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Abstract

Using a unique administrative level dataset from a large and diverse U.S. financial institution, we test the impact of rewards on credit card spending and debt. Specifically, we study the impact of 1 percent cash-back reward on individuals before and during their enrollment in the program. We find that the marginal increase in spending per month during the first quarter of the program is $68. Average monthly payments decreased more than the marginal increase from cash-back rewards resulting in card debt increasing an average of $115 during the first quarter. Evidence from the credit bureaus confirms that consumers offset their increased spending and debt on their rewards card by lowering their spending and debt on their other credit cards. Segmenting the data by different types of cardholders, we find that cardholders who do not use their card prior to the cash-back program increase their spending and debt more than cardholders with debt prior to the cash-back program. We also find heterogeneous responses by demographic and credit constraint characteristics.

Key Words: Household Finance, Credit Cards, Consumption, Financial Incentives, Rewards

JEL Codes: D1, D8, G2

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1. Introduction

Today, rewards are routinely given by airlines, hotel operators, and credit card issuers to increase use of their products. In the case of credit cards, rewards are an effective way to attract cardholders or convince existing ones to use a specific card for their purchases and borrowing needs. In 2005, six billion reward card offers were mailed by the credit card industry. Typically these mailing are randomized and the response rates are very low. For instance, in 2005, the response rate was 0.3% (also see Agarwal, Chomsisengphet, and Liu, 2010). Card companies have pursued aggressive tactics, such as offering cash back, airlines miles, rebates and lower interest rates. The main objective of the card companies is to increase card spending that may result in cardholder's debt in the future.[1]

In this paper, we study the impact of credit card rewards on spending and debt. We explore three questions. First, do consumers spend more when given rewards? Second, do consumers increase their debt because they receive rewards? Third, do consumers partially or fully offset their increases in spending and debt accumulation by reducing spending and debt on their other credit cards?

We find that consumers generally spend more and increase their debt when offered one percent cash-back rewards. The impact of a relatively small reward generates large spending and debt accumulation. On average, each cardholder receives $25 in cash-back rewards during our sample period. We find that average spending increases by $68 per month and average debt increases by over $115 per month in the first quarter after the cash-back reward program starts. The greater increase in debt compared to spending suggests that average monthly payment drops more than the marginal increase in spending from the cash-back program. Specifically, we find a

[1] Many websites offer tips to smartly choose the rewards programs. For example, www.rewardcreditcardsite.com suggests the following 7 tips – do not carry a balance, know what "UP TO" means, what the limit, etc.

reduction of payments within the first quarter of $38 of the start of the program, suggesting that the marginal increase in spending due to the cash-back reward is converted into debt along with a portion of baseline spending. Furthermore, evidence from credit bureau data confirms that consumers substitute their spending from other cards to the card with cash-back and decrease debt on their other cards. Finally, even in the long run, we find a persistent increase in spending and debt. Specifically, the average spending and debt rise during the nine months subsequent to the cash back reward is $76 and $197 per month, respectively. The reduction in payments is $83 during the same nine months period.

We identify certain types of cardholders that are more responsive to the cash-back rewards program. Cardholders that do not carry debt have a larger response to the cash-back program. We find that 11 percent of inactive cardholders during the three months prior to the cash-back program used their cards to make purchases of at least $50 in the first month of the program. Specifically, inactive cardholders increase their average per month spending by $220 during the first quarter and their average per month spending only decreases to $180 during the first nine months. Their average per month increase in debt during the first quarter is $167. We find that these cardholders substitute spending and debt accumulation from other cards to the cash-back card.

Cardholders react differently to cash-back rewards based on some demographic characteristics. Average per month spending increases by $55 by single cardholders and by $95 by married cardholders during the first quarter. Similarly, single cardholders increase their average per month debt by $65 as compared to $111 by married cardholders during the first quarter. We do not find significant differences between male and female cardholders. Cardholders that earn less than $40,000 increase their average per month spending by $47 as

compared to $74 for cardholders that earn more than $40,000 during the first quarter of the program. Those earning below $40,000 accumulate $56 additional debt on average per month versus $87 for cardholders earning more than $40,000 during the first quarter.

Credit constraints also impact the response to the cash-back program. Not surprisingly, those cardholders with higher credit limits tend to spend more and accumulate more debt per month on average in response to the cash-back program. Cardholders utilizing less than 50% utilization of their credit limits tend to spend more and accumulate more debt per month.

We are also able to study another tool to increase card usage and debt, albeit more costly, to convince cardholders to increase their debt: APR reductions. During our sample period, the financial institution offered certain cardholders a 10 percent APR reduction. Consistent with Gross and Souleles (2002), we find that consumers react to such a large reduction in APRs by increasing card spending and debt. However, we find that only part of this increase in spending contributes to an increase in the consumer's balance for all her credit cards, which suggests that consumers shift spending and debt from other cards.

Our paper incorporates key features from several strands of the literature in economics and finance – consumer payment choice, consumption response to income shocks, and behavioral finance. We tie our work to each of these fields and highlight our contribution. First, the literature on payment substitution argues that monetary incentives are effective in enticing consumers to use a given payment instrument over another. While the literature focuses on different types of payment instruments, our analysis suggests that these incentives are also effective in differentiating providers of the same type of payment instrument. Second, we incorporate findings from the consumption literature that study monetary payouts such as tax rebates and their impact on increased spending and debt. Our results confirm one of the main

findings in this literature that only a small financial incentive is required to change consumer behavior. Third, the literature on time-inconsistency suggests that at least some consumers increase their spending and debt when offered financial rewards but may incur greater debt than expected. Given our ability to study a cardholder's overall portfolio, we are able to distinguish between increase in spending and debt on a specific card and how that affects a consumer's overall balance sheet.

