.00
APR_0	12.14	15.75	7.32	6.77
APR_1	3.88	2.65	5.31	4.27
Intro Rate Period	9.50	6.76	9.43	10.20
Balance	6,535.84	12,871.24	9,420.75	14,779.49
NCC	3.23	4.23	2.24	2.60
Age	48.76	47.51	12.31	11.88
Marital Status	0.67	0.68	0.46	0.47
Home Ownership	0.82	0.90	0.39	0.30
Benefits of Switching (in Dollars Saved)	434.75	1438.81	1125.20	1925.76

Table 4.3: Sample Characterstics of Switchers and Non-Switchers (N = 1,101)

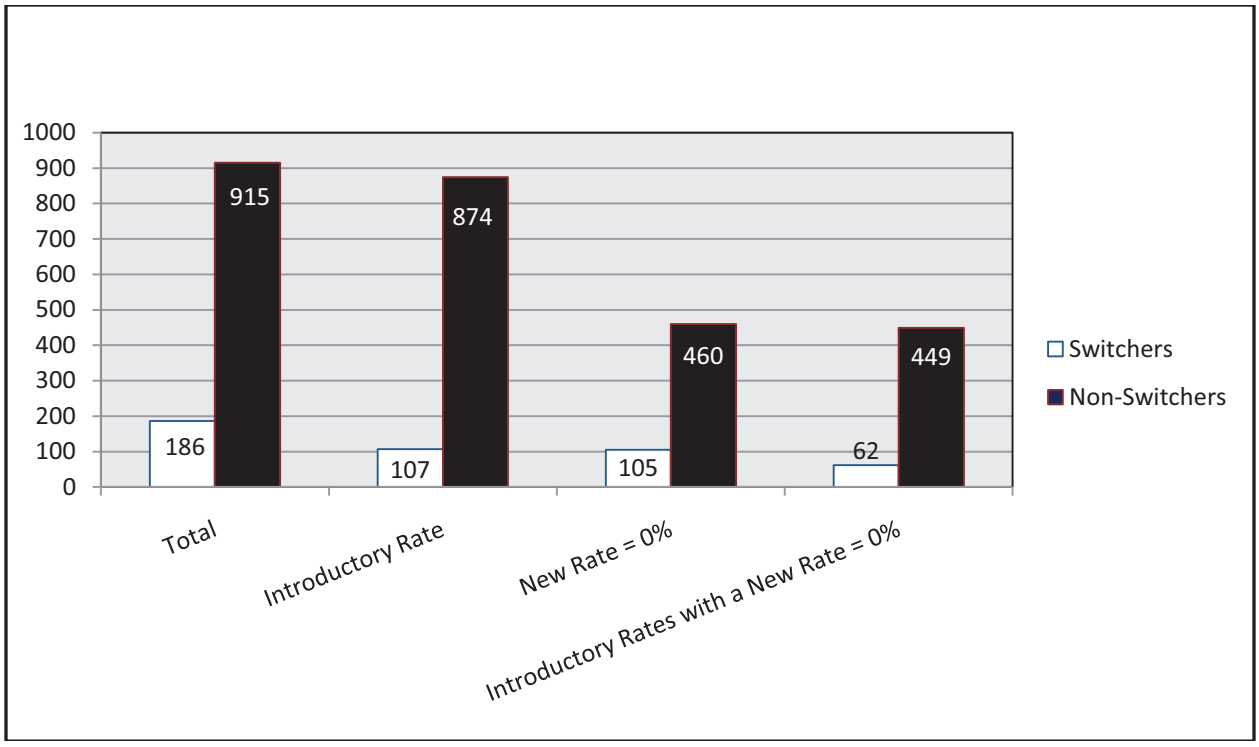

Figure 4.1: Comparisons between Switchers' Data and Non-Switchers' Data

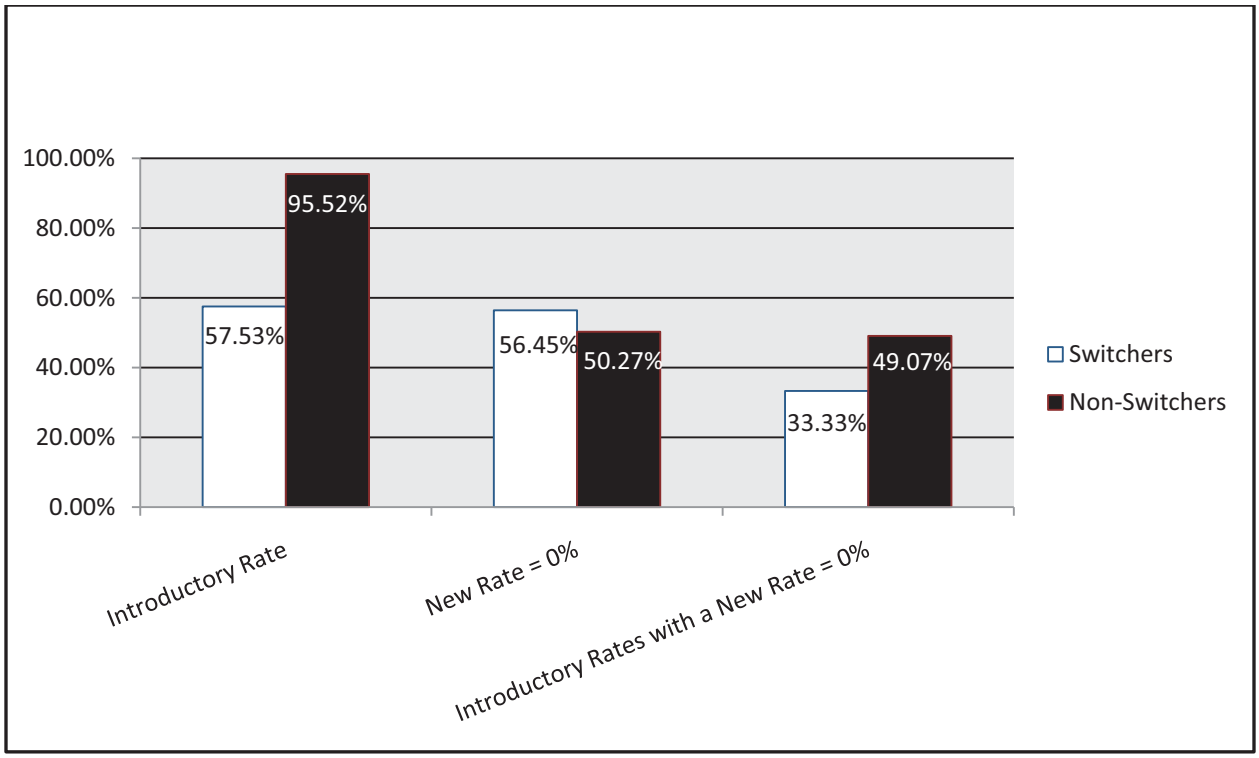

Figure: 4.2: Comparison of Percentages between Switchers and Non-Switchers

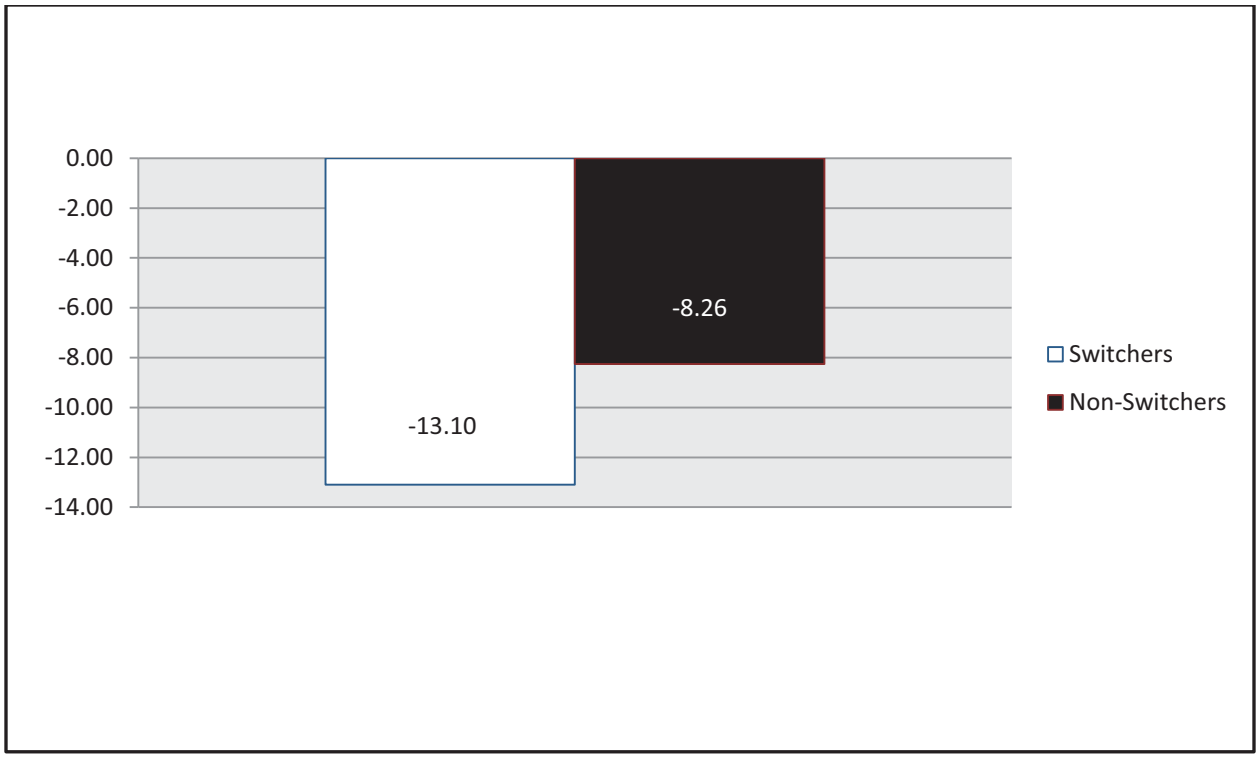

Figure 4.3: Comparison between APR Switchers and APR Non-Switchers

