A review of credit card literature: perspectives from consumers

Sumit Agarwal
Low Tuck Kwong Professor, Departments of Economics, Finance and Real Estate
Research Director, CAMRI and Senior Fellow, ABFER
Research Associate, IRES, CQF, CBE and RMI
National University of Singapore

Jian Zhang
Department of Finance
National University of Singapore

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Executive Summary

1. Introduction

Examining consumers' behaviours in choosing and using credits cards, this report was commissioned to present an empirical review of the credit card market, with the intention of providing insight for policy implementers in consumer protection within the UK market. We review the literature on credit card consumption from the perspectives of economics, finance, marketing and psychology, and discuss (1) how consumers source for and switch between credit card contracts, along with the mistakes they commonly make; (2) the determinants of borrowing behaviour using credit cards; (3) how consumers repay credit card debts and the impact of minimum repayment requirement presentation; (4) borrowing costs including interests and fees that consumers pay on credit cards; (5) the extent to which behavioural biases drive consumers' behaviours. Although majority of the literature focuses on the U.S. market, we believe that these findings are highly applicable to the UK owing to the similarities between both countries' credit card markets.

2. Results in brief

2.1 Searching and Switching

The increasing volume of direct solicitations combined with disclosure requirements during recent years, have reduced the costs of searching for credit cards greatly. The literature has demonstrated that consumers, especially those carrying high balances, remain particularly sensitive to interest-rates and are actively searching for lower credit card rates; consumers are effectively obtaining benefits from their searches ending up with lower interest rates.

Studies show that few consumers take action to switch bank services despite reporting dissatisfaction with their current banks. This suggests that faced with switching costs, consumers choose to remain with their current bank services. The literature further suggests that switching costs are most severe among consumers with high balances where it is likely for them to end up with lower levels of credit. This phenomenon persists even today, though banks utilize automated pre-screening systems to improve their ability to judge the creditworthiness of consumers and lower evaluation costs.

Lower costs of searching by consumers are believed to intensify competition and lower margins in the industry. This also holds in the credit card market as searching behaviours evidently impact on the pricings listed by banks. One study shows that the issuers' interest rate is an increasing function of the customers' switching cost, which suggests that some banks may exploit these consumers with high switching costs and discriminate against them by setting higher prices.

2.2 Borrowing behaviour

Knowing the characteristics of credit card users is the first step for banks to set out advertisement strategies or for policy makers to implement consumer protection plans. Empirical results are roughly consistent with general conjecture that credit card users are more likely to be married, wealthier, better educated and own houses. Growing competition in the credit card industry has influenced many issuers actively involved in soliciting potential consumers in extending more and more competitively motivated "attractive" offers. However, the literature highlights one concern about such solicitation methods: consumers who respond to inferior offers were found to exhibit significantly higher credit risks.

Consumers' borrowing behaviours are also shown to be affected by numerous external conditions. For example, the increase in credit limit is followed by an immediate and significant rise in the credit card debt and the average is between 10 to 14 percent of total credit limit. The effect is much larger for people previously near the credit limit, indicating that such changes benefit consumers with liquidity constraints. Rewards, such as cash back, are routinely given by the issuers, and this strategy is shown to effectively affect consumers' use of credit cards. As one study shows, participation in the reward

program increases the probability of credit card use by 23% and reduces the probability of using cash by 14%. Besides more credit card adoptions, rewards are also effective in affecting consumers' spending via credit cards: average spending and credit card debt was found to increase by $79 and $191 respectively per month in the first quarter after the cashback program started. It seems that the reward program induces people to become debt revolvers benefitting the bank at a very low cost of giving trivial rewards. This effect is particularly larger for cardholders who do not carry debt prior to the program.

Credit card contracts are also becoming increasingly dense and semantically complex, reducing the consumers' ability to clearly understand the true costs involved, presenting challenges in their card selection and use. One study on the 6 largest US issuers reported that the greatest issue stems from the fact that credit card documents are written in an unnecessarily complicated manner, well above the level that is likely to be understood by many consumers. The muddled organization, poor formatting, and obscuring of important information amidst unnecessary details further add to the already complex presentation of credit card contracts.

As banks provide more services to a customer, they create a stronger relationship with the consumers and benefit by gaining more information from them. Additionally, according to the literature, consumers who have stronger relationships with their banks also have increased likelihoods of getting credit in the future and the borrowing, on average, come with lower rates.

2.3 Repayment

Repayment decision is an important topic since it directly impacts consumers' debt level and borrowing costs. What characterizes consumers with high balances in their credit cards? One descriptive study suggests a positive correlation of high balances with their education, income and real assets; however, the findings of this study remain limited by its small sample size and measurement error. Repayment behaviours also differ among birth cohorts, where youngsters' payoff rate is estimated to be 24% lower than their parents and 77% lower than their grandparents. Further, repayment patterns for most consumers are also, interestingly, either paid in full or paid near the minimum amount each month, with very few intermediate payments.

The minimum repayment requirement is usually made known in most credit card contracts. However, the literature shows that the availability of such information does not contribute to higher probabilities of repayment and some consumers choose to still repay the minimum amount. Such behaviour is known as an anchoring bias within psychology where the consumers' repayment patterns are psychologically tethered by the postulated levels of minimum payment. A number of studies monitored the consumers' repayment patterns after removing the minimum repayment information and saw a dramatic increase of repayment value by 70%. It is apparent then, that imposing warnings about cost of minimum payment alone does not assist with encouraging consumers in their credit card repayments.

Two possible approaches were suggested to mitigate the negative effects wrought by presenting minimum payment information. The first is to increase the minimum repayment requirement, which takes advantage of the anchoring effect since borrowers may allocate their payment at the newly-changed or newly salient levels. One estimate shows that a 1% increase in minimum repayment requirement might lead to an increase in the average payoff rate by 1.9%.

The other choice experimentally proven to be effective in increasing repayment is to present the costs of both minimum payment and alternative choice (i.e. what will happen if repaying a higher level of the balance) and make the comparison salient to consumers. The 2009 US CARD Act requires such disclosure of comparing the cost of minimum payment with the case when the card holder repays the current balance within 36 months. Estimates show that the disclosure significantly increases repayment levels and thus reduces interest payment. In aggregate, the annualized reduction in interest payments is approximately 71 million US dollars. This potentially suggests that there is room for alternative approaches.

3.4 Borrowing cost

One empirical estimate over the span of 2008 to 2010 in the US market shows that banks are earning significant profits in their credit card portfolios, 1.6% of which come from interest payments and fees paid by the consumers. In particular, consumers with poor credit quality pay 43.9% per dollar borrowed and generate a net profit of 7.9%. If we only focus on fees and charges on credit cards, more than 40% of all accounts incur such cost and the average amount is estimated to be $14~18 per account per month. The amount paid for credit card fee is also huge in terms of aggregation. During the economic downturn in 2008, British credit card suppliers collected 213 million pounds in penalty charges and the amount collected in the US is estimated to be 20.5 billion dollars. Studies report a positive correlation between penalty fees and consumer default risk. This suggests that penalty fees may serve to compensate banks for taking risks. However, the literature does not exclude the possibility that banks are excessively charging its consumers.

Besides interest rates, fees and charges are also taken into consideration when consumers choose among a variety of credit card contracts. In most cases, they are facing a trade-off between the two depending on their estimation of future consumption. If one expects to borrow a large amount, then one should choose the contract with a lower interest rate, thus minimizing the total borrowing cost. The literature also shows that in reality, consumers do rationally choose the right credit contract for themselves, even when initial mistakes were made consumers were likely to switch to more optimal contracts after. Consumers also learn to avoid fees. Studies show that paying a fee last month reduces the fee payment in current month by 40%, although this learning effect is depreciating when the strain of paying fees becomes distant.

To avoid excessive credit card fees, policy makers can implement regulations that aim to reduce or limit fee charges. The effectiveness of such policies is undetermined since it may steer banks to hike other rates and impose other conditions which might negatively impact consumer welfare. Researchers are offering support to such regulatory policies by evaluating the 2009 US CARD Act, which limits the ability of banks to charge certain types of credit card fees. Empirical estimates show that the overall fees cost reduction is an annualized 2.8% of borrowing volume, which translates into annual cost savings of 20.8 billion per year. Such protection schemes are most beneficial to consumers with poor credit qualities (low FICO score).

2.5 Behavioural bias

The interest rate charges for credit card debts are usually as high as 15%, usually higher than the returns that most liquid assets, such as cash and checks, can deliver. So it is optimal for consumers to pay off credit card debts as long as they are not highly constrained credit-wise. However, studies show that this is not true in reality, offering evidence that households tend to hold significant credit card debts and sizable liquid assets simultaneously. Surprisingly, the size of liquid assets held is not small. For a third of all households, the liquid assets respectively held amount to more than one month's income. This phenomenon is prevalent for households with all levels of income and education.

Compared to a traditional payment mechanism like cash and check, paying by credit card decreases the vividness with which individuals can feel the outflow of money. Therefore, there is a frequently heard conjecture that credit card use causes people to spend more and save less. A number of studies confirmed this notion in experimental settings. Credit card payment can enhance not only the magnitude but also the decision time involved in spending. One solution to the overspending problem might be inferred from one study which shows that participants do not spend more when using credit cards (as opposed to cash) when they are instructed to consider the cost of each item they purchase individually and add them together.

Consumers are shown to suffer from present bias by emphasizing too much on current consumption instead of the future consumption and ignoring long-term plans. This bias affects their choice of credit card contracts, rendering them to prefer contracts with lower introductory interest rate over certain

time durations. Those with present bias were also found to more likely accumulate credit card debts. Consumers may also feel overly optimistic about their future card usage and paying schemes, choosing the sub-optimal contracts with high interest rate and low fees but end up with large outstanding balances.