In addition, our results also have policy implications. For instance, the recent regulatory and legislative actions have focused attention on the impact of rewards on consumer choice of payment instrument and who pays for these rewards. Some observers have argued that the recently passed Card Act and recent changes to overdraft access for debit cards in the United States would reduce the ability of issuers to extend rewards.[2] While mandated reduction in cardholder fees and finance charges may potentially affect the level of rewards, we find that rewards have significant impact on credit card debt especially via substitution from another issuer's credit card suggesting that rewards are an effective tool to steal customers from a financial institution's competitors.

The rest of the paper is organized as follows. Section 2, reviews the literature. Sections 3 and 4 outline the data and provide results, respectively. Finally, section 5 concludes.

2. Background

During the past decade, there has been a growing literature documenting the changing nature of consumer finance due to the explosive growth of credit card usage. For instance, in 1970, credit card related consumer debt totaled $2 billion as compared to $626 billion in 2000.

[2] For details about the 2010 Card Act, see http://www.federalreserve.gov/consumerinfo/wyntk_creditcardrules.htm. For details regarding recent debit card overdraft rules, see http://www.federalreserve.gov/consumerinfo/wyntk_overdraft.htm.

In 2007, servicing credit card debt (interest plus minimum payments) represented about 14% of disposable personal income. According to Kennickell, Mach, Bucks and Moore (2009), 29 percent of households with a percentile net worth less than 20 percent carry credit card debt, as compared to 38 percent of household with a percentile net worth above 90 percent carry debt. Credit cards serve two main purposes. First, they serve as a payment device in place of cash or checks for millions of routine transactions. Most credit cards have a grace period whereby interest charges can be avoided by paying off the outstanding balance in full at the end of the month. Second, they are the primary source of unsecured open-end revolving consumer credit, competing with bank loans and other forms of financing.[3]

The theoretical payment card literature focuses on how the costs of payment cards are distributed between banks, merchants and card holders through prices. These models generally conclude that banks may charge fees in excess of their costs to merchants and extend incentives to cardholders to increase card adoption and usage (Baxter, 1983; Chakravorti, 2010; Rochet and Tirole, 2002). These models focus on adoption and usage of payment cards vis-à-vis other payment instruments. The results are dependent on various model parameters including the degree of competitiveness in the market for goods and payment services along with consumer and merchant demand elasticities. For the most part, this literature does not focus the extension of credit.[4]

Debate continues as to who pays for credit card rewards and their social welfare implications. Some U.S. merchants have complained that financial institutions are funding their credit card rewards by extracting merchant surplus (Jacob, Jankowski, and Lunn, 2009). Theoretical models focus on other funding sources for credit cards rewards. For example,

[3] There are other payment instruments that share these characteristics, e.g. checks and debit cards with overdraft protections. For more discussion about linkages between consumer payment and credit, see Chakravorti (2007).
[4] Bolt and Chakravorti (2008), Chakravorti and To (2007), and Rochet and Wright (2010) are notable exceptions.

Chakravorti and Emmons (2003) argue that rewards are funded by those that borrow in the form of higher interest rates. More recently, Schuh, Shy, and Stavins (2010) argue that cash users subsidize these rewards because merchants are unable to separate credit card users from other payment instrument users by charging more to credit card users.[5]

There is anecdotal evidence from merchants suggesting that rewards are effective in convincing consumers to substitute credit cards for debit cards to reduce their payment costs. IKEA, a large furniture store operating in several countries, imposed a 70 pence surcharge on credit card transactions in their United Kingdom stores resulting in a 15% decrease in credit card usage (Bolt et. al, 2010). Given the relatively high average transaction size at IKEA, only a relatively small financial incentive was required to change consumer behavior.

Some policymakers have intervened in the pricing of payment services to reduce consumer incentives to use their credit cards to make purchases especially when consumers do not avail the extension of credit. The Reserve Bank of Australia (RBA) argued that credit card rewards partially funded by fees charged to merchants distorted the efficient choice of payment instruments by consumers. The RBA (2008) estimated the benefit to consumer of using their credit cards as purely a payment device as AUS$ 1.30 for each AUS$ 100 spent. To reduce the incentive for consumers to use credit cards, the RBA mandated around a 50 percent reduction in the interchange fee (fees paid by merchants' financial institutions to issuers that are paid for by merchants) along with other policy changes.

Several empirical studies use consumer surveys to study the impact of rewards on payment instrument usage (Ching and Hayashi, 2010). Borzekowski, Kiser and Ahmed (2008)

[5] In some cases, merchants are unable to charge different prices based on the type of payment instrument to make purchases. However, in cases where merchants have the ability to do so, few merchants actually set different prices. Regardless of the reason, one-price policies may result in cross-subsidies between users of different payment instruments.

examine survey data on debit card usage and find that financial incentives are effective in steering customers to one payment type. Twenty-one percent of survey respondents cited pecuniary reasons for substituting between payment types, and many in this group explicitly cited credit card rewards. Zinman (2009) also observes consumer price sensitivity to payment choices. Specifically, he finds that credit card users with balances are more likely to use their debit card because interest accrues immediately after credit card purchases are made. Our paper is the first to empirically test the effect of credit card rewards not only on payment choice but on change in spending and debt.