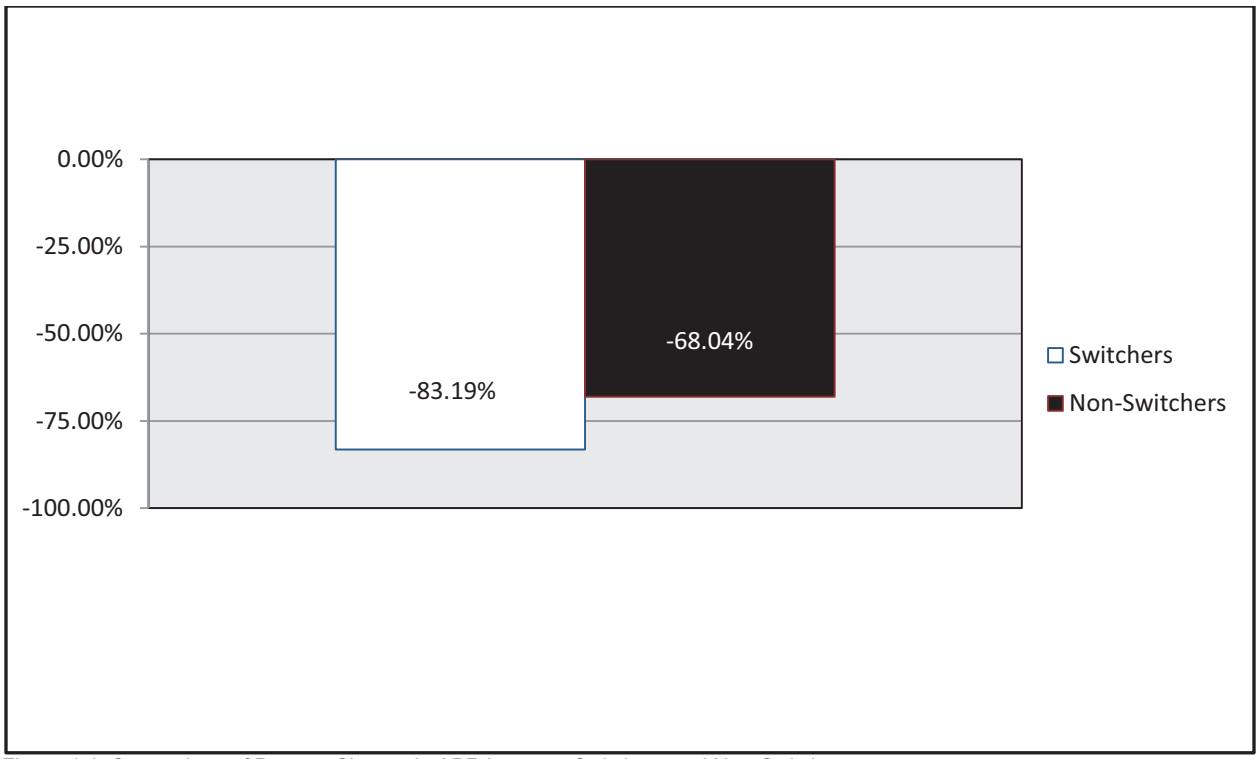

Figure 4.4: Comparison of Percent Change in APR between Switchers and Non-Switchers

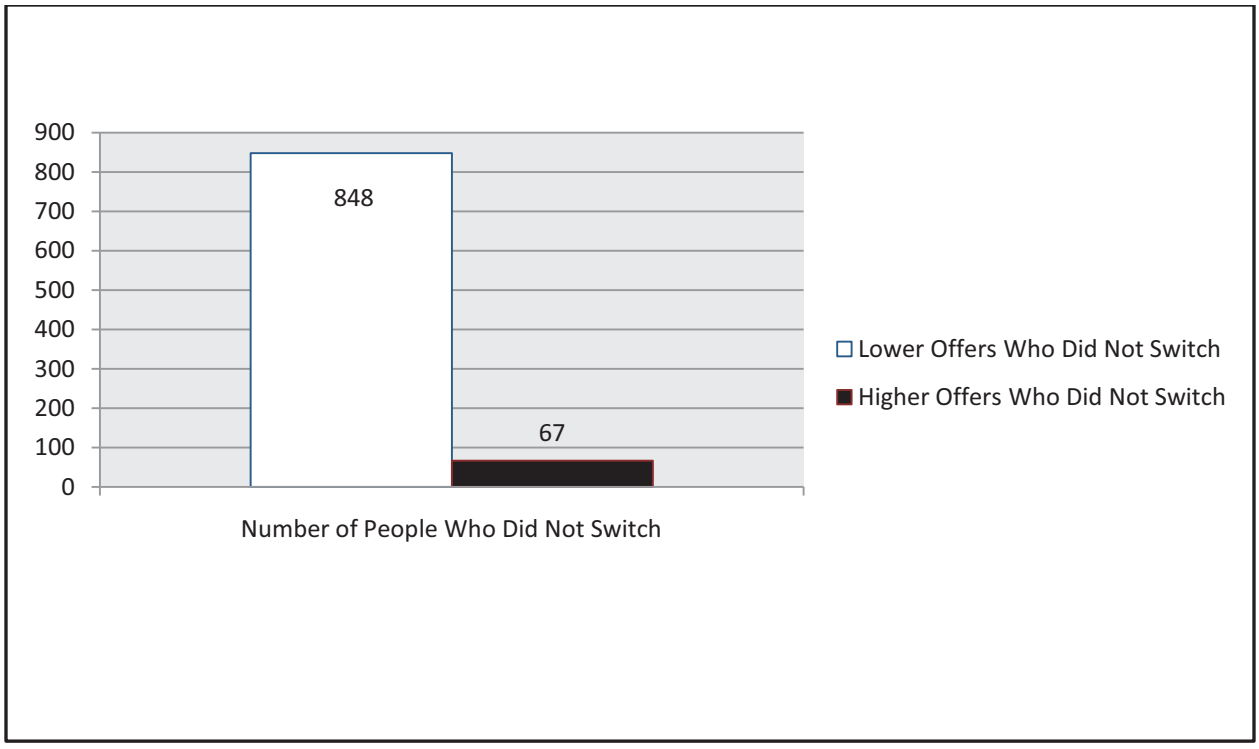

Figure: 4.5: Comparison between Non-Switchers with Lower Rates in the Mail and Non-Switchers with Higher Rates in the Mail

CHAPTER 5

EMPIRICAL RESULTS

5.1. Model 1 Determinants of Credit Card Switching

Table 5.1 presents the results of the model 1 (equation 4.23) logit estimation for credit card switching. Besides the parameters coefficients and standard errors, marginal effects around the mean are also reported to reflect the estimated changes in the probability of switching. The marginal effects are calculated for a representative household with sample mean characteristics. These regression results support the general conclusion that consumers' balances switching is systematically related to the explanatory variables. Moreover, they show variables that seem to explain what influences consumer behavior toward switching. Among these variables are: old interest rate, new interest rate, duration of the introductory rate, balances, number of credit cards (NCC), homeownership, and age. At the conventional 5 percent standard level for statistical significance, the following coefficients have significance: old interest rate, new interest rate, duration of the introductory rate, balances, number of credit cards, homeownership, and age.