3. Conclusions and Recommendations

With increasing access to personal credit, credit cards are now pervasively held by most consumers in developed countries. This report summarizes the academic findings on credit card choice and use by consumers in the last two decades. The credit card market is becoming more competitive and consumers are generally behaving rationally to maximize their own utility. However, consumers are still shown to misuse their credit cards, make obvious mistakes, suffer from various behavioural biases and sometimes suffer exploitation by the banks. This calls for the protection of consumers in the credit card market, which is also the main statutory objective of many public policy regulators.

This review draws some specific recommendations that regulators may rely on for policy makings to enhance consumer protection. It is important to increase consumer awareness of useful issues, such as the benefits of actively searching for low interest rates, the costs of repaying at the minimum level, and the potential behavioural biases that may be affecting consumers. This might be accomplished via television or advertising and launching educational programs for the less educated consumers. Other suggestions are the increased regulations on the card issuers. For example, it has proven to be useful to limit the banks' abilities to charge various fees on consumers and present the comparison of alternative payment choices versus the minimum payment. It would also be helpful to mandate more effective disclosure to reduce the complexity of the contracts and enhance consumers' understanding, by reducing the amount of frivolous information disclosed and providing a more compact document that summarizes key information.

Contents

1. Introduction

Since 2000, the prevalence and use of credit cards in the United Kingdom has grown sharply. Between 2000 and 2013, according to statistics provided by the Bank of England, the credit card gross lending by the banks[1] grew from 35 billion pounds per quarter to nearly 60 billion while the number of credit cards in issuance doubled to 60 billion[2]. Credit cards are now more and more reward-based, while the average fee is also gradually falling, standing at 73.07 pounds, significantly lower than the long-term average of 97.62 pounds[3]. Meanwhile, consumers' behaviour of using credit cards has also dramatically changed. Consumers are less likely to accumulate credit card debts since the significant repayment increases after 2005. As a result, the net lending after 2005 remains flatter and much lower than it had been before. More recent data revealed that the average minimum monthly payment increased from 5 pounds in 2006 to 10.76 pounds in 2013. With the increasing number of personal insolvencies in the UK, the ratio of write-off amount to outstanding balances increased from 2% in 2000 to 6% in 2013. In this article, we review empirical evidence on the credit card market from the consumers' perspective, that is, how consumers behave when choosing and using a credit card. As part of the Credit Card Market Study, this study aims to provide an empirical review of the credit card market, with the intention of providing insight for policy implementators in consumer protection and promoting competition within the UK market.

Although the majority of academic papers which we review focus on the U.S., we believe that these findings are highly applicable to the UK due to the similarities of the credit card markets between these countries[4]. Credit cards are prevalently held by consumers in both US and UK: as at 2013, statistics from US Census Bureau shows that 75% household owns credit cards by 2013, while, according to UK Card Association, 61% of UK's population hold at least one credit card. Furthermore, credit cards play an important role in UK consumers' lives and were used to make 2.2 billion purchases with a value of 140 billion pounds in 2012. Figures were also huge in U.S. with total value of credit card transactions amounting to $2.48 trillion US dollars. The borrowing cost, measured as the weighted average interest rate, 18% is roughly the same in both countries. Cardholders in the UK are more conservative in borrowing credit, as 60% of credit card holders report paying off their balances monthly, in contrast to only 54% pay balance in full in the US. Finally, card issuers in both countries are facing similar levels of competition and institutional environment.

[1] Banks in the paper is defined broadly and refers to all firms issuing credit cards including banks and other credit card providers.

[2] The statistics is from http://www.pwcwebcast.co.uk/dpliv_mu/pdfs/precious_plastic_2011.pdf

[3] Data source: Treasury reports in December 2014 by Moneyfacts.

[4] Despite apparent similarities in the two markets, there are still different rules and practices. For example, in US no annual fee is more the norm while annual fees are still commonly charged in UK. However, we believe it does not limit the applicability of US studies in UK market.

The first and foremost question is how consumers use their credit cards. In particular, we review the empirical evidence regarding consumers' choices between payment tools (Section 2.1), responses to lenders' solicitation (Section 2.2), use of credit limit (Section 2.3), the impact of credit limit or interest rate change (Section 2.4) and how participation in reward programs impact consumers.

As the household credit card debts have cumulated substantially due to interest compounding and fee exposure, the path of repayment is a crucial determinant of the total cost of borrowing. In section 3.1, we review the empirical evidence on consumers' repayment behaviours. The card issuers often include a condition of minimum payment requirement in the credit card contracts and the bill statement as well; hence we review studies that evaluate its impact on consumers' repayment behaviour in Section 3.2. The interest rate for credit card debt is quite high, mostly above 10%, thus it is usually in the interests of consumers to pay off the debt as much as possible[5]. A number of solutions have been raised by consumer advocators and regulators to encourage consumers to pay more. The review we perform in Section 3.3 show that two practices, increasing minimum payment requirement and presenting alternative choices of payment, are effective in increasing consumers' repayment amount, though these are not desirable outcomes for card issuers.

Accompanied with the fast accumulation of household debt in the last two decades, is the sharp rise in the default rates, which is our focus in Section 4. Understanding the underlying driving factors for defaulting is critical not only for credit risk modelling purposes but also for policy implications. Section 4.1 covers evidence on the determinants of credit card defaults. Banks are actively taking measures to reduce losses as a result of defaulted credit card accounts, as we discuss in Section 4.2.

The 2008 Financial crisis has drawn huge attention on the financial industry, especially the banking sectors. Critics have argued that banks are making huge profits from consumer banking sectors. In Section 5, we conduct a review on the theme of borrowing costs, including interest payments and fee charges. In Section 5.1, we first present the total borrowing costs paid by consumers estimated in the literature, then, motivated by the debate whether consumers are making rational choices over all available contracts (Agarwal et al 2015), we review related empirical studies. Recently, regulators are pushing policies that aim to limit the ability of banks to impose fees and charges on consumers. One recent example is the CARD Act in US that took effect in 2009. The review in Section 5.3 suggests this Act is successful in reducing overall credit card fees by a substantial amount, especially for borrowers with low FICO scores[6].

Section 6 focuses on how consumers search for and switch between credit card contracts. Standard economic models imply that industry with relatively lower searching costs is often associated with

[5] One exception for rationally accumulating credit card debt is the consumer can earn higher return in other investments.

[6] The FICO score is the most widely used credit score, which the vast majority of banks and credit grantors in the US rely on to evaluate the potential risk posed by lending money to consumers.

higher levels of competition, which is beneficial to customers. In Section 6.1, we first review the empirical evidence on switching costs that consumers are facing. However, as we show in Section 6.2, the financial benefits may still motivate consumers to search for products with lower interest rates. Lastly, we summarize the findings on how the existence of switching cost impact banks' competition and pricing in Section 6.3.

In Section 7, we review the additional behavioural biases with respect to credit card use discussed in the literature. In Section 7.1, we first touch on the well-known credit card debt puzzle (Gross and Souleles, 2002a), where consumers are not using the liquid assets in hand to pay off credit card debt. Contrary to payment using cash or check, individuals feel less vividly about the outflow of money using credit cards. Therefore, credit cards may lead to overspending and higher levels of debt ex post. Section 7.2 presents evidence on this notion. Section 7.3 and 7.4 discusses papers on how present bias and over-optimism impact consumers' choices and behaviours in during the use of their credit cards.

We conclude in Section 8 with a summary of empirical evidence, discuss the implications for policy implementation and directions for future research.

2. Credit card use

This section reviews papers that generally describe how consumers use their credit cards including the choices made between credit cards and alternative payment tools, card usage patterns and consumers' response to lender's solicitation. It also covers the impacts of changes in credit limits, interest rates, as well as price incentives e.g. cash reward program.

2.1 Choice among credit card and alternative payment tools

The question intriguing researchers in the credit card literature is why consumers choose credit cards over other alternatives, such as cash or debit cards. Stavins (2002) tries to compare the characteristics between credit card users and individuals preferring other payment instruments, using data from the 1998 Survey of Consumer Finance (SCF)[7]. Their sample contains 21,525 households[8] and has a comprehensive coverage of all states in the U.S. The author applies a weighted logit regression analysis to isolate the effect of individual characteristics on people's likelihood of using specific payment instruments. Results are roughly consistent with general conjecture that credit card users are more likely to be married, wealthier, better educated, and to own houses. Though interesting, the finding in this study is hard to be generalized as they are obtained in only one wave of this survey. In

[7] The Survey of Consumer Finances (SCF) is a triennial statistical survey of the balance sheet, pension, income and other demographic characteristics of families in the United States. It is sponsored by the United States Federal Reserve Board in cooperation with the U.S. Treasury Department. Data from the survey has been widely used for analysis at the Federal Reserve and scholarly work at various economic research institutions.

[8] The 1998 survey employed multiple imputation technique, whereby missing data were imputed five times by drawing repeatedly from an estimate of the conditional distribution.

a follow-up study, Klee (2006) examines a longer period of time (the 1995, 1998 and 2001 waves of SCF) to show the dynamics of these characteristics associated with credit card use. The primary results suggest that the personal characteristics that predict credit card use are relatively constant over time, although there have been significant increases in the payments via credit card from 1995 to 2002. In a more recent paper, Schuh and Stavins (2013) confirm this by examining the 2008 Survey of Consumer Payment Choice (SCPC) which administered to sample 1,010 US consumers: the rate of credit card adoption is higher for older, more educated, high income, wealthier respondents.

Another increasingly discussed factor for choosing credit cards is the consumers' heterogeneity in their spending behaviours. For example, credit card revolvers, who regularly carry unpaid credit card debts, may have different preferences with payment tools in contrast to convenience users who simply enjoy the convenience and repay their entire credit card balance every month. Sprenger and Stavins (2008) utilizes survey data specifically tailored to answering the question of how revolving credit card balances are related to payment method use. The survey was distributed through either mail or online surveys to 3,008 participants with ages over 18, across the US in the Spring of 2005. They found that credit card revolvers were significantly more likely to use debts compared to convenience users. But there were no differences found between the two types of credit card users in their use of checks or cash. The results should be taken with caution for application in the current UK credit card market because the sample selection problem in the survey could impact both the generality and validity of the result. Moreover, respondents in the survey, on average, had higher levels of education and were more likely to be middle aged and middle class income groups compared to the US population.