The consumption literature considers permanent and transitory shocks to consumption. Giving consumers cash rewards for spending using a certain device increases their consumption because they are receiving money for purchases that they would have made without the incentives. A number of papers have studied consumers' response to a permanent predictable change in income, as a means of testing whether households smooth consumption as predicted by the rational expectation life-cycle permanent-income hypothesis. Using credit card data, Gross and Souleles (2002) find a marginal propensity to consume of 13% and for accounts that had an increase in credit limit. They also find that debt levels rise by as much as $350. Souleles (1999) finds that consumption responds significantly to the federal income tax refunds that most taxpayers receive each spring. Both of these papers find evidence of liquidity constraints.[6] Aaronson, Agarwal, and French (2007) find that following a minimum wage hike, households with minimum wage workers often buy vehicles. The size, timing, persistence, composition, and distribution of the spending response is inconsistent with the basic certainty equivalent life cycle model.

[6] Other related studies include Wilcox (1989, 1990), Parker (1999), Souleles (2000, 2002), Browning and Collado (2001), Hsieh (2003), and Stephens (2003).

There have been four recent studies, using micro data, by Shapiro and Slemrod (2003a and 2003b), Johnson, Parker, and Souleles (2006) and Agarwal, Liu, and Souleles (2007) on the 2001 tax rebates. Given the conflicting findings of the consumption literature, we cannot form a hypothesis about whether consumption will increase in response to these cash rewards. Moreover, our case becomes more complicated when we consider the relationship between the rewards and spending. While a consumer may receive cash for transferring all their spending from their debit card to this credit card, she also has an incentive to increase her spending and use the credit line attached to the credit card. Therefore, we look to the behavioral literature to find predictions about how a reward program will affect consumers' overall debt level.

The seminal paper on time inconsistency is Ausubel (1991) who finds that consumers often ignore the interest rate on credit cards because when they make purchases they fully intend to pay back but change their mind when the bill comes. Agarwal, Chomsisengphet, Liu and Souleles (2006) find that consumers both under- and over-estimate their spending on the card. More recently, behavioral economists have extended this time inconsistency feature in several directions (Heidhues and Köszegi, 2010). Laibson (1997) argues that consumer have self-control problems discounting present consumption over future consumption, describing it as "hyperbolic discounting." This provides an explanation for the first anomaly – increased spending. A potential explanation for the second anomaly – increased debt, can be explained by the "bounded rationality" model of Gabaix and Laibson (2000). It is conceivable that the contract terms and conditions are rather complex and over time consumers forget them and use the credit card for present consumption. Ex-post consumers could even justify their mistake as financially insignificant or easily fixable since they receive several balance transfer offers on a weekly basis.

Therefore, there are several explanations for increased spending, but we can point to "bounded rationality" if we observe an increase in overall debt as a result of the program.

3. Data

We use a unique, proprietary data set from a large financial institution that issues credit cards nationally. Account level administrative data from a financial institution has a number of advantages over consumer survey data. Relative to traditional household data sets such as the Survey of Consumer Finances, our sample is large with little measurement error. Also, because each account is observed over many months, it is possible to study high-frequency dynamics. However, using credit card data does entail a number of limitations. The main unit of analysis is a credit card account, not an individual (who can hold multiple accounts). Unfortunately, we do not observe total spending (i.e. spending via cash and checks).

Our data set contains a representative sample of about 12,000 credit card accounts from June 2000 to June 2002 with monthly observations. For all card accounts, the data on the credit card transactions include monthly data from account statements, including spending, repayment, balance, debt, APR and credit limit. In addition to monthly data on credit card use, the data set also contains credit card bureau data about the other credit cards held by each account holder, in particular the number of other cards and their combined balances. Unfortunately, credit bureaus do not separately record credit card debt, spending and payments – they record only balances. The credit card issuer obtained these data from the credit bureaus quarterly. Finally, there is limited demographic data – age and marital status of the cardholders. Account holders are assumed to be married if there is a spouse also listed on the account. We provide summary statistics of all cardholders in Table 1.

For approximately half of the data set (6,600 accounts), we also have information regarding participation in a cash-back bonus including how much cash back is accrued and redeemed. The cash-back program begins in month 12 of our sample. The average value redeemed is around $10 and the average redemption per account is around $25. Ninety percent of cardholders redeem their cash-back rewards and 85 percent of the value is redeemed.

In Table 2, we provide summary statistics for the control and treated groups for months 3-5. We also looked at the summary statistics for these two groups at other time period and we do not observe any systematic patters to suggest any selection of any particular variables. For instance, during these three months, some variables are statistically similar for these two groups such as spending, internal behavior and FICO scores, and some demographic characteristics. However, some variables such as debt on card, credit line and total overall balance are statistically different. As mentioned before, some cardholders are also part of the APR reduction program. We have also looked at the treated group without these individuals (not reported). When these cardholders are excluded, spending, debt, and credit line decrease to levels below the control group. This would suggest that the financial institution does not systematically select a group of customers for the reward program. Based on our conversations with the institution, cardholders are not selected on a given criterion to be included in the program. Moreover, large financial institutions are reluctant to prescreen cardholders for such programs due to the potential regulatory scrutiny regarding discrimination based on demographic characteristics. The additional cost to make sure such selection is legitimate is significant for issuers. Finally, if the institution had the goal of maximizing revenue, it would have given cash back to all cardholders not using their cards. Giving rewards to cardholders already using their cards with low probability of increased usage is costly.