One of the key variables of the study, interest rate, is a significant determinant of credit-card switching. When shopping for credit cards in the market, revolvers usually prefer offers with lower interest rates, although convenience users are not as sensitive to the interest rate as revolvers (Canner and Luckette, 1992).

Not surprisingly, the old interest rate is positively and significantly related to the likelihood of switching and the marginal effect is about 1.03 percent points with every one unit increase in the old interest rate..

In recent years, card issuers have made widespread of “teaser” rates, soliciting cardholders to switch banks. These teaser rates are simply much lower than the prevailing rate for the first year or so, encouraging cardholders to switch balances to the lower interest rates. After the introductory rate offer period ends, card issuers will increase the rate to prime plus a dozen. The new interest rate is negatively and significantly associated with the likelihood of switching because the interest rate is the price of borrowing and it is more expensive to borrow on credit cards with higher interest rates. Holding other variables constant at sample mean levels, one unit increase in the new interest rate (APR_1) will decrease the likelihood of switching by 0.97 percentage points for a representative household. Hence, my empirical results support and the following theoretical predictions: $\frac{\partial(\mathrm{Y}=1)}{\partial \mathrm{r}_0} > 0 \text{ and } \frac{\partial(\mathrm{Y}=1)}{\partial \mathrm{r}_1} < 0$ (see propositions 2 and 3 in chapter 4). Curiously enough, this empirical finding is inconsistent with Ausubel’s (1991) finding that cardholders act myopically and do not foresee indebtedness and interest payments on their outstanding balances.

The duration of new introductory offer rates is positively related to the likelihood of switching and the marginal effect is 0.23 percentage points with each additional one month (period) increase in the duration of a new introductory rate offer the representative household is offered, which means that I have empirical support for the following prediction: $\frac{\partial(\mathrm{Y}=1)}{\partial \mathrm{L}} > 0$ (see proposition 5 in chapter 4).

Multiple credit cards increase the available funds for borrowing and therefore the likelihood of switching. Holding multiple credit cards by a consumer may be an indication of this consumer's willingness to take on a high debt which may be manifested in higher balances held. The logit model shows that number of credit cards is significantly and positively related to the likelihood of switching and the marginal effect is 0.94 percentage points with one additional credit card the representative household has. Switchers tend to hold more credit cards because they can save money by transferring balances from credit cards with higher interest rates to those with lower interest rates. This makes sense because the more credit cards a consumer has the more freedom he/she has to switch balances between existing cards, consistent with Cargill and Wendel's (1996) finding that people obtain more cards to allow for larger balances.

Compared with transactors, revolvers tend to have more credit cards as well as more balances. Therefore, revolvers have more incentives to search for lower rates. This is consistent with Cook's (2002) finding that that credit card holders with high balances do not seem to search less than those with lower balances. Moreover, economic theory indicates that credit card balances should fall as the APR increases. However, Min and Kim (2003) found that for households, interest rates had no significant effect on the amount of borrowing, only on the borrowing decision. The empirical regression results obtained in this study fit the theory fairly well. The higher the balances of a representative household, the higher the probability of switching. Hence, credit card balances have the expected positive and significant effect on the likelihood of switching. For a household with sample mean characteristics, each

additional $100 increase in balances will increase the probability of switching by 0.04473 percentage points. Thus, I have empirical support for the following prediction: $\frac{\partial(Y=1)}{\partial B} > 0$ (see proposition 4 in chapter 4).

Among demographic variables, age is significantly and negatively associated with the decision of switching and with each additional year of age the probability of switching cards goes down by 0.19 percentage points. The negative coefficient on age is consistent with Calem and Mester's (1995) and Min and Kim's (2003) findings that credit card balances are negatively related to age. They argue that older households are less likely to use credit cards for borrowing than younger households and the more elderly an applicant is, the greater the physical difficulty of searching for lower interest rates is. Also, some elderly consumers may prefer the traditional payment methods to credit cards, consistent with the premise that age reflects on the amount of desired credit, borrowing needs tend to be relatively lower in the earlier and late stages of the lificycle. Hence, older households search and switch less than younger households.

Homeownership is significantly and positively associated with the decision of switching a credit card, the estimated difference in the probability of credit card switching is 9.79 percentage points for a homeowner representative household. Homeownership may influence credit card borrowing through home equity lines of credit (HELOC).[7] HELOCs provide another finance instrument for consumers who are homeowners tend to borrow less on their credit cards than renters. They have the option of borrowing from HELOCS instead from credit card, and they also can choose to

[7]Home Equity Line of Credit

pay down their credit card debt using HELOCs. Since renters do not have such an option, this might be the reason why they switch balances and borrow more on their credit cards than homeowners.

Marital status (MS) was not found to be significantly associated with the decision of switching balances. The probability of switching a credit card is less for married consumers. According to the marginal effect the probability of switching cards for a married household is 3.44 percentage points less than for non-married household.

5.2. Testing Whether or not Model 1 β_1 and β_2 Are Equal or Equal to the Opposite

Table 5.2 presents the analysis of testing the hypotheses whether or not the coefficients on the old interest rates and the new interest rates are equal in magnitude but opposite in sign. I failed to reject the hypothesis that $\beta_1 = -\beta_2$, that is β1 and β2 (the coefficients on APR_1 and APR_2) are opposite in sign. However, I rejected the hypothesis that $\beta_1 = \beta_2$, that is β_1 and β_2 (the coefficients on APR_1 and APR_2) are equal in magnitude and have the same sign.

5.3. Model 2 Determinants of Credit Card Switching

Table 5.3 presents the results of the model 2 (equation 4.24) logit estimation for credit-card switching. Besides the parameters coefficients and standard errors, marginal effects around the mean are also reported to reflect the estimated changes in the probability of switching. At the conventional 5 percent level for statistical significance, the following coefficients have significance: benefit from switching, number of credit cards (NCC) held, age, and homeownership. As expected, the switching benefit variable has the greatest influence on why consumers switch credit cards.