Zinman (2009) supplements this study by investigating how consumers' choices between credit and debit cards respond to the prices of payment instruments. Debit cards offer similar attributes to credit cards like acceptance, security, portability and time costs. The pecuniary cost of a marginal credit card charge is the key economic difference between debit and credit for many households. The data were taken from 1995-2004 Surveys of Consumer Finance which represents a cross-section of over 2000 US households. The estimate shows that credit card revolvers are at least 21% more likely to use debit cards than convenience users, conditional on a rich set of proxies for transaction demand and preferences. Moreover, other implicit prices on credit card payments lead to the more debit card use for credit card revolvers who are facing relatively high marginal cost on marginal credit card charges or binding credit limit constraint.

The findings in Stavins (2002) and Klee (2006) provide useful implications for both business and policy applications. Knowing the characteristics of target consumers is the first step for banks (or card issuers) to set out advertisement strategies or policy makers to implement consumer protection plans.

2.2 Consumers' response to lender's solicitation

To grab market share, nowadays many issuers are actively involved in soliciting potential consumers in extending more and more competitively motivated "attractive" offers. However, adverse selection problems may mitigate the effectiveness of such marketing strategies for the banks because respondents are more likely to be with high credit risk and few outside options. Agarwal, Chomsisengphet and Liu (2010) present findings consistent with this notion. The data came from a large financial institution which conducted several large-scale randomized trials of preapproved credit card solicitation to a random population of over 2.3 million consumers from January to May 2001 in the US. The descriptive analysis reveals that consumers who responded to the lender's credit card solicitation exhibited significantly higher credit risk characteristics than those who did not respond. Among 6,448 consumers who had responded, the bank finally issued a credit card to 5,059 consumers, the author then tracked these consumers' debt payments over 24 months after card issuance. A further study offers strong evidence of adverse selection: consumers who responded to inferior offer type (with high interest rate) were significantly more likely to default for unknown reasons. This motivates policymakers and lenders to consider guarantee, information coordination, enhanced screening technologies to reduce the information asymmetry and mitigate the adverse selection problem.

Even assuming no information asymmetry, the solicitations may be negatively affected by the moral hazard problem[9] because consumers who are given high rates also have greater incentive to default, as shown in Karlan and Zinman (2009). Using a field experiment of directly soliciting the 58,000 former clients of a major South African lender, they estimated the presence and importance of adverse selection and the moral hazard problem in the credit card market. The interest rate is randomized in three dimensions: (i) an initial offer rate featured on a direct mail solicitation; (ii) the real interest rate only revealed only after a borrower agreed with the initial offer rate; (iii) interest rate offered on future loans. The results show that a group of borrowers select at identical rates but face different repayment incentives later. In contrast, another group of borrowers select at different rates but face identical repayment incentives. The results support weaker evidence of adverse selection but stronger evidence for moral hazard as 13% to 21% of defaults are due to moral hazard.

Using this design, the paper tries to distinguish two different motives for default on credit card debt. The default may be due to that those borrowers with relative high probability of default will be more likely to accept a high rate. This is termed as adverse selection ex ante. Or, the default occurs because those given rates have greater incentive to default, which is called moral hazard ex post. The results suggest 13% to 21% of default in the sample can be explained by moral hazard problem while there is weak evidence of adverse selection.

[9] In economics, moral hazard occurs where the actions of one party may change to the detriment of another after a financial transaction has taken place. Examples are the originators of subprime loans selling loans to borrowers even though they already expect these borrowers cannot maintain payments in the long run.

2.3 Credit limit

A few studies document interesting patterns about consumers' usage of their credit cards and limit. For example, Castronova and Hagstrom (2004) show that consumers tend to have target utilization rates using data from 1998 SCF. Consumers borrow greater amounts by acquiring more cards or higher limits, rather than maximizing on the cards they already hold. This is consistent with the argument that consumers usually impose constraint on their spending using one card as a means of self-control (e.g. Gathergood and Weber, 2014), though seeking new credit cards incurs higher cost. Using the transaction data called the Payment System Panel Study data from Visa International and Visa, Rysman (2007) documents an inertia phenomenon in the use of credit card: consumers tend to concentrate their spending on a single payment network though they hold many unused cards which can enable them the use of multiple networks. Not surprisingly, consumer usage of certain cards was significantly correlated with the acceptance by the merchants for the four major networks (Visa, MasterCard, American Express and Discover).

2.4 The impact of limit and interest rate change

As with other markets, consumers were found to respond to credit supply via increases in credit limit or interest rates. Gross and Souleles (2002a) were among the first few studies to offer in-depth empirical analysis of this issue. The data were derived from several issuers, each of whom provided a representative sample of their personal bankcard accounts, open as of 1995. It is representative of credit cards in the United States as they include some of the largest credit card companies. Each account was followed on average for over 24 months or until they attritioned. The total time period spanned from January 1995 through January 1998. An immediate and significant rise in the credit card debt in response to the increase in credit limits was documented. As for the magnitude, the average increase in the debt scaled by credit limit was between 10-14 percent. The effect was much larger for people nearer their credit limit, which supports the notion that increases in credit limits benefit consumers with liquidity constraints. The impact on debt holds regardless of whether or not the credit limit increase was requested by the account-holder or initiated by the issuers. Moreover, consumers were quite sensitive to interest rates, remaining wary of higher interest rates. Interestingly, there was an asymmetry, that is, credit card debts declined in response to increases in interest rates and rose even more strongly in response to borrowing rate decrease. Consumers are advised to show more sophistications about the promotion offers since bank and card issuers may use the temporary interest rate reduction to ratchet up the debt. A number of lenders set credit limits as a discontinuous function of a consumer's FICO credit score, for instance, a bank might grant a $2,000 credit limit to applicants with FICO below 720 and $5,000 to those above 720. Agarwal et al (2014f) explored this variation and used more recent data to examine the spending response to the increase in credit limits. The dataset was assembled by the U.S. Office of the Comptroller of the Currency and contains 160

million credit card accounts from 2008 to 2012. The estimate shows that for a $1,000 increase in credit limits, spending in the first year after the origination rises from $82 in 2008 to slightly more than $500 in 2011 and 2012.

2.5 Participation in the reward program

Rewards are routinely given by airlines and hotel operators to attract customers and increase the use of their products. The credit card industry is no exception. For example, six billion reward card offers were mailed by the US credit card industry in 2005, although the responses were found to be quite low[10]. As competition for card holders intensified, issuers made their reward programs more generous. Today 3 to 5 percent cash-back bonus is common on purchases in the US. In the past, American Express, Dinners Club and Discover have offered the most generous rewards, with Mastercard's world and Visa's Signature card recently joining the ranks. Estimates of reward participation rates vary: 40 to 70 percent of consumers that have at least one general credit card in the US have a rewards credit card (Hayashi, 2008).

Theoretical studies

Theoretical literature on payment cards mainly focus on the distribution of payment card costs in the network of card issuers, merchants and cardholders. The general implication from these models (e.g. Rochet and Tirole, 2002; Agarwal, Chakravorti and Lunn, 2010) provide support for the existence of reward programs: in order to increase card adoption and usage, card issuers may charge fees to merchants and extend incentives to cardholders. However, most of the conclusions are dependent on model parameters like the degree of competitiveness in the market for goods and payment services along with consumer and merchant demand elasticity. Other theoretical papers focus on those who pay for credit card rewards in equilibrium. For example, Chakravorti and Emmons (2003) presented a theoretical model of side payment in the competitive credit-card market and concluded that rewards offered by card issuers should finally be funded by card users who roll over balances with interest if their subjective discount rates are high enough.

Empirical evidence--impact on credit card adoption

Anecdotal evidence suggested that reward is effective in enticing consumers to substitute their credit cards for debit cards.

The literature has consistently established that rewards matter for credit card adoption. Using a nationally representative consumer survey of 1,501 distinct household conducted in the US during 2004, Borzekowski, Kiser and Ahmed (2008) showed that financial incentives steer consumers to use

[10] Agarwal, Chomesisengphet and Liu (2010) shows that the response rate was 0.3% in 2005.

certain types of payment tools over others. Participants were asked about their payment choice and reasons. 21 percent of credit card users cited pecuniary motives and mentioned credit card reward programs. Ching and Hayash (2008) relied on a different national survey to estimate the effect of payment card rewards on consumers' choice of payment methods. The data came from the 2005/2006 study of consumer payment preferences conducted by the American Bankers Association and Dove consulting, and were collected using paper and web-based surveys sent to US consumers, yielding with 3,008 completed respondents. The data contained detailed information about demographics, consumer payment choice and consumers' attitudes toward each payment method. For consumers who held both credit and debit cards, removing rewards increased their share of paper-based payment methods such as cash and checks by 4 percent. While interesting, the findings in these two studies should be interpreted with caution due to the relatively small sample sizes or sub-population of consumers who held both credit and debit cards. Knowing more information about the rewards earning and redemption rates is crucial to further understand how rewards affect consumer payment choice.

Similarly, Simon, Smith and West (2010) provided supporting evidence of the price incentives on consumers' payment choices in Australia, where the payment instruments available were similar to other industrialised countries. The transaction-level data were from a survey on how consumers paid for goods and services, conducted by the Reserve Bank of Australia in 2007. They uncovered intriguing findings about the effect of loyalty program participation on the substitution pattern between credit cards, debit and cash. Loyalty programs increased the probability of credit card use by 23% and reduced the probability of cash use by 14%. Moreover, they documented significant effects from interest rate changes on payment choices: when there was no financial cost to accessing the line of credit during an interest-free period, consumers tended to use a credit card instead of a debit card. However, the interest-free period had little significant effect on cash use, possibly because cash is most commonly used for small-value transactions.