In Table 3, we compare the aggregate monthly summary statistics for the treatment group during the preceding month before the cash-back program and during the first quarter after the program starts. Note that the average purchase amount increases while the average payment amount decreases. Because all consumers are lumped together across time, these summary statistics may not indicate the underlying changes in cardholder behavior.

Additionally, we have information about an interest rate reduction program that is offered to certain individuals. The month in which cardholders receive reductions in APR is evenly distributed during our sample period. Over half of cardholders have promotional APRs when our panel ends. The average APR reduction is 10%. Interestingly, all cardholders that receive APR reductions are also part of the cash-back program.

4. Empirical Strategy

Our empirical strategy is to quantify consumer responses to financial incentives such as cash-back and interest rate reduction programs. Our dataset allows us to study two different programs that the financial institution uses to increase card usage. In addition to studying the impact of card spending and additional debt accrued, we are able to study the impact on the cardholder's overall balances which include additional spending and changes in debt.

4.1 Cash-back rewards

We use an event window methodology to study the impact of cash-back incentives (Agarwal, Liu, and Souleles (2007)). The general structure of our OLS regressions is:

$$Y_{it} = f(\text{cashback}_{it}, \text{account controls, demographic controls, portfolio controls}) \quad (1)$$

Our dependent variable, Y_{it}, represents monthly spending, change in debt, or change in overall balance on all credit cards. Our main explanatory variable, cashback_{it}, is an indicator variable

for cash back. It is one if the cardholder receives cash back for that month's purchases and zero otherwise. We compare one month before the cash back is offered to three, six, or nine months after the cash-back program has started.[7] Our account control variables are account age, realized APR, credit line and the bank's behavioral score. Our demographic control variables are marital status, gender, income, age and age squared. Our portfolio controls are from credit bureau data and include the individual's FICO score, sum of all credit card lines, total balance on all credit cards, number of other credit cards, and number of other credit cards with balances. All regressions are run with individual fixed effects and clustered standard errors.

The expected response to a cash-back reward is to increase spending on the card. We would expect spending to increase for two reasons. First, cash back may generate additional overall spending. Second, cardholders may substitute this card for purchases made with cash, check, debit cards or other credit cards.

While card issuers earn revenue from merchants indirectly through interchange fees that are paid to them by the merchants' banks, the bulk of issuer income is earned from finance charges that accrue when cardholders carry debt. Similar to spending, cardholders may increase their overall debt or substitute credit card borrowing from one card to another.

To study spending and debt substitution across credit cards, we estimate the impact of cash back on overall credit card balances. Unlike bank level data, credit bureau data combines spending and debt into one variable called total credit card balances. Thus, overall balances can increase because of increased spending and/or additional debt. Furthermore, we are cautious about our results because credit bureau data is only available for our cardholders every quarter.

[7] In unreported specifications, we also tried 3 and 6 months before the program. The results do not show any spending or debt responses before the rebate and so we dropped those specification to conserve data. Additionally, in unreported specification, we also ran the same regressions for the control and treated samples together and we do not find any spending response for the control sample.

We are also able to compare the impact of cash-back rewards on several different subgroups. First, we compare those cardholders that carry debt and those that do not. Those that do not carry debt can be further divided into two groups—those that use their cards and payoff their balances in full every month and those that do not use their cards in the previous three months before enrollment in the program. Second, we consider different demographic characteristics such as gender and marital status along with differences in credit limits. Finally, we compare different levels of utilization of credit limits.

We also study the impact of a ten percent reduction in the APR on card spending, change in card debt, and overall credit card balances. We use the same controls as in the cash-back regression along with the same event windows. Instead of the cashback indicator variable, we use an APR reduction indicator variable. The general structure of our regression becomes:

$$Y_{it} = f(APR_{it}, \text{account controls, demographic controls, portfolio controls}) \quad (2)$$

5. Results

In this section, we report our regression results about the impact of the cash-back program and the APR reduction program. All regressions are run with individual fixed effects.

5.1 Cash Back

In Table 4, we report the coefficient on the cash indicator variable for the whole treatment group. Our results indicate that spending increases significantly for all cardholders—the average consumer increases her spending by over $68 dollars per month during the first quarter of being in the cash back program. The average per month spending continues to increase at $76 per month during the first 9 months after the program is introduced. These results are both statistically and economically significant.

We also examine the effect of the rewards program on consumers' incremental debt accumulation. We use the change in cardholder debt as the dependent variable to study the impact of the cash-back program. On average, a consumer increases her debt by $115 per month during the first quarter of the cash-back program. Our results confirm that cardholders not only increase spending but also their debt. The increase in monthly spending and change in debt remains relatively constant and continues during the first nine months after the beginning of the cash-back program. We show the complete regression results in appendix tables 1A and 1B. The greater increase in debt compared to spending suggests that payments drop not only for purchases due to the cash-back reward but also on spending that is not related to the cash-back rewards. Specifically, we find a average monthly reduction in payments within the first quarter of $38, suggesting that all the marginal increase in spending due to the cash-back reward is converted into debt and a part of the cardholder's monthly baseline spending is also converted into debt.