Switching benefit is positively and significantly related to the likelihood of switching. Holding other variables constant at sample mean levels, each additional unit increase in switching benefits will increase the likelihood of switching by 0.0060 percentage points for a representative household. At sample mean levels, a typical cardholder's expected benefits from switching is $604.37 over the entire introductory rate period.

The number of credit cards in logit model 2 shows that the number of credit cards is significantly and positively related to the likelihood of switching in logit model 2 and the marginal effect is 1.13 percentage points with one additional credit card the representative household has.

Age is significantly and negatively related to the decision of switching and with each additional year of age the probability of switching cards goes down by 0.18 percentage points. Homeownership is significantly and positively associated with the decision of switching a credit card, the estimated difference in the probability of credit card switching is 8.96 percentage points for a homeowner representative household.

Marital status (MS) was not found to be significantly associated with the decision of switching balances. The probability of switching a credit card is less for married consumers. According to the marginal effect the probability of switching cards for a married household is 3.18 percentage points less than for non-married household.

5.4. Measuring the Goodness of Fit of the Logit regression Model

The logit regression output yields many new statistics because the estimation methodology is different from multiple regression. The first statistic is measure of the overall fit. The log-likelihood test, analgous to the global F-test where the null hypothesis says that some of the β_s are equal to zero. The absolute values: (880.480)

and (907.678) in models 1 and 2 respectively have no interpretation; the statistics shows that model 1 with the eight explanatory variables is significantly better than the the model with the (base or null) that lacks these variables. Similarly, the statistics shows that model 2 with the four explanatory variables is significantly better than the the model with the (base or null) that lacks these variables.

Another way to test the goodness of fit of a logit regression model is to use Hosmer and Lemeshow test. The Hosmer and Lemeshow test is a measure of overall model fit, comparing the observed and predicted values. Hosmer and Lemeshow, also called the chi-square test, has an insignificant Chi-square value for the presented model, yielding a p-value of 0.0865 and 13.824 Chi-Square value for model 1 (equation 4.23) thus suggesting a model with a (fairly) good predictive value and indicating a good model fit. Therefore, we fail to reject the null hypothesis that there is no difference between observed and model predicted values, implying that the model's estimates fit the data at an acceptable level.

5.5. J-Tests for Model Selection Results

Tables 5.4 and 5.5 report the empirical results of the J-Tests for models 1 and 2. Among many approaches which have been formulated for model selection is the J-test of Davidson and MacKinnon (1981). J-test is most commonly used to test non-nested hypotheses. This test is used in this paper and is proceeded as follows: (1) models 1 and 2 were estimated, deriving the fitted values (expected values for models 1and 2) of $\hat{Y}_{i1}$ and$\hat{Y}_{i2}$; (2) the variable $\hat{Y}_{i1}$ was added as an independent variable to model 2 and the new model was re-estimated to test the hypothesis that the coefficient on $\hat{Y}_{i1}$ is equal to

zero using a t-test. I failed to reject the hypothesis in question; and (3) the variable $\hat{Y}_{i2}$ was added to model 1 and the new model was re-estimated to test the hypothesis that the coefficient on $\hat{Y}_{I2}$ is equal to zero. The hypothesis was not rejected. Both models 1 and 2 are accepted models. I failed to reject the hypotheses that the coefficients on the fitted values of $\hat{Y}_{i2}$ and $\hat{Y}_{i1}$ are equal to zero. Adding the fitted values for $\hat{Y}_{i1}$ to model 2 had no explanatory power over and above the variables in model 2. Similarly, adding the fitted value of $\hat{Y}_{i2}$ to model 1 had no additional explanation over and above the variables in model 1. Therefore, neither model is rejected and both models are accepted.

5.6. Why Do Not Consumers Switch Their Credit Cards?

The credit card industry is an industry where both search and switching costs are likely to be present. Switching costs are incurred by buyers for terminating transaction relationships and initiating a new relation. Calem and Mester (1995) show that consumers carry balances on their cards with fairly high interest rates, despite receiving offers from cards with fairly low interest rates. They argue that the reason behind doing so is that consumers with high balances have difficulty switching cards. They also argue that search and switching costs result in adverse selection in the credit card market. Specifically, if a bank unilaterally lowers its interest rate, it will mainly attract cardholders who search switch most for lower interest rates. Cardholders with large balances who yield high profits would be less able to transfer their balances to a new card issuer due to asymmetric information between card issuers in the credit card market. This difficulty in switching balances by those cardholders who carry high

balances may be an indicator of switching and search costs existence in the credit card industry.

Stango (2002) argues that consumers are becoming more insensitive to Interest rate selection because they feel they will never get a better rate. Consumer level data shows that consumers receive offers with teaser rates to switch credit cards, move balances from one card to another. However, they are reluctant to do so. One reason could be the existence of switching costs in the credit card markets. Because these costs are intangible, they are hard to observe and measure. My empirical data shows that 95 percent (915 cardholders) of those who did not switch balances received offers with significantly lower rates than what they already had but refused to switch (see Figures 4.1 and 4.2). The reason for this consumer reluctance to switch is that these offers were introductory offer rates, lasting for very short periods of time. For economists, this apparent reluctance to switch credit card balances appears to be irrational behavior. However, in the credit market, switching a credit card is not always costless. Consumers are aware that they are likely to incur certain costs when switching suppliers. Some of these costs might have to do with switching costs (costs of switching a supplier). The major switching cost is the transaction cost. There are some one-time inconveniences and efforts incurred each time a consumer switches from one card to another. Consumers also face information costs of searching for and switching to a new credit card supplier and setting up a new relationship, which may be a time-consuming process. There are also artificial or contractual costs that are present because of special programs and discounts credit card issuing firms offer their cardholders. Specifically, consumers may build up frequent-fliers miles on their cards,

have their utility bills automatically charged, or enjoy the familiarity of having the same account for a long time. Because consumers have different motives for holding credit cards, they have different incentives to incur certain costs of searching for lower interest rate terms (Kim, Dunn, and Mumy, 2005). It is not unusual for some consumers to maintain a loyalty toward a product they have been using for a long time. Brand loyalty increases consumers' commitment toward a product, making consumer willingness to switch weaker.