Empirical evidence--- impact on credit card spending and debt

Apart from trying to directly relate reward program participation to higher credit card usage, a few studies have displayed interest in estimating the impact on change in spending and debt[11]. For example, Agarwal, Chakravorti and Lunn (2010) estimated the effectiveness of reward programs through a proprietary account-level data, taken from a large US financial institution that issues credit cards nationally. The data were reliable with a large sample and little measurement error, and each account was traced over many months, which enabled the possibility of studying high-frequency dynamics. An event window methodology was adopted to study the impact of cash-back incentives,

[11] Besides credit card adoption, another objective of extending rewards is to increase credit card spending that may result in more credit card debt in the future.

similar to Agarwal, Liu and Souleles (2007). They found supporting evidence for the efficacy of the reward program: average spending and debt increased by $79 and $191 per month respectively in the first quarter after the cashback program started. The effect was economically meaningful compared to the average cash-back reward received by its cardholders, $25, in the sample. The increase in spending and debt persisted in the long run: $67 and $207 per month respectively over the nine months ex post. The reward program was effective particularly for cardholders who did not carry debts prior to the program: they increased spending by $238 and debts by $242 during the first quarter. The results suggest that rewards can be another tool to steal customers from competitors in an extremely competitive credit card market besides gaining adoption of a payment instrument.

Examining the effect of receiving reward is virtually the same as how consumers respond to a permanent or transitory change in income, because consumers are receiving money for purchase that they would have made without the incentives. Thus, we can also draw some inferences from the consumption literature that considers permanent or transitory shocks to consumption. Agarwal, Liu and Souleles (2007) estimated the monthly response of credit card payments, spending and debt to the 2001 Federal income tax rebate. They found that, on average, consumers initially saved some of the rebates by increasing their credit card payments, but soon afterwards their spending too, increased, which runs counter to the prediction of the Permanent Income Hypothesis[12]. Aaronson, Agarwal and French (2012) found that as a response to minimum wage hikes, spending increased substantially, with most of the spending occurring on durable goods such as vehicles. On average, vehicle spending increased more than income among the impacted households. There were other studies that used the micro data to examine the consumption responses[13] (e.g. Johnson, Parker and Souleles, 2006): while some found that consumption response was essentially zero, others found that the response effect was dominated by liquidity constrained consumers (e.g. Agarwal and Qian, 2014).

Welfare evaluation

While the literature has presented evidence supporting the effect of reward offering on increasing card adoption and usage, it is still unclear about their social welfare implications. Opponents argue that even though consumers seem to be the direct beneficiary at the expense of merchants, who fund the rewards via fees paid to card issuers (please see detailed introduction about pay scheme in Section 5 fee and charges), it is possible that merchants may pass on the fees to consumers by charging higher retail prices. With regards to the impact on social welfare, card issuers and merchants also hold opposing standpoints. Card companies believe that offering rewards is capable of reducing the total costs to society by inducing more consumers to choose less costly payment cards over more costly

[12] The Permanent Income Hypothesis is first developed by the Nobel laureate Milton Friedman. It states that changes in permanent income, rather than changes in temporary income, are what drive the changes in a consumer's consumption patterns. So consumer will smooth consumption by spreading out transitory changes in income over time.

[13] Browning and Collado (2001), and Jappelli and Pistaferri (2010) offer a review of this literature.

payment tools such as checks. They argue that merchants will benefit as well since reward users would make more transactions with larger values. On the other hand, merchants complain that the credit card rewards are funded by extracting merchant surplus (Jacob, Jankowski and Dunn, 2009).

Do consumers really benefit from the rewards? Hayashi (2008) considers whether current rewards program benefit consumers and society. The empirical findings in this article suggest that existing provided payment card reward programs are not likely to be efficient, though the author admits that further data is required for a more concrete answer. On the other hand, using a simple model of payment card system, Shy and Wang (2011) supported the usefulness of reward programs indirectly by showing that consumer utility and social welfare was higher when merchants were charged with fees proportional to the transactions. Schuh, Shy and Stavins (2010) argued that merchant fees and reward programs generated an implicit monetary transfer to credit card users from non-card users, because merchants generally do not set differential prices for card users to recoup the cost of fees and rewards. They built and calibrated a model of consumer payment choice to compute the effects of merchant fees and card rewards on consumer welfare. The analysis suggested that aggregate consumer welfare can be increased by reducing transfer between consumers via a decrease in credit card rewards. This study also suggests general principles and implications for policy interventions at a policy level to improve welfare, among which, reducing transfers by regulating the merchant fees is an important aspect. This coincides with the recent policies enacted to regulate payment card interchange fees in Australia, Spain as well as the European Commission[14]. More recently, the European Parliament has voted in favour of a proposed interchange fee regulation, which caps the fee at 0.3% of credit card transaction values and the lower of 0.2% or 0.07 euros for debit card transaction. It requires the final endorsement of EU member states and the Economic and Monetary Affairs Committee before taking effect. This new regulation would apply to both EU cross-border and domestic transactions within EU countries and is expected to benefit consumers and retailer by dealing with the harm caused by current interchange fees.

2.6 Credit card complexity

Credit cards used to be charged with a fixed single interest rate of 20 percent, few fees and offered only to consumers with high outstanding balances for many years after being introduced. Things changed after 1990 when card issuers started to introduce cards with a greater variety of rates and fees. As a result, the cost of using the credit card now varies based on the borrowers' risk profiles, allowing consumers with lower credit the possibility of obtaining a credit card now. However, these changes have led to credit card contracts becoming more 'complex', hindering the consumer's ability to fully understand the true cost of credit cards, the entailed challenges in selecting and using cards (Canner and Ellienhausen, 2013).

[14] Bradford and Hayashi (2008) provide detailed discussion of actions taken by various countries.

In a report submitted to the U.S. Senate, Gao (2006) directly investigated the increasing complexity of credit card rates and fees, highlighting the need for more effective disclosure by the issuers. The content in the credit card documents were usually written far above the level that was likely to be understood by most consumers. They assessed the readability of two primary disclosure documents for 28 cards, from the six largest US issuers, including direct mail solicitation letters and cardmember agreements. Their usability consultant's analysis revealed that the two documents were written at a reading level commensurate with about a tenth- to twelfth-grade education. This level of presentation stood appears much higher than the eighth-grade, which was the average reading level of consumers in the United States[15]. To worsen matters, certain portions of typical disclosure materials required even higher reading levels. For instance, the information about annual percentage rates, grace periods, balance computation and payment allocation methods, was written at a level equivalent to a fifteenth-grade education, which is the equivalent of 3 years of college education.

The ineffective organization also made the disclosure document more complex and hinders consumers' ability to find useful and crucial information. One example in Gao (2006) indicated that issuers frequently placed pertinent information toward the end of sentences and the consumers would need to read through dense amounts of text before arriving at the important information. Other weaknesses included the use of small font sizes, and ineffective font placements; unnecessarily emphasis placed on specific terms and indistinguishable heading from the main text. Finally, credit card disclosure documents were usually further convoluted by being immersed in too much detail and riddled with superfluous jargon to convey simple concepts.

A number of credit cardholders were also selected and interviewed on how they typically used credit card disclosure documents to locate and understand key information. Results showed that the items that were apparently not well understood included (1) default interest rate; (2) late payment fees; (3) using credit card to withdraw cash, (4) grace periods and (5) balance computation method. Gao (2006) believed that the difficult-to-read materials was due to the attempts by issuers to avoid lawsuits and adhere to federal law and regulation, which no longer suited the complex features and terms of many cards.

2.7 Credit access and banking relationship

As a bank provides more services to a customer, it creates a stronger relationship with the customer and gains more private information. Such a relationship can potentially benefit consumers through either greater quantities or lower price of credit (e.g. Boot and Thakor, 1994). Using the 1989 Survey of Consumer Finances (SCF), Chakravarty and Scott (1999) empirically examined the role of banking

[15] 1992 National Adult Literacy Survey indicates that nearly half of the adult population in US reads or below the eighth-grade level. A later study, the 2003 National Assessment of Adult Literacy, show that reading comprehension levels did not significantly change between 1992 and 2003.

relationships in the consumer debt market. They showed that the stronger the relationship with the bank, measured by the relationship duration and number of activities, consumers reported significantly lower probabilities of being credit-rationed. Conditioning on obtaining the loan, stronger relationships also led to lower loan rate for two typical consumer loans: collateralized mortgage loan and signature special purposes loan.

Such a relationship is also beneficial to banks since it can help banks to better monitor the default risk of borrowers and lower the cost of information collection. Agarwal et al(2014e) used a more comprehensive dataset from a large, national financial institution in the US and examined the benefits of consumers' relationship to banks in the credit card market. They found that relationship accounts exhibited lower probabilities of defaulting and attrition, and had higher utilization rates, compared to non-relationship accounts. The effect is robust in various measures of relationship strength, such as relationship breadth, depth, length and proximity.