To study the overall impact on the cardholder's total credit card spending and debt, we study the impact of cash back on the total credit card balance as reported by the credit bureaus. If the sum of spending and change in card debt is greater than the impact on overall card balances, we conclude that the cardholder has substituted some spending and debt from other cards to the cash back card. The change in overall balance only increases by an average of $40 per month during the first quarter and increases to an average of $76 per month during the first nine months. These results suggest that cardholders have not only substituted spending but also debt since their overall credit card balances are lower than both the increases in spending and debt. However, these estimates are not statistically significant. As mentioned before, the credit

bureau data is only available at quarterly intervals making our measurement somewhat imprecise.

Cardholders differ in how they use their credit cards. Cardholders may use their cards primarily as a payment instrument by paying off their balances in full every month or make purchases on credit that they payoff over a longer time horizon. We would expect these different groups to respond to the cash-back incentive program in different ways. We separate cardholders into those that carry debt, commonly referred to as revolvers, and those that do not. In Table 5, we study the impact of the cash-back program on cardholders that carry debt from month-to-month with those that have zero balances. In the first quarter of the program, cardholders that do not carry debt increase their spending by $138 per month versus $47 per month for those cardholders that carry debt during the first quarter. During the first nine months, those cardholders without debt continue to spend more than an average $99 per month and those that carry debt increase their spending by an average of $67 per month. All of these estimates are statistically and economically significant.

The effect of cash back on change in debt also differs across cardholders (Table 6). Those carrying debt, increase their debt by an average of $134 per month during the first quarter and by an average of $142 per month during the first nine months after the program starts. Those that do not carry debt increase their debt by an average of $114 per month during the first quarter and by an average of $211 per month during the first nine months. Those cardholders that do not carry debt substitute spending and debt accumulation on this card from other cards (Table 7). Those that do not carry debt do not increase their overall card balance as a result of participating in the cash back program.

To further investigate the impact of no debt cardholders of the cash-back program, we separate the "no debt" group into convenience users and inactive cardholders for the three months prior to being in the program. Note that in both cases, cardholders would be categorized as zero debt. About half of cardholders in the treatment group were inactive during the three months before being enrolled in the cash-back program. In Tables 8, 9, and 10, we report our results for convenience users and inactive cardholders for the previous three months. The cash back impact on spending is not statistically significant for convenience users (Table 8). However, the cash back impact on spending of inactive cardholders prior to the cash-back program is statistically and economically significant. The average per month spending increases by $220 during the first quarter and only decreases to $180 on average per month during the first nine months of being in the program. The increase in debt for inactive cardholders prior to the cash-back program is statistically and economically significant as well (Table 9). The average monthly change in debt during the first quarter is $167 and the average monthly change in debt rises to $196 during the first nine months. Furthermore, the impact of cash back on overall balances suggests that inactive cardholders substituted spending and debt accumulation from other cards (Table 10). We also find evidence that those that inactive users substituted credit card balances including spending and change in debt from other cards as they increased spending and debt on their cash-back card.

In addition, we include some analysis based on demographic characteristics to study the impact of the cash-back program. In Tables 11, we report our results on certain demographic characteristics. Single cardholders increase their spending by $55 on average per month during the first quarter whereas married cardholders increase their spending by $95. Single cardholder debt increases by $95 on average per month during the first quarter and rises to $164 during the

first nine months after the program is introduced whereas married cardholder debt starts at $155 and rises to $262, respectively. The impact of the cash back program on the quarterly change in the cardholder's overall balance is not statistically significant. The impact of cash back on spending and debt is similar for males and females with males being a bit more stable in their increase in spending and debt accumulation.

We divide the treated sample into those that have income below $40,000 and those above $40,000 based on what the cardholder reported at the time of application. We find that those with higher income tend to spend more and accumulate more debt in response to being in the cash-back program.

In Table 12, we report results from considering different levels of credit constraints. We separate our treated group into three different categories of credit limits—below $6,000, between $6,000 and $12,000, and above $12,000. Those with higher credit limits tend to spend more and accumulate more debt in response to the cash-back program. We also divide the sample by two levels of credit line utilization—below 50% and above 50%. We find that cardholders that utilize their credit lines 50% or greater spend more and borrow more especially after being in the cash-back program for nine months than cardholders who are less credit constrained.

5.2 Interest rate reduction

We find that on average, consumers increase their spending by an average of $1098 per month during the first quarter following an APR reduction (Table 13). However, this sharply drops off to an average of $579 per month during the first nine months after the cardholder is in the APR reduction program. This attenuation suggests that many cardholders transferred balances or spending from other credit cards to this one at the beginning of the promotion.

Additionally, we find that the change in debt on average increases on average by $1059 during the first quarter but falls to $356 during the first nine months suggesting that cardholders are substituting debt from higher interest cards to this one with a lower interest rate. The coefficients of the indicator variable of the APR reduction program on the overall credit card balance suggests that there is cardholders are exchanging debt from other cards to this card. Finally, 24 percent of cardholders that did not use their cards three months prior to the APR program used their cards to make at least $50 of purchases during the first month of being enrolled in the program.