Ausubel (1991) and Stango (2002) argue that some credit card fees, such as the card annual fee, may prevent consumers from switching cards as it becomes costly for customers to switch or to carry more than one card. Consumers' ignorance and underestimation of their borrowing potentials, leading them to accumulate huge amounts of debt, may also contribute to their inability to find better rates and so to switch cards. These added costs for switching may explain why consumers do not switch cards when they are offered to do so, which contributes to the failure of competition in this industry as theorized by Ausubel (1991).

Variables	Coefficient	Standard Error	Marginal Effect
Intercept**	-3.0440	0.4895	N/A
APR_0***	8.4147	0.0127	1.0339
APR_1***	-7.9180	0.0204	-0.9729
Intro Time Period***	0.0193	0.00844	0.2375
Balance***	0.000036	7.24E-6	0.0004473
NCC**	0.0769	0.0355	0.9453
Age**	-0.0158	0.00736	-0.1937
Marital Status	-0.2803	0.1894	-3.4447
Home Ownership***	0.7973	0.2792	9.7964

Table 5.1: Model 1 Logit Estimates for Credit Card Switching (N = 1101)

Note: Marginal effects are in terms of percentage points
***Significant at 1% level of better;
**Significant at 5% level or better;
*Significant at 10% level or better.

The Logistic Procedure

Linear Hypotheses Testing Results

Label	Wald Chi-Square	DF	Pr > Chi-Square
Test 1	0.0570	1	0.8113
Test 2	36.8752	1	< .0001

Table 5.2: Testing Whether or not the Coefficients on APR_1 and APR_2 are Equal

Variables	Coefficient	Standard Error	Marginal Effect
Intercept**	-2.2077	0.4314	N/A
Benefits of Switching***	0.000483	0.000070	0.006089
NCC***	0.0903	0.0339	1.1378
Age**	-0.0145	0.00723	-0.1821
Marital Status	-0.2525	0.1856	-3.1818
Home Ownership***	0.7115	0.2771	8.9667

Table 5.3: Model 2 Logit Estimates for Credit Card Switching (N = 1101)

Note: Marginal effects are in terms of percentage points
***Significant at 1% level of better;
**Significant at 5% level or better;
*Significant at 10% level or better.

Variables	Coefficient	Standard Error	Pr > Chisq
Intercept**	-3.1001	0.4933	< .0001
APR_0***	8.8474	1.3329	< .0001
APR_1***	-8.1569	2.0596	< .0001
Intro Time Period***	0.0193	0.00852	<.0001
Balance***	0.000041	8.296E-6	< .0001
NCC**	0.0828	0.0358	0.0207
Age**	-0.0167	0.00742	0.0247
Marital Status	-0.2978	0.1900	0.1171
Home Ownership**	0.8144	0.2799	0.0036
$\hat{Y}_{i2}$_Expected	-0.5341	0.4918	0.2774

Table 5.4.: Model 1 (J-Test) Logit Estimates for Credit Card Switching (N = 1101)

Note: Marginal effects are in terms of percentage points
***Significant at 1% level of better;
**Significant at 5% level or better;
*Significant at 10% level or better.

Variables	Coefficient	Standard Error	Pr > Chisq
Intercept**	-2.0388	0.4292	< .0001
Benefits of Switching***	0.00563	0.000929	< .0001
NCC***	0.0982	0.0350	0.0051
Age**	-0.0155	0.00727	0.0337
Marital Status	-0.2948	0.1872	0.1153
Home Ownership**	0.7338	0.2719	0.0070
$\hat{Y}_{i1}$_Expected	-0.7180	0.5041	0.1544

Table 5.5: Model 2 (J-Test) Logit Estimates for Credit Card Switching (N = 1101)

Note: Marginal effects are in terms of percentage points
***Significant at 1% level of better;
**Significant at 5% level or better;
*Significant at 10% level or better.

CHAPTER 6

CONCLUDING REMARKS AND SUMMARY

This chapter provides a summary of the main issues, key findings of the study, and discusses the links between the research and the key findings in this analysis. It also provides the implications of the study and presents some suggestions for future research.

The introduction of the credit card in the mid-twentieth century revolutionized and transformed how people live. According to the CFM, the percentage of credit card ownership averaged 75% of the population over the last 5 years. With the increase in credit card borrowing and competition among credit card issuers, the consumer behavior in this market is becoming more complex. This research is an attempt to model the changing behavior of credit card switching among consumers who revolve balances.

The unique CFM data used in this study provides the most up-to-date information on the consumers' recent behavioral changes in the credit card industry that is not available in any other public consumer finance data set. Based on a set of new survey data, this dissertation empirically investigates consumer behavior in the credit card industry.

Analyzing consumer behavior in the credit card market helps to provide an understanding of how consumers maximize utilities by switching balances, and allows us to look at consumer behavior in the credit card market from broader prospective.

I have theoretically identified the crucial factors that determine whether or not a consumer is likely to switch cards. Specifically, this research represents an effort of modeling credit card switching of consumers using an econometric model that is anchored on the economic theory of consumer behavior that incorporates demographic, economic and socioeconomic considerations into the decision making process. It has empirically investigated consumer credit card usage and switching. The variables which I have examined have captured some key behaviors which have not been studied previously and hopefully shed new light on overall consumer behavior in the credit card market. Using data from the Consumer Finance Monthly (CFM) of The Ohio State University, I find that at the conventional 5 percent level of significance, the following variables have significance: old interest rate, new interest rate, duration of the introductory rate, balances, number of credit cards, homeownership, and age. As expected, interest rates, balance, the duration of new introductory rate, and homeownership have the greatest influence on why or why not people switch credit cards in model 1(equation 4.23). Switching benefit, number of credit cards, and homeownership have the greatest influence on why or why not people switch credit cards in model 2 (equation 4.24).