3. Repayment

3.1 Empirical evidence

Repayment decision - how much of the loan to repay and when to make the payments - is also an important question as it directly impacts consumers' debt levels and borrowing costs. Using the 1998 Survey of Consumer Finances, Kim and DeVaney (2001) conducted a Heckman two-stage estimation of factors predicting the amount of outstanding credit card balances. The first stage examines the probability of having an outstanding credit card balance (or being a revolver) while the second stage focuses on the factors influencing the outstanding balance. Results show that education, income and liquid assets are negatively associated with being a credit card revolver. However, the second-stage analysis suggested different factors: conditional on having outstanding balance, consumers with higher education, income, real assets, a positive attitude toward credit, and behind-schedule or missed loan payments, tended to have more outstanding balances. Moreover, the small sample size (3,376 and 1,500 household with outstanding balance) and measurement error inherent in the survey study limit the generality of its conclusion. Jiang and Dunn (2013) compared the credit card borrowing and payment behaviour for different birth cohorts as the literature established a hump-shaped curve of consumption over an individual lifecycle (e.g. Aguiar and Hurst, 2005; Agarwal, Pan and Qian, 2014). The dataset came from two large monthly surveys: one was conducted in period of 1996-2002 in the state of Ohio and the other was a national-level survey known as Consumer Finance Monthly (CFM) which began since 2005. The combined final sample spanned a period of 121 months and included 32,542 households. They examined the payoff rates, which was the percent of statement balance that was paid off before the minimum required payment was past its due. The estimated differences in

payoff rates between generations showed that the children's payoff rate was about 24% lower than their parents and 77% lower than their grandparents.

A recent study by Keys and Wang (2014) provided a comprehensive analysis of consumers' payment behaviour on their credit cards using data obtained from the Consumer Financial Protection Bureau (CFPB) credit card database. It contained the near-universe of account-level data for eighteen of the largest credit card issuers in the U.S. and also included nine institutions that fell under the purview of the U.S. Office of the Controller of the Currency (OCC)[16]. The dataset included monthly summary data from 2008 through 2012 and was merged with credit bureau data that provide an overview of each borrower's overall credit portfolio[17]. They first documented that most consumers exhibited consistent and strongly bimodal payment behaviours, that is, most accounts were either paid in full or paid near the minimum amount each month, with very few intermediate payment amounts. The payment pattern was strongly correlated with FICO score but not with income, as some high-income borrowers choose to revolve their debts at a relatively high cost with a median APR equalling 15 percent.

3.2 Minimum payment requirement

Paying at the minimum is rational only when the cardholders are extremely constrained because the credit card debt is often accumulated with expensive costs (APR is often above 10%). One possible reason for the observed minimum repayment may be that consumers have limited knowledge and pay little attention about the details in credit card contracts. Thus, requiring lenders to disclose loan cost information might lead to higher repayment to avoid the interest compounding from the minimum payment. However, experimental evidences provide mixed support for this notion.

Including minimum-repayment has an unintended negative effect since the postulated minimum payment may be interpreted by consumers as an existing psychological anchor (e.g. Thaler and Sunstein, 2008). In anchoring, arbitrary and irrelevant numbers bias people's judgements and decisions (Tverkey and Kahneman, 1974; Ariely, Loewenstein and Prelec, 2003), even when participants know that anchors are random or implausible (Chapman and Johnson, 1994) or the anchors are meaningful (Mussweiler and Strack, 2000). If payment decisions are anchored on minimum repayment information, then people will tend to pay less than they otherwise do.

In a hypothetical bill-payment experiment, Stewart (2009) reported results consistent with the anchor hypothesis. Two types of credit-card statements with a balance of 435 pounds were distributed to 400 participants in the U.K., who were asked to consider how much they could afford to pay,

[16] Agarwal, Chomsisengphet, Mahoney and Stroebel (2013) provides a detailed description of the OCC portion.
[17] This dataset is claimed to be the most comprehensive source of U.S. account-level data on credit card repayments in related literatures.

supposing that the bill had just arrived that morning. The only difference between the statements was that some were listed with a minimum repayment of 5.42 pounds while others were not. Results showed that removing the minimum-repayment information led to a dramatic increase in payment by 75%, from 99 to 175 pounds. The author argued against warnings about anchoring as the potential solution since studies (e.g. Wilson, Houston, Etiling and Brekke, 1996) have shown its ineffectiveness in other domains. Instead, they suggested that providing a table of alternative repayment scenarios, which aims to make the interest cost of paying at the minimum salient, may help attenuate anchoring. Following Stewart (2009), Navarro-Martinez et al (2011) conducted a two-cell between-subjects experiment with 127 randomly selected U.S. adult consumers. Similar results were found: participants tended to pay less when minimum payment information was presented (versus absent), even controlling for difference in temporal orientation, knowledge of interest compounding and income level. I find this study, Stewart's (2009) study, is particularly suitable for FCA to draw implications not only because the experiment was set in the U.K, but also due to the presence of a sharp contrast of payment between including and excluding minimum repayment requirements.

3.3 Practices to increase repayment

One possible approach to mitigate the negative effect of anchoring is to increase minimum payment requirements. This solution aims to take advantage of, rather than to attenuate the anchor effect since increasing the repayment requirement can be interpreted as shifting an existing anchor or introducing a new anchor. Thus, borrowers may locate their payment at the newly-changed or newly-salient anchors. A number of studies have found evidence to support this. Keys and Wang (2014) examined consumers' responses to the change in issuers' minimum payment formula, in which minimum payments increased by an average of $18 or 5% of the average balance. Results showed that the payment increased at least 4-6% of account-month, concentrated in shifts between full payment and near-minimum payments. This change was largely driven by the mechanical effect of consumers moving to the new, higher minimum requirement. The estimated magnitude of this positive effect was larger in Jiang and Dunn (2013). In a U.S. national-level survey containing 32,542 households from 1997 to 2009, they found that one additional percentage point increase in the minimum payoff rate led to the average payoff rate to rise 1.9 percent[18].

One recent study by Navarro-Martinez et al (2011) examined the effect of increasing minimum required payment levels in both US and UK. In the experiment with a random sample of U.S. adult consumers, they showed a significantly positive effect of minimum payment increase on the payment amount. They examined the same question in U.K. using the credit card transaction data provided by eleven U.K credit card issuers in 2009, which included 106,554 credit cardholders and a period of 21 months. The results also indicated a significantly positive association of higher minimum payment on

[18] As the authors outline, most banks usually set threshold to be $10 to $20 and the minimum payoff rate to be around 2%.

the proportion of both full and partial repayments. Finally, they made two arguments about the limitations of this positive effect: firstly, it tends to be moderated by borrowers' credit limit and balance due; secondly, increasing the minimum level is unlikely to completely eliminate the strong negative effect of merely presenting minimum payment information.

Mandatory information disclosure has been intensively adopted in domains such as health communications (e.g. Keller and Lehmann, 2008), nutrition labelling (Creyear, Kozup and Burton, 2002) and product warnings (Argo and Main, 2004). In the consumer credit market, it has also been suggested as a potential solution to mitigate the negative effect of merely including minimum payment and encourage borrowers to make larger monthly repayments. A potential solution might be including a minimum payment warning on borrowers' monthly statement or making the cost of minimum payment salient to the consumers. However, this seemingly effective approach receives limited support in the literature.

Focusing on the U.S. and U.K. as discussed above, Navarro-Martines et al (2011) further shows disclosing supplemental information, such as future interest cost and time needed to repay the loan, has no substantial positive effect on repayments. A more recent study by Salisbury (2014) designed experiments to offer an in-depth analysis of this question in the United States. Participants were presented hypothetical credit card statements and asked to decide how much of the credit card balances were due to repay. The evidence presented suggest that disclosing the negative impact of repaying only the minimum requirement amount each month, such as incurring higher interest cost and longer payoff time duration, does not lead to significant change in the repayment behaviour for the vast majority of consumers. The only exception was for consumers very low in payment knowledge or those holding a large number of credit cards may have an increased probability of repaying when the information is presented[19]. Salisbury (2014) offers support to solve the anchoring bias problem: most notably, it was found that when payment information was accompanied by additional information about an alternative course of action (i.e. what will happen if repaying a higher level of the balance), repayment behaviour changed consistently and consumers were choosing to pay back significantly more. This finding was consistent with the suggestions made by Stewart (2009).

In reality, policy makers also adopt similar strategies in order to enable borrowers to make more informed debt repayment decisions and increase monthly repayments. One recent example was the US Credit Card Accountability and Responsibility Disclosure (CARD) Act, which went into effect on Feb 22, 2010. This Act aimed to protect consumers by prohibiting lenders from making unfair increases in interest rates and requiring enhanced disclosures of card terms and conditions. One type of such disclosure required credit card statements to prominently display the cost to repay the balance

[19] Haws, Bearden and Nenkov (2012) has similar finding that supplemental such information increase repayment amount only for consumers who are low in spending self-control.

for those only making minimum payments, and to compare this amount to the cost if the card holder repaid the current balance within 36 months[20]. The CARD Act provided a rare opportunity for researchers to analyse the impact in a nationally representative context instead of small experimental settings like Navarro-Martines et al (2011).

The most notable study on evaluating the CARD Act was done by Agarwal et al (2014a). The source of their data came from Credit Card Metrics assembled by the US Office of the Comptroller of the Currency (OCC), which charters, supervise and regulates nationally chartered banks and federal saving associations. The sample was quite comprehensive and contained approximately 150 million accounts, covering roughly 40% of all outstanding U.S. credit card accounts from 2008 to 2011. The primary finding showed that the disclosure requirements had a small but significant effect on borrowers' repayment behaviours. The number of account holders paying at a rate that would repay the balance within 36 months increased by 0.5 percentage points, with a similar sized decrease in the number of account holders below this rate. In terms of monetary amount, the interest payment reduction was estimated to be an annualized average of $24. In aggregate, the annualized reduction in interest payments for U.S. credit card borrowers was less than 0.01% of the average daily balance, approximately $71 million. Campell, Gartenberg and Tufano (2011) also showed support for the success of this disclosure requirement but relied on a much smaller sample of 132,000 members from Affinity Plus Federal Credit Union. They found that there were fewer payments at minimum amount on aggregate and this impact was particularly stronger for most credit-constrained consumers.

To sum up, simply presenting the minimum payment requirement introduced an anchoring bias to consumers and bore a negative impact on the repayment amount. Imposing warnings or cost of minimum payment does not seem to mitigate the negative effects that follow. Possible solutions are increasing minimum payment requirement or including both the cost of minimum payment and comparison with alternative choices of payment.