6. Conclusion

Using statement level data from a large U.S. financial institution, we explored the impact of cash-back rewards on credit card spending, debt accumulation, and overall credit bureau balances. Our analysis suggests that cash-back rewards positively and significantly affects spending and debt accumulation. However, overall spending and debt accumulation measured by total credit card balances at the credit bureau remain constant or increase slightly suggesting that cardholders substitute spending and debt from other credit cards. Furthermore, the relatively small average cardholder redemption of $25 per cardholder makes such a program a cost effective tool to increase bank revenue from increased spending and borrowing by cardholders.

Cash-back rewards are an effective tool to spur spending and debt accumulation by cardholders that hold the institution's credit cards but do not use them. This group makes up about half of all the cardholders that receive the cash back offer. Furthermore, the cash-back program provides sufficient incentives to 11 percent of inactive cardholders to use their cards. The response to cash-back rewards by this group is an increase in average spending of $220 per

month during the first quarter and an increase in debt accumulation of close to $167 per month during the first quarter. The cash-back program is generating the greatest revenue from those that were not using this card prior to the reward.

Our paper sheds light on various aspects of the consumption and payment literature. Our results support that financial incentives need not be large to generate significant shifts in consumer behavior. While not the main focus of our paper, we are unable to rule out time inconsistency issues arising from payment substitution and increases in incremental cardholder spending. A more complete view of the cardholders debt portfolio and monthly expenditures would be necessary to explore this issue further. Finally, we consider an alternative view as to why financial institutions issue rewards. Much of the theoretical payment card literature suggests that financial incentives may be necessary to gain adoption of a payment instrument. Others have suggested that credit card rewards are a form of surplus extraction. Our analysis suggests that in an extremely competitive credit card issuing market, rewards are another tool along with lower interest rates to steal customers from competitors.

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TABLE 1
SUMMARY STATISTICS FOR ALL OBSERVATIONS (N=261435)

	Mean	Standard Deviation
Account Characteristics		
Spending	220	790
Debt on Card	2610	3045
Internal Behavioral Score	712	30
Account Age (years)	4	3
Credit Line	8509	3280
Realized APR	15.37%	6.70%
Did Not Use (1=Not spending before the program)	50.07%	50.00%
Revolver (1=Carrying debt before the program)	70.72%	45.51%
Credit Characteristics		
FICO Score	731	46
Total Balance on All Credit Cards	10007	13603
Total Credit Cards with Debt	3	3
Total Number of Credit Cards	5	4
Demographics		
Income	58089	93789
Age	48	13
Gender (male=1, female=0)	52.35%	49.95%
Married (Spouse Listed=1, No Spouse Listed=0)	33.49%	47.20%

Notes: The data come from the monthly billing statement of credit card accounts, and attached credit bureaus. All values are averaged over the sample period (June 2000 to June 2002).

TABLE 2
SUMMARY STATISTICS BY TREATMENT AND CONTROL GROUP
Months 3-5

	Control (N=14209)		Treatment (N=19430)	
	Mean	Standard Deviation	Mean	Standard Deviation
Account Characteristics				
Spending	244	707	257	1075
Debt on Card	2139	2810	3541	3085
Internal Behavioral Score	718	38	716	24
Account Age	4	3	3	3
Credit Line	7494	3205	8569	2831
Did Not Use (1=Not spending before the program)	35.3%	47.8%	61.1%	48.8%
Revolver (1=Carrying debt before the program)	63.0%	48.3%	76.4%	42.4%
Credit Characteristics				
FICO Score	724	56	737	33
Total Balance on All Credit Cards	8625	12766	9916	12766
Total Credit Cards with Debt	3	3	3	3
Total Number of Credit Cards	4	4	5	4
Demographics				
Income	57755	71005	58351	103033
Age	46	13	48	13
Gender (male=1, female=0)	52.28%	49.95%	52.68%	49.93%
Married (Spouse Listed=1, No Spouse Listed=0)	32.99%	47.02%	33.83%	47.31%

Notes: The data come from the monthly billing statement of credit card accounts, and attached credit bureaus. All values are averaged over the sample period (September to November 2000).

TABLE 3
SUMMARY STATISTICS BEFORE AND AFTER TREATMENT IN TREATMENT GROUP
Months 11-14

	Before (N=7037)		After (N=12504)	
	Mean	Standard Deviation	Mean	Standard Deviation
Account Characteristics				
Spending	159	652	203	915
Debt on Card	2716	3048	2772	3099
Internal Behavioral Score	703	19	702	18
Account Age	4	3	4	3
Credit Line	9217	2897	9268	2949
Credit Characteristics				
FICO Score	738	33	739	32
Total Balance on All Credit Cards	10553	13692	11255	13819
Total Credit Cards with Debt	3	3	3	3
Total Number of Credit Cards	5	4	6	4
Demographics				
Income	59104	100510	57819	104200
Age	48	13	49	13
Gender (male=1, female=0)	53.17%	49.91%	52.55%	49.94%
Married (Spouse Listed=1, No Spouse Listed=0)	34.56%	47.56%	33.24%	47.11%

Notes: The data come from the monthly billing statement of credit card accounts, and attached credit bureaus. All values are averaged over the sample period (May to August 2001).