Another key result is that the interest rates on existing balances significantly and positively influence credit-card switching of the U.S. households. This finding is consistent with the view that consumers make rational decisions in the credit card market, since balance-carrying consumers are sensitive to the terms of credit card contracts, such as the interest rate on existing balances, the new rate, and the duration of the new rate. It also implies that switching and search costs are important economic

factors in this market, challenging Ausubel's (1991) argument of credit card consumer irrationality and Calem and Mester's (1995) empirical finding that credit card rates are sticky because consumers are irresponsive to rate cuts. I have also found that the longer the duration of the introductory rate, the higher the probability of switching.

The empirical data used in this study tends to support that consumers usually receive new offers to switch cards with significantly lower rate than what they already have, however they reject to switch. One of the main reasons for this consumer irresponsiveness or reluctance to switch credit-card balances is that these offers are introductory, lasting for only a short period of time. Due to costs associated with the consumer decision of switching credit card suppliers, consumers may become reluctant to switch, suggesting that switching costs outweigh switching benefits.

I have indicated earlier in this paper (in chapter 4) that switching a credit card is not always costless. Consumers are aware that they are likely to incur certain costs when switching suppliers. Some of these costs might have to do with switching costs (costs of switching a supplier). There are some one-time inconveniences and efforts incurred each time a consumer switches from one card to another. Switching credit card balances may be a time-consuming process. There are also artificial or contractual costs that are present because of special programs or discounts offered by credit issuers. However, due to a lack of information of relevant variables such as switching fees and annual fees, these variables were not incorporated in the presented models. However, this does not diminish the results of my research.

Research in the economic literature on credit card markets is relatively new. This dissertation adds to this young literature, but there is much more to be explored and

learned. For example, the payment behavior of consumers in the credit card market could be analyzed and explored. Some consumers use their credit cards as extension to liquidity and roll over balances, incurring unnecessary costs even though they are not liquidity constrained. Some may choose to pay exactly the minimum required payment and some pay more than the minimum, and others pay balances in full. It will be very useful to model these behaviors.

BIBLIOGRAPHY

Amemiya T., 1981. Qualitative response models: a survey. J. Econ. Lit. 19, 1483-536.

Ashenfelter, O., Levin, P., and D. Zimmerman, 2003. Statistics and Econometrics: Methods and Applications. NY: John Wiley & Sons. Inc.

Ausubel, L., 1991. The Failure of Competition in the Credit Card Markets. American Economic Review 81, 50–81.

Ausubel, L., 1999. Adverse Selection in the Credit Card Market. Manuscript, University of Maryland.

Baumol, W. J., 1982. Contestable Markets: An Uprising in the Theory of Industrial Structure. American Economic review 72, 1-15.

Barone, G., Felici, R., Pagnini, M., 2006. Switching Costs in Local Credit Market. Working Paper, Economic Research Unit, Bank of Italy.

Beggs, A. W., Klemperer, P., 1992. Multi–Period Competition with Switching Costs. Econometrica 60, 651–666.

Berlin, M., Mester, L., Credit Card Rates and Consumer Search. Review of Financial Economics 13, 179–198.

Board of Governors of the Federal Reserve. The Profitability of Credit Card Operations of Depository Institutions Annual Report. June / 2008.

Board of Governors of the Federal Reserve. Federal Reserve G-19 Report. February / 2009.

Brito, D., Hartley, P., 1995. Consumer Rationality and Credit Cards. Journal of Political Economy 103, 400–433.

Calem, P. S., Mester, L., 1995. Consumer Behavior and the Stickiness of Credit Card Interest Rates. American Economic Review 85, 1327–1336.

Calem, P., Gordy, M., Mester, L., 2005. Switching Costs and Adverse Selection in the Market for Credit Card: New Evidence. Working Paper No. 05–16, Federal Reserve Bank of Philadelphia.

Cargil, T. F., Wendel, J., 1996. Bank Credit Cards: Consumer Irrationality Versus Market Forces. The Journal of Consumer Affairs 30, 373–389.

Canner, G. B., Luckett C., 1992. Developments in the Pricing of Credit Card Services. Federal Reserve Bulletin (September): 652–666.

Carow, TK. A., Staten, M. E., 2002. Plastic Choices: Consumer Usage of Bank Cards Versus Propriety Credit Cards. Journal of Economics and Finance 26, 216–232.

Chakravorti, S, Emmons, W. R., 2003. Who Pays for Credit Cards? Journal of Consumer Affairs 37, 208–230.

Chakravorti, S, Ted, T., 2007. A Theory of Credit Card. International Journal of Industrial Economics 25, 583–595.

Chakravorti, S., Ted, T., 1999. Why Do Merchants Accept Credit Cards? Federal Reserve Bank of Chicago Research Paper.

Chen, Y., 1997. Paying Customers to Switch. Journal of Economics and Management Strategy 6, 877–899.

Crook, 2002. Adverse Selection and Search in the US Bank Credit Card Market. Working Paper, The Credit Research Center, University of Edinburgh.

Davidson, R., MacKinnon, J.C., 1981. Several Tests for Models Specification in the Presence of Alternative Hypotheses. Econometrica 49, 781-793.

Dey, S., Mummy, G., 2005. Determining the Borrowing Limits on Credit cards. Working Paper # 2005–7, Bank of Canada.

Duca, J., Whitesell,W., 1995. Credit Cards and Money Demand: A Cross-Sectional Study. Journal of Money, Credit, and Banking 27, 604–623.