4. Default

4.1 Determinants

With increasing access to a rich constellation of loan products, the level of household debts has been rising substantially in the last two decades. According to the statistics by Federal Reserve Flow of Funds, 2014q1, U.S. households owe $12~13 trillion in debt. Meanwhile, default on debts, in particular the default rates on credit cards, rose sharply (Federal Reserve Bank of Cleveland, 1998). Defaulting is not desirable for both the card issuers and consumers, so understanding the underlying factors is critical not only for credit risk modelling purposes but also policy making.

[20] The information disclosure relates to both the cost of making minimum payment and alternative options.

Gross and Souleles (2002b) were among the first study to use micro data to investigate this issue. The data is a nationally representative sample of credit card accounts assembled from some of the largest credit card companies in 1995. They analysed the duration model for default and assessed the relative importance of two popular explanations for the increasing trend of default -change in risk composition versus the demand effect. Estimates showed that the propensity to default still significantly increased between mid-1995 and mid-1997, even after controlling for risk composition and other economic factors. This result remains consistent with the demand effect explanation, that is, an increase in the borrower's willingness to default, might be due to declines in social stigma and availability of information costs. However, the author cannot directly identify what underlined the estimated demand effect. Studies also evaluated the importance of macroeconomic factors in predicting defaults. For example, using credit data from a large financial institution for around 700 thousand customers from January 1995 to December 1997, Agarwal and Liu (2003) provided conclusive evidence that unemployment is critical in determining the default rate, and credit supply proxies by credit limits, negatively affects default. In another study, Agarwal, Liu and Mielnicki (2003) examined the effect of homestead exemption laws[21] and showed that loose garnishment and property led to higher credit card default rates after controlling for macroeconomic factors.

Social norms (e.g. reputation in Agarwal et al, 2012, social networks in Agarwal, Chomsisengphet and Liu, 2011) and demographics (e.g. race and gender in Agarwal et al, 2014 b and d) were also found to be important driving forces. Agarwal et al (2014) evaluated the role of gender in credit card defaults by exploring a population dataset in Singapore and found that the odds of incurring credit card bankruptcy for female is only 28% that of males. Delinquency can also be intentional as a way for bureaucrats to extract rents from the banks (Agarwal et al 2014g). These findings are robust to controlling for a rich set of demographics and consistent with the gender gap on risk attitudes (e.g. Croson and Gneezy, 2009).

4.2 Banks' solution

With the increasing credit card debt, lenders are actively trying to reduce losses associated with credit card default. The commonly adopted approach is offering consumers forbearance options such as lengthening repayment terms and lowering interest rate. Choices also include permitting cardholder to reinstate their 90 days default status conditional on the borrowers' meeting the minimum payment on their debt. Agarwal, Chomsisengphet and Mielnicki (2008a) evaluated the effect of such re-aging program using proprietary data from 241,452 individual accounts from 1995 to 2001 in the US. Their results showed re-aging programs to be effective for the bank to recover previous losses as 78% of the re-aged accounts did not default again. Moreover, it also benefitted consumers who defaulted on their credit by improving their credit profiles: their FICO score rose by 20 points. Overall, these findings

[21] Agarwal et al (2005) shows the impact of state exemption laws on small business bankruptcy decisions.

indicate that the re-aging program is helpful to both banks and liquidly-constrained borrowers who might have otherwise defaulted on their debt.

5. Borrowing costs

Besides interchange or merchant fees charged from the merchants depending on the payment schemes[22], credit issuers typically have two potential revenue sources from the consumers, including interest from cardholders with a positive credit card balance and fees to cardholders (such as annual fees, penalty fees and cash advance fees).

5.1 Empirical estimates

Supporters of enhanced regulation insist that banks are earning significant profits in their credit card portfolios, especially from consumers with the lowest FICO scores. Estimates from Agarwal et al (2014a) showed that from April 2008 to January 2010, the average consumer in the US paid an annualized 21.9% in interest payments and fees and generated a net profit of 1.6% for the bank. Consumers with low FICO scores (<620) paid almost in double, 43.9% per dollar borrowed and generated a net profit of 7.9%. Massoud, Saunders and Scholnick (2011) find that banks set up penalty fee based on consumers' credit risk and the estimate for late and over-limit fee was $14.68 and $17.54 per month respectively. Stango and Zinman (2009) measured the total explicit and implicit costs consumers paid across all of their banks and credit card accounts. They examined a novel administrative data of 917 consumers and 722,944 transactions over two years in 2006 and 2007. In their sample, the median household paid $43 in total bank and credit card accounts costs per month, with credit card interest rates being the largest cost. The credit card penalty fees, including late and over limit charge, are also important: at least 48% pay and many consumers pay more than $10 per month. They argued that a large share of costs can be avoided, for instance, most credit cards late and over limit fees could be avoided by either paying a bill using available checking balance or using a different card with sufficient available credit. They conclude that the median consumer could avoid 60 percent of all credit card interest charges, over limit and late fees with minor behaviour changes.

Penalty fees are charged as a punishment when consumers either are late with a payment or have charged an amount over the preauthorized limit or both. Statistics have shown that incurring penalty

[22] Similar to the United States, the payment card schemes generally take one of two principal forms in UK: 1. Four-party schemes comprising of cardholders, merchants, card issuers and merchant acquirers. The latter two are members of a payment card network, such as Master or Visas (or in the US a regional debit card network, such as Star and NYCE). The merchant pays interchange fees, set by the card networks, to the card issuers. They will also pay a merchant fee to the merchant acquirer, who sets the merchant fee. 2. Three-party scheme comprising of cardholder, merchants and a card network such as American Express or Discover. In contrast to four-party schemes, there is no explicit interchange fee as the card network acts as both card issuer and merchant acquirer. The merchant only needs to pay a merchant fee to the card network. Networks may allow third parties to issue cards on their behalf.

fees has become a prevalent phenomenon in UK and US[23]. During the economic downturn, British credit card suppliers collected 213 million pounds in penalty charges in 2008 and the number in US is estimated to be 20.5 billion dollars in 2009, according to R.K. Hammer, a consultant in the credit card industry (New York Times, September 2009). Massoud, Saunders and Scholnick (2011) is among the few studies that examined the determinants of US credit card penalty fees. Specifically, they used the data from the Terms of Credit Card Plan Survey conducted by the Federal Reserve from 1990 to 2002. They documented that penalty fees were increasing in consumer default risk, which was consistent with the standard argument that penalty fees compensate banks for credit card default risks (Furletti and Ody, 2006). Results suggest that banks with higher market shares tend to charge higher penalty fees.

5.2 Contract choice concerning interest rate and fees

Consumer's choice of certain credit card contracts involves the trade-off between annual fees and interest rate. To minimize the total borrowing cost, the rational consumer should be more sensitive to interest rate and choose the lower interest rates if he or she expects to borrow a sufficiently large amount. In reality, do consumers choose the right credit card contract? Agarwal et al (2015) investigated this by examining the monthly behaviour of 200,000 credit card accounts from a large U.S. bank issuing credit cards nationally. Their answer to this question was, yes: consumers on average chose the credit contract that minimized their total costs ex post. Although about 40% of consumers chose the ex post sub-optimal contract, they were more likely to subsequently switch to the optimal contract afterwards. Therefore most of the errors were apparently not very costly.

Learning has been believed to be a key mechanism that underpins economic theories of rational behaviour, such as switching telephone calling plans and medical contracts. For credit cards, it is possible that consumers who paid large fees in the past learnt to avoid future fees. Agarwal et al (2008b) showed the learning pattern of consumers in avoiding credit card fees using a representative sample of about 128,000 credit card accounts over a 36 month period (from January 2002 through December 2004). Evidence suggests that paying a fee last month reduces fee payment in current month by 40% and monthly fee payment by 75% during the first four years of a card holder's account life. The learning effect is also shown to depreciate at a rate of between 10 and 20 percent per month. This suggests a forgetting effect as the monetary crunch becomes more distant (e.g. Ericson, 2011; Gallagher, 2014).

5.3 Policy evaluation- the CARD Act on limiting fees

[23] According to 2008 UK Financial News, 20% of British adults incur a penalty fee in 2008 and the number in US is 15%. Such fees are of less concern in countries of Scandinavia, France and Italy where debit cards are more prevalent.

Policymakers are increasingly turning their attention to implement regulations that aim to reduce or limit fees charged on customers. However, researchers (Mullainathan, Barr and Shafir, 2009; Agarwal et al 2014c) raise the concern that the reduced revenue to lenders from fees would steer banks to adjust other rates and fees to compensate. This coincides with the finding that penalty fees and card interest rates are often substitutes (Massoud, Saunders and Scholnick, 2011). As a result, such fee-limiting policies may increase borrowers' cost and impose negative external conditions on consumers' welfare. The CARD Act of 2009 in US is one such regulatory policy that protects consumers by putting limits on the ability of banks to charge certain types of credit card fees[24]. Agarwal et al (2014a) conducted a quantitative analysis of the CARD Act's provisions to limit fees and found that this Act was highly effective in lowering borrower's cost. Over-limit dropped from an annualized 1% of average daily balance to nearly zero while late fees dropped by 0.5 percentage points. Combined across various implementation phases, the CARD Act seems to reduce overall fee costs by an annualized 2.8% of borrowing volume, which translates into annual cost savings of $20.8 billion per year. The effect is largest for borrowers with low FICO scores.

6. Searching and switching costs

The credit card market has been shown to deviate from the perfectly competitive model. Supporting evidence in the US is that, for example, banks earning huge profits from their credit card portfolios[25] and credit card rates remain irresponsive to changes in the money-market rates. Another observation suggests that consumers may face large switching costs: not every consumer who feels dissatisfied with his or her bank actually takes action to switch to other banks. As a research report from the University of Auckland showed that while 15-20% of residential customers thought of changing banks, only 3-5% actually moved (Sheeran, 2003). This section offers a summary of studies on the existence of searching and switching costs in the credit card market and how consumers' searching and switching behaviours impacted banks' competition and pricing.