TABLE 4

Effects of Bonus Program within Treatment Group

Spending

	3 Months (N=24308)			6 Months (N=40633)			9 Months (N=55989)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	68.41	12.73	5.37	80.43	10.76	7.47	76.14	10.18	7.48

Change in Debt

	3 Months (N=21675)			6 Months (N=35764)			9 Months (N=48487)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	114.85	25.05	4.58	177.43	20.77	8.54	197.08	19.22	10.26

Change in Total Balance Across Cards

	3 Months (N=24308)			6 Months (N=40633)			9 Months (N=55989)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	40.26	56.91	0.71	56.25	59.96	0.94	66.60	60.29	1.10

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for the three regressions of spending, change in debt, and change in credit bureau balances for 3, 6, and 9 months respectively. All values are in current dollars (2000-2002). Each regression also includes a full set of controls – the quarterly change in FICO and internal behavioral scores, account age, the APR that the consumer pays, credit limit, total balance from the credit bureau (except in equations estimated effect on change in total balance across cards), number of other credit lines from the credit bureau, number of other cards with debt from the credit bureau, an indicator for married, age and age squared. The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

TABLE 5

Effects of Bonus Program on Spending if Cardholder Carries Debt

	Panelists that DO NOT have Debt Before the Program Starts								
	3 Months (N=5286)			6 Months (N=8142)			9 Months (N=11016)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	138.16	28.02	4.93	119.42	23.01	5.19	98.73	22.28	4.43
	Panelists that DO have Debt Before the Program Starts								
	3 Months (N=19022)			6 Months (N=32491)			9 Months (N=44973)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	47.47	14.21	3.34	69.11	12.28	5.63	66.69	11.59	5.76

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for the three regressions of spending, change in debt, and change in credit bureau balances for 3, 6, and 9 months respectively. All values are in current dollars (2000-2002). Each regression also includes a full set of controls – the quarterly change in FICO and internal behavioral scores, account age, the APR that the consumer pays, credit limit, total balance from the credit bureau, number of other credit lines from the credit bureau, number of other cards with debt from the credit bureau, an indicator for married, age and age squared. The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

TABLE 6

Effects of Bonus Program on Change in Debt if Cardholder Carries Debt

Panelists that DO NOT have Debt Before the Program Starts

	3 Months (N=4002)			6 Months (N=5868)			9 Months (N=7521)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	133.92	28.80	4.65	137.37	23.61	5.82	142.61	21.48	6.64

Panelists that DO have Debt Before the Program Starts

	3 Months (N=17672)			6 Months (N=29896)			9 Months (N=40966)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	114.04	30.19	3.78	190.61	24.87	7.66	210.89	22.97	9.18

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for the three regressions of spending, change in debt, and change in credit bureau balances for 3, 6, and 9 months respectively. All values are in current dollars (2000-2002). Each regression also includes a full set of controls – the quarterly change in FICO and internal behavioral scores, account age, the APR that the consumer pays, credit limit, total balance from the credit bureau, number of other credit lines from the credit bureau, number of other cards with debt from the credit bureau, an indicator for married, age and age squared. The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

TABLE 7

Effects of Bonus Program on Quarterly Change in Total Balance if Cardholder Carries Debt

Panelists that DO NOT have Debt Before the Program Starts

	3 Months (N=5286)			6 Months (N=8142)			9 Months (N=11016)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	293.49	122.26	2.40	371.35	129.36	2.87	466.37	136.03	3.43

Panelists that DO have Debt Before the Program Starts

	3 Months (N=19022)			6 Months (N=32491)			9 Months (N=44973)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	-12.35	64.71	-0.19	-20.19	66.08	-0.31	-18.99	68.31	-0.28

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for the three regressions of spending, change in debt, and change in credit bureau balances for 3, 6, and 9 months respectively. All values are in current dollars (2000-2002). Each regression also includes a full set of controls – the quarterly change in FICO and internal behavioral scores, account age, the APR that the consumer pays, credit limit, number of other credit lines from the credit bureau, number of other cards with debt from the credit bureau, an indicator for married, age and age squared. The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

TABLE 8

Effects of Bonus Program on Spending by Convenience and Inactive Users

Convenience Users Before the Program Starts

	3 Months (N=2113)			6 Months (N=3288)			9 Months (N=4417)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	26.86	44.41	0.60	-14.77	40.09	-.37	-28.83	38.93	-.74

Inactive Users Before the Program Starts

	3 Months (N=3095)			6 Months (N=4692)			9 Months (N=6248)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	219.61	38.16	5.75	205.97	27.67	7.44	180.24	26.73	6.74

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for the three regressions of spending, change in debt, and change in credit bureau balances for 3, 6, and 9 months respectively. All values are in current dollars (2000-2002). Each regression also includes a full set of controls – the quarterly change in FICO and internal behavioral scores, account age, the APR that the consumer pays, credit limit, total balance from the credit bureau, number of other credit lines from the credit bureau, number of other cards with debt from the credit bureau, an indicator for married, age and age squared. The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

TABLE 9

Effects of Bonus Program on Change in Debt by Convenience and Inactive Users

	Convenience Users Before the Program Starts								
	3 Months (N=1624)			6 Months (N=2445)			9 Months (N=3129)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	95.32	34.65	2.75	81.13	31.25	2.60	80.19	23.97	3.35

	Inactive Users Before the Program Starts								
	3 Months (N=2318)			6 Months (N=3312)			9 Months (N=4193)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	166.66	45.63	3.65	186.38	34.74	5.36	196.15	33.62	5.83