Ekici, Tufan, 2006. Do the Expected Real Interest Rate and Consumer Confidence Matter for Credit Card Borrowing. Working Paper, The Ohio State University.

Evan, D. and R. Schmalensee, 1999. Paying With Plastic. M.I.T. Press, Cambridge, MA.

Farrell, J., Shapiro, C., 1988. Dynamic Competition with Switching Costs. Rand Journal of Economics 19, 123–137.

Garman, E. Thomas and Forgue, E. F., 2000. Personal Finance, sixth Edition, Boston, MA: Houghton Miffin company.

Greene, W. H., 2003. Econometric Analysis. 5th edition. New Jersey: Prentice Hall.

Gross, D., Souleles, N., 2002. Do liquidity Constraint and Interest Rates Matter for Consumer Behavior? Evidence from Credit Card Data. Quarterly Journal of Economics 117, 149–185.

Kerr, S., 2002. Interest Rate Dispersion Due to Information Asymmetry in the Credit Card Market: An Empirical Study. Unpublished Paper, The Ohio State University.

Kerr, S., Lucia, D., 2002. Consumer Search Behavior in changing Credit Card Market. Working Paper No. 02–03, The Ohio State University.

Kim, M., Klinger, D., Vale, B., 2003. Estimating Switching Costs: The Case of Banking, Journal of Financial Intermediation 12, 25–56.

Kim, T., Dunn, L., Mumy, G., 2005. Bank Competition and Consumer Search Over Credit Card Interest Rates. Economic Inquiry 43, 344–353.

Klemperer, P., 1987a. Markets with Consumer Switching Costs. Quarterly Journal of Economics 102 , 375–394.

Klemperer , P., 1987b . The competitiveness of Markets with Consumer Switching Costs. Rand Journal of economics 18, 137–150.

Klemperer, P., 1987c. Entry Deterrence in Markets with Consumer Switching Costs. Economic Journal 97, 99–117.

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, 515–539.

Knittel, C., Stango, V., 2003. Price Ceiling as Focal Points for Tacit Collusion: Evidence from Credit Market. American Economic Review 93, 1703-1729.

Maddala, G. S., 1992 . Introduction to Econometrics. 2nd Edition. New York: Macmillan.

Mester, L., 1994. Why Are Credit Card Rates Sticky ? Economic Theory 4, 505-530.

Min, I., J–H–Kim, 2003. Modeling Credit Card Borrowing: A Comparision of Type I and Type II Tobit Approaches. Southern Economic Journal 70, 128–143.

Nilson Report, 2008, issue 902.

Nilson Report, 2008, issue 914.

Nilson Report, 2009, issue 924.

Park, S., 1997. Effects of Price Competition in the Credit card Industry. Economics Letters 57, 79–85.

Park, S., 1997. Option Value of credit Lines as an Explanations of High Credit Card Rates. Federal Reserve Bank of New York Research Paper No. 9702.

Pozdena, R.J., 1991. Solving the Mystery of High Credit Card Rates. FRBSF Weekly Letter 91 (42), 1–3.

Pindyck, R. and Rubinfeld, D., 1998. Econometric Models and Economic Forecast. NY: Irwin McGraw–Hill.

Sharpe, S., 1990. Asymmetric Information, Bank Lending and Implicit Contract. Journal of Finance 45, 1069–1087.

Shephard, W. J., 1984. Contestability versus Competition. American Economic Review 74, 572–587.

Shephard, W. J., 1997. The Economics of Industrial Organization, 4th ed. New Jersey: Prentice hall Inc.

Stango V., 2000. Competition and Pricing in the Credit Card Market. Review of Economics and Statistics 82, 499–508.

Stango, V., 2002. Pricing with Consumers Switching Costs: Evidence from the Credit Card market. The Journal of Industrial Economics 50, 475–492.

Stavins, J.,1996. Can Demand Elasticities Explain Sticky Credit Card Rates? Federal Reserve Bank of Boston, New England Economic Review, (July / August): 43–54.

Telyukova, I, Wright, R., 2008. A model of Money and Credit, with Application to the Credit Card Debt Puzzle. Review of Economic Studies 75, 629–64.

To, T., 1996. Multi–Period Competition with Switching Costs. Journal of Industrial Economics 44, 81-87.

Von Weizsacker, C., 1984. The Cost of Substitution. Econometrica 54, 1085–1116.

Yang, S., Markoczy, L., Qi, M., 2007. Unrealistic Optimism in Consumer Credit Card Adoption. Journal of Economic Psychology 28, 170–185.

Zywicki, T.J., 2000. Economics of Credit Cards. Working Paper # 00-22, School of Law, Law and Economics, George Mason University.

ABSTRACT

CONSUMER SEARCH AND SWITCHING BEHAVIOR: EVIDENCE FROM THE CREDIT CARD MARKET

by

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May 2011

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The introduction of the credit card in the mid-twentieth century revolutionized and transformed how people live. Based on a set of new survey data, this dissertation empirically investigates and analyzes consumers' behavior in the credit card market. Specifically, it investigates the underlying determinants of consumers' choices regarding switching credit-card balances. To estimate the likelihood that consumers switch credit cards, two logit models are estimated. Using data from the Consumer Finance Monthly (CFM) of The Ohio State University, the author finds that at the conventional 5 percent level of significance, the following variables have significance: old interest rate, new interest rate, duration of the introductory rate, balances, number of credit cards, homeownership, and age. As expected, interest rates, balances, the duration of new introductory offer rates, and homeownership have the greatest influence on why or why not people switch credit cards. The findings are consistent with the view that consumers make rational decisions in the credit card market, since balance-carrying consumers are sensitive to the terms of credit card contracts, such as the interest rate on existing

balances, the new rate, and the duration of the new rate. It also implies that switching costs are important, challenging Ausubel's argument of credit card consumer irrationality and Calem and Mester's empirical finding that credit card rates are sticky because consumers are unresponsive to rate cuts.

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