6.1 Switching costs

Information barriers in the credit card market created switching costs for customers with high balance, as documented in Calem and Mester (1995). They relied on data from the 1989 Survey of Consumer Finances and examined the effect of the household bank-card debt, CCB, on the dummy whether the household has been denied by the bank. Estimates suggested that the coefficient on CCB was

[24] The Office of Fair Trading provide a guidance on principles to determine the legitimate default charges and adopt a simple monetary threshold,12 pounds. Details can be found in https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/284445/oft842.pdf

[25] A carefully done study by Ausubel (1991) concluded during the 1980s bank credit-card operations earned 3 to 5 times the rate earned in the banking industry. A more recent estimate is from Agarwal et al (2014a), the return on equity for the credit card portfolio is about five times the US commercial banking sector's average ROE.

statistically significant and positive. Households with larger card debts incur higher switching cost since they are less likely to get new credit from another bank.

However, the credit card market has witnessed rapid changes over the 1990s and 2000s. Particularly, the widespread use of automated systems for the pre-screening and solicitation of card applicants has greatly improved the issuers' ability to judge creditworthiness and lower evaluation costs. As a result, the switching costs due to information based barriers should be reduced. As a follow-up study, Calem, Grody and Mester (2006) re-examined the same question using more recent data, 1998 and 2001 SCF. They found similar findings where high-balance households still remained more likely to be rejected or to be granted at lower-than-desired credit limit when applying for new credit. Thus, information-based barriers that obstruct switching, remain relevant in the credit card market despite the advances and innovations in the market over the past decade.

Matthews, Moore and Wright (2008) drew similar conclusions using survey data with 955 valid responses in New Zealand. Participants were asked about their desire to switch to another bank and also the likelihood of doing so in the future. In the survey, switch costs were further broken down into nine categories, including 1) learning costs; 2) search costs; 3) uncertainty; 4) benefit loss; 5) monetary loss; 6) hassle; 7) brand relationship; 8) personal relationship; 9) service disruption[26]. To which cost served as the main hurdle, the authors investigated the relative importance of the nine switching cost components in reducing the positive correlation with Switching Desire. The results showed that out of the nine categories of switching costs, only learning costs and uncertainty reduce the correlation between switching desire and switching likelihood. The findings provided important insights on the importance of different switching cost components, despite some measurement errors inherent in the survey.

6.2 Searching behaviour

Due to high volumes of direct solicitations combined with disclosure requirements which reduce the costs of searching, consumers in the current credit card market are interest-rate sensitive and finance charge considerations appear to offset the switching costs that exist for high-balance consumers.

Using data from 1989 Survey of Consumer Finances, Calem and Mester (1995) estimated a tobit model of consumers' propensity to engage in search, SHOP, on the household's bank-card debt, CCB.

[26] Detailed definitions for the nine categories are: Learning costs include familiarisation with the new bank, its production and systems; Search costs includes the cost to find out and evaluate other financial institutions; Uncertainty is the risk that the new bank may be better or even worse; Benefit loss is the loss of accumulated benefits in the forms of reward schemes, discounts and other privileges; Monetary loss is in the form of fess for terminating the old relationship and those incurred establishing new relationship; Hassle involves the inconvenience of actually making the change from one bank to another; the loss of Brand relationship refers to the potential damage to their self-image when consumers move to a smaller bank or with fewer market share; the loss of Personal relationship means the breakup of relationship the switcher has with the bank staff; and Service disruption refers to the possibility that the automatic payment may be missed or a direct credit not received on time.

The MLE estimates showed a negative and significant relationship between SHOP and CCB. This remained consistent with consumer searches leading to less-credit card debts. Kim, Dunn and Mumy (2005) provided support where consumers were actually getting benefits from actively searching. They first presented a model of Bertrand-type competition among credit card issuers under consumers' asymmetric responses to interest rate differences. In any of the possible equilibria, cardholders who had a borrowing motive ended up with a lower interest rate. The regression analysis generated results in line with the theoretical predictions. The size of cardholders' total balance negatively affected the APR to which he or she was subject, since higher balances gave a greater incentive to search for a lower interest rate.

Even though high-balance-carrying consumers have large switching costs, such as higher likelihood of being rejected, they may still have incentive to search for lower credit card rates when interest savings on large credit card balances can outweigh the discouraging effect of credit rejection. Kerr and Dun (2008) supported this notion using the 2001 Survey of Consumer Finance. They estimated a structural form of equation containing the propensity to search, SHOP, and the probability of rejection, REJECT. Results showed that the negative impact from each one percentage point increase in the expected probability of Reject was offset by an extra $190 in balances.

6.3 Impact on banks' competition and pricing

The literature has shown that reducing the cost of searching intensifies competition and lowers margins by expanding the scope of competition[27] (e.g. the case of online wine shopping in Lynch and Ariely, 2000). On the other hand, the existence of switching costs will also affect the competition in the markets since firms are facing the trade-off between setting a low price to capture market shares and setting high prices to harvest profits by exploiting its currently locked-in customers. As we discussed above, the inactiveness of consumers with high balances despite of dissatisfaction may indicate the existence of high switching costs in the credit card market. Thus, the credit card market provides a natural setting for investigating the question whether the active searching and switching by consumers actually leads to more competition among banks and efficient pricing.

To answer this question, Stango (2002) used panel data from the *Card Industry Directory* which lists for the largest 250 credit card issuers in US from 1989-1994. The empirical test involved regressing issuer-level prices on issuer-level switching costs, which was measured in three ways: (1) the ratio of balance to account number; (2) issuer's annual fee; (3) issuer's size. Results showed that the issuer's price or interest rate was an increasing function of customer's switching cost and the magnitude of the effect could explain within-firm interest rate differences of 100-150 basis points.

[27] Agarwal, Ben-David and Yao (2014) examine the similar setup how consumers' behaviours impact on pricing in the residential real estate market.

The effect existed only for commercial banks but not for credit unions, which were not-for-profit organizations and were not expected to exploit consumer switching cost.

7. Consumer behavioural biases and implications

Individuals commonly make suboptimal financial decisions that would be driven by various behavioural biases[28]. In this section, we review the literature covering how and to what extent consumer behavioural biases affect their decisions with regards to credit card use.

7.1 Credit card debt puzzle

Gross and Souleles (2002a) first documented the surprising fact, called 'credit card debt puzzle', that U.S. households tended to hold significant credit card debts and sizable liquid assets simultaneously. They relied on the 1995 SCF and found that almost all US households with credit card debts held a positive position in liquid assets and the size of assets were larger than one month's income for a third of the sample. Since liquid assets pay lower returns than the interest charged for credit card debt, which is usually as high as 15%, this occurrence cannot be easily explained by a rational framework. However, this finding is not specific to the 1995 SCF wave but present in all years with magnitudes quite stable over time (Bertaut, Haliassos and Reiter, 2009). This phenomenon seems not to be restricted within households with low levels of income and education. One example of this puzzle was documented by Agarwal, Skiba and Tobacman (2009). Using a merged dataset of payday loan borrowing and credit card history, they found that most account holders still borrowed on payday loans at the time when they still held substantial unused liquidity on their credit cards. The losses from payday borrowing instead of using credit cards is large compared to the co-existence puzzle as the annual percentage rate in payday loan is usually more than 100%.

Later studies devoted efforts to provide motives for this puzzle. For example, Lehnert and Maki (2002) argued that the puzzle could be explained by the consumers' intention to strategically prepare for the bankruptcy filing, while storing their assets in liquid form so they might be converted to exemptible assets. Consistent evidence was found, where the credit card debt puzzle is more prevalent in the U.S. where exemption levels are higher. However, this bankruptcy filing explanation is too narrow in the sense that most puzzle households are unlikely to file for bankruptcy. The simultaneous holding of liquidity and credit card debt can also serve as a means of self- or spousal control (Bertaut, Haliassos and Reiter, 2009; Haliassos and Reiter, 2005). One spouse in the household is the earner and the other is the compulsive shopper. Their argument is that the earner will choose not to pay off credit card debts in full in order to leave less of the credit line open for the shopper to spend. The limitation with this explanation is that the cost of imposing such control is relatively too high since the

[28] There is a growing evidence that cognitive ability is related to behavioural anomalies (e.g. Dohmen et al, 2010; Agarwal and Mazumder, 2013).

household in the puzzle is shown to lose an average of $374 per year, which amounts to 1.5% of the total annual after-tax income. The precautionary explanation proposed by Telyukova and Visschers (2013) is relatively more convincing. He highlighted the role of liquidity demand in accounting for this puzzle: households are not using their money in the bank to pay off the accumulated credit card debt because they anticipate needing that money in situation where credit cards cannot be used. So households are consuming both cash goods and credit card goods. The calibration result was able to account for around half of households who held consumer debt and liquidity simultaneously.

7.2 Does credit card encourage spending

Since 1980s, the U.S. personal savings rate, which had hovered in the 6-12% for decades, began a secular decline. This decline roughly coincided with a secular increase in the dissemination and use of credit cards, supporting the frequently heard conjecture that credit card use causes people to spend more and save less. The earliest work related to this issue is a descriptive study done by Hirschman (1979), which conducted interviews with customers in several branches of a department store chain during 1977. The primary result showed a positive correlation of a bank-card or store-issued card possession with purchases per department store visit. However, the usual caveats concerning generalizing from regionally-generated research could also be found here. The data were limited both by its geographical and sampling frame, so there is no inherent guarantee that same findings could be obtained in other settings.

In a later study, Feinberg (1986) designed experiments to test whether the presence of credit card stimuli facilitates spending. Participants (60 undergraduates) were asked how much they would be willing to spend for various consumer products on the experimental desk where credit card paraphernalia were displayed. He found that by so decorating the experimental setting, he could boost hypothetical willingness to pay by an estimated 50-200% relative to the estimates of a control group. Feinberg also found that response times were substantially shorter in the presence of the credit card stimuli. The experiments indicated that credit card stimuli could enhance the magnitude and decision time involved in spending, though the subjects were generated from sample of youths. In a similar vein, Prelec and Simester (2001) investigated the question in two experiments. In one experiment, they sold tickets for different sport events to MBA students using a second-price sealed-bid auction. The average price paid by the group who were expecting to pay by credit card was significantly higher than the average price paid by the group who were expecting to pay cash. However, they did not find a significant difference in the second experiment when they sold a $175 gift card for a local restaurant.

Other studies have attempted to uncover the underlying mechanisms on how the credit cards promote spending. Soman (2001) argued it is because payment mediums, such as cash and check, affect consumer's future spending behaviours. They involve two mechanisms: (1) rehearsal which

cause consumers to recall past expenses more accurately and (2) immediacy that lend to an immediate depletion of wealth, both of which will make consumers more averse to spending. However, the use of credit cards did not bring such negative impact on spending. In a subsequent filed study, Soman (2003) collected receipts from shoppers at the exit of a large supermarket store and found the positive effect of credit card use on spending was mainly concentrated on the purchase of flexible items (an expense which may vary on price and quantity available), but not on inflexible goods (needed irrespective of changes in price and other factors). Other explanations include the payment transparency hypothesis: credit cards and other payment tools are different in the transparency or the vividness with which individuals can feel the outflow of money, with cash being the most transparent mode. The more transparent the payment outflow, the greater the aversion to spending or higher pain of paying (Prelec and Loewenstein, 1998). Raghurbir and Srivastava (2008) supported this notion in an experimental study. They asked the participants to estimate the budget for a hypothetical thanksgiving party where the specified payment medium was cash or credit card. Estimates of the total cost of the party were significantly higher in the credit card condition. Interestingly, when participants were instructed to consider the cost of each item individually and add them together, there was no difference between costs of using cash and credit card.

7.3 Present bias

Another behavioural bias, known as present bias, has been documented in the field of behavioural economics. This terminology refers to the situation where decision-maker's preferences change over time, in such a way that they place significantly more emphasis on the present than in the future[29]. Present-biased preference can be seen as a result of the interplay between two separate decision making systems: the affective system, which values immediate gratification and sharply discounts all future periods; and the deliberative system, which makes long-run plans and displays higher discount factors(for example Bernheim and Rangel, 2004; Fundenberg and Levine, 2006). A number of theoretical papers suggested that present bias can drive credit card borrowing (e.g. Laibson, 1997; Fehr, 2002; Heidhues and Koszegi, 2008), which implies that consumers may have to constrain their own future choices.

Shui and Ausubel (2005) found empirical evidence to support present bias in the credit card market using a large-scale randomized experiment. 600,000 consumers were each randomly assigned to one of the six different groups, who are mailed with six different credit card offers. The six offers have different introductory interest rates and different durations. All other characteristics were identical across the six market cells. The advantage of their experimental setting was that they were able to identify the consumer's long-run plans from their actions and consumers remained blind to the experiment. The first finding was that consumers preferred an offer with a lower introductory interest

[29] This is one type of the time-inconsistent preference in the behaviour economic literature.

rate (4.9%) and shorter time duration (6 months) to an offer with a higher introductory interest rate (7.9%) and longer time duration (12 months), even though their ex post borrowing behaviours revealed that the offer with the longer duration was more optimal. The second finding was that the majority of respondents did not switch after the expiration of their introductory offer; even if they had the same level of debt when they accepted the offer. This was puzzling because there were many other offers and the benefits of switching were large. This may also suggest the inertia which was well documented in the household finance literature (e.g. Andersen et al, 2014). The limitation of this study stems from its datedness, conducted in 1995. Further, they analysed aggregate credit and saving outcomes, which makes the link between borrowing and present bias indirect. Additionally, examination of aggregates does not allow for evaluation of individual behaviour.

Meier and Sprenger (2010) overcomes the limitation of aggregate examination by combining directly elicited time preference measures with administrative data on borrowing. For a sample of around 600 low-to-moderate income individuals at two Volunteer Income Tax Assistances in Boston in 2006 and 2007, they measured individual discount factors using incentivized choice experiment. The results showed that present-biased individuals were around 15% more likely to have credit card debts. Conditional on borrowing, they borrow around 25% (measured by outstanding balances on revolving accounts from the credit reports) more than dynamically consistent individuals. The correlation is robust after controlling for income, credit constraints and socio-demographic characteristics. However, the study was limited by its small sample and was mainly conducted on low-income consumers.

7.4 Over-optimism

Dispositional over-optimism, refers to an overly positive general outlook towards future matters for individual economic decision-making that a person has, particularly for credit card use in this context. Puri and Robinson (2006) examined the general role of optimism on individual economic outcome using data from the Survey of Consumer Finance. Optimism was measured as discrepancy between respondent's self-reported life expectancy to that implied by actuarial tables. In particular, they compared the payment behaviours of credit card debts among moderate and extreme optimists. Results show that moderate optimists seem to have prudent financial habits and are more likely to pay off their credit card balances while extreme optimists do not. The result holds after controlling for net worth, age, education, health, and other demographics.

In a follow-up study, Yang, Markoczy and Qi (2007) directly documented the consumer credit card adoption behaviour when individuals are overly optimistic about their future usage of the card. Data were obtained from a survey of credit card usage for multiple consecutive time periods in the 1990's

in the United States. They determined the degree of unrealistic optimism based on the discrepancy between individually reported debt paying intention and the individual's actual outstanding balance. Results showed that consumers with higher levels of unrealistic optimism had a weaker preference for low ARP but stronger preference for low fees. This credit card adoption behaviour was sub-optimal as they usually ended up keeping the balances in their accounts even though they did not intend to borrow.

These people who are more unrealistically optimistic about their future may be a good target for credit card issuers and marketers since the high interest that borrowers pay on their outstanding balances is the primary source of profit. Thus, banks can offer cards with low fees but not low APRs to attract these consumers. For policy purposes, the results suggest that alternative approaches, like limit on the APRs in the solicitation offers or financial education to draw consumers' attentions on the potential bias, are helpful to protect consumers' interest.

7 Conclusions

Credit cards have become pervasively held by most consumers. With increasing access to personal credit, households are now relying more and more on electronic payment media, mostly credit cards in the UK and the US. Meanwhile, educators, consumer advocates and public policy administrators have raised concern over the problems of credit card misuse and the massive accumulation of credit card debt. This paper reviewed the empirical evidence, mostly in the US for the last two decades[30], on issues related to consumers' behaviour in the use of their credit cards.

We first focused on the driving forces for consumers' choice of credit cards. Descriptive studies showed that credit card holders were often characterized as those with better education and higher income, which is not surprising as they are more likely to receive credit from the banks. It is more meaningful to compare the use of credit card versus debit card since they are the most popular electronic means of payment. A number of studies using survey data show that the use of debit card is significantly higher for credit card revolvers, who were carrying unpaid balances than convenience users who paid off their debts every month.

As the credit card market is becoming more competitive, banks actively solicit potential consumers by extending attractive offers, such as low interest rates or longer payment periods. However, related papers highlighted two potential problems, adverse selection and moral hazard. Solicitations, especially those with inferior conditions, tend to attract consumers with higher credit risk, who were more likely to default ex post. Even if banks successfully guaranteed borrowers' credit quality, the high interest rates included in some solicitations may provide greater incentives to default.

[30] The majority of empirical studies on credit cards focused on the US market due to the data availability.

A number of studies also documented interesting facts regarding the use of credit cards. Consumers tended to target a certain fraction of limit as debt or only spend within a single payment network. Credit card usage was found to be driven by external factors. For example, the credit card debt was observed to experience an immediate and significant rise in response to the increase in credit limit or decrease in APR. Reward program participation led to higher levels of credit card usage and increase in spending.

One recent study suggested bimodal repayment behaviour: where most accounts were either paid in full or paid near the minimum amount. Simply including the minimum payment requirement might induce the anchoring effect and misguide consumers to allocation payment levels around the minimum amount. Experimental and field studies show that increasing the minimum payment requirement or presenting alternative payment options can effectively increase consumers' repayment amount.

Empirical studies show that the rise of the credit card default in the past decades in the US is largely due to the decline in bankruptcy stigmas such as disgrace and bad reputation. Macroeconomic factors (e.g. unemployment and exemption law) and demographics (e.g. gender and race) are both found to be highly associated with credit card defaults. Empirical estimates indicate a high level of total borrowing cost, including interest payment and fees. Meanwhile, most consumers are price sensitive and can make rational and wise choices over different credit card contracts given their ex post borrowing needs.

Though card issuers are now more capable of judging borrower's creditworthiness with the automatic screening technology and credit score system, studies still document the existence of switching cost. This cost is particularly high for consumers with high balances in terms of rejection, since they face a higher probability of being rejected when applying for new credit. However, high-balance consumers are found to actively search for a lower interest rate and gain benefits. At the same time, studies have also shown that it is banks, instead of credit unions, that are exploiting constrained consumers with high switching costs by charging them a higher interest rate.

Finally, we listed several behavioural biases found during credit card use. The first puzzle is that consumers were holding liquid assets and credit card debt simultaneously. This was highly irrational given the high interest rates associated with revolving debts. Moreover, lab studies found supportive evidence that consumers tended to overspend using credit cards compared to alternative tools such as cash and checks. Consumers are also found to suffer from present bias by only considering short-term borrowing. They are also overly optimistic regarding their self-control of future spending and chose the credit contracts which were sub-optimal ex post.

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