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for the three regressions of spending, change in debt, and change in credit bureau balances for 3, 6, and 9 months respectively. All values are in current dollars (2000-2002). Each regression also includes a full set of controls – the quarterly change in FICO and internal behavioral scores, account age, the APR that the consumer pays, credit limit, total balance from the credit bureau, number of other credit lines from the credit bureau, number of other cards with debt from the credit bureau, an indicator for married, age and age squared. The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

TABLE 10

Effects of Bonus Program on Quarterly Change in Total Balance by Convenience and Inactive Users

Convenience Users Before the Program Starts

	3 Months (N=2113)			6 Months (N=3288)			9 Months (N=4417)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	244.38	183.82	1.33	310.55	189.16	1.64	239.83	186.43	1.29

Inactive Users Before the Program Starts

	3 Months (N=3095)			6 Months (N=4692)			9 Months (N=6248)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
Cashback Indicator (Receiving Cashback=1)	276.80	159.70	1.73	368.05	182.38	2.02	594.36	197.72	3.01

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for the three regressions of spending, change in debt, and change in credit bureau balances for 3, 6, and 9 months respectively. All values are in current dollars (2000-2002). Each regression also includes a full set of controls – the quarterly change in FICO and internal behavioral scores, account age, the APR that the consumer pays, credit limit, number of other credit lines from the credit bureau, number of other cards with debt from the credit bureau, an indicator for married, age and age squared. The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

TABLE 11

Only Coefficients for Cashback Indicator Variable are Reported

		Single	Married	Male	Female	Income<$40k	Income>$40k
Spending	3	55.34***	95.06***	47.01**	70.50***	47.06**	73.94***
	6	65.06***	110.80***	78.38***	83.85***	56.28***	87.03***
	9	59.47***	108.05***	80.82***	76.17***	57.74***	81.13***
Change in Debt	3	95.05***	155.03***	71.28	83.85	99.96**	119.31***
	6	150.54***	230.87***	137.58***	158.41***	137.05***	187.82***
	9	163.61***	261.83***	170.11***	177.15***	152.96***	208.58***
Quarterly Change in Total Balance	3	56.08	7.73	-12.79	169.50	30.75	36.31
	6	90.01	-3.86	-74.66	248.72**	47.50	54.46
	9	113.80	-19.04	-22.53	235.03	40.82	67.38

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for the three regressions of spending, change in debt, and change in credit bureau balances for 3, 6, and 9 months respectively. All values are in current dollars (2000-2002). Each regression also includes a full set of controls – the quarterly change in FICO and internal behavioral scores, account age, the APR that the consumer pays, credit limit, total balance from the credit bureau (except in equations estimated effect on change in total balance across cards), number of other credit lines from the credit bureau, number of other cards with debt from the credit bureau, an indicator for married, age and age squared. The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

TABLE 12

Only Coefficients for Cashback Indicator Variable are Reported

		Credit Limit Less than $6k	Credit Limit $6-12k	Credit Limit > $12k	Percent Utilization <50%	Percent Utilization >50%
Spending	3	30.25	69.33***	91.72**	17.41	36.27*
	6	32.12**	78.05***	105.06***	26.23***	94.46***
	9	23.68	77.38***	96.12***	24.09***	124.64***
Change in Debt	3	68.06	108.77***	184.97**	69.86	4.78**
	6	94.65***	160.66***	256.74***	109.60***	129.92***
	9	108.78***	166.57***	290.52***	119.97***	188.35***
Quarterly Change in Total Balance	3	-176.00	45.11	189.67	61.24	-68.48
	6	-226.50	34.40	270.73*	58.29	-16.41
	9	-82.03	21.91	297.52**	26.98	23.77

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for the three regressions of spending, change in debt, and change in credit bureau balances for 3, 6, and 9 months respectively. All values are in current dollars (2000-2002). Each regression also includes a full set of controls – the quarterly change in FICO and internal behavioral scores, account age, the APR that the consumer pays, credit limit, total balance from the credit bureau (except in equations estimated effect on change in total balance across cards), number of other credit lines from the credit bureau, number of other cards with debt from the credit bureau, an indicator for married, age and age squared. The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

TABLE 13

Effects of APR Reduction within Treatment Group

Spending

	3 Months (N=4633)			6 Months (N=7721)			9 Months (N=10298)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
APR Reduction Indicator (Receiving APR Reduction=1)	1097.79	84.80	12.95	822.98	55.40	14.86	578.63	44.30	13.06

Change in Debt

	3 Months (N=4022)			6 Months (N=6687)			9 Months (N=8932)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
APR Reduction Indicator (Receiving APR Reduction=1)	1058.65	117.51	9.01	660.48	89.70	7.36	355.94	69.39	5.13

Change in Total Balance

	3 Months (N=4633)			6 Months (N=7721)			9 Months (N=10298)		
	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat	Coeffic	Standard Error	T-Stat
APR Reduction Indicator (Receiving APR Reduction=1)	636.15	432.67	1.47	604.08	288.07	2.10	586.55	263.30	2.23

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the APR reduction indicator variable in equation (1) for the three regressions of spending, change in debt, and change in credit bureau balances for 3, 6, and 9 months respectively. All values are in current dollars (2000-2002). Each regression also includes a full set of controls – the quarterly change in FICO and internal behavioral scores, account age, the APR that the consumer pays, credit limit, total balance from the credit bureau (except in equations estimated effect on change in total balance across cards), number of other credit lines from the credit bureau, number of other cards with debt from the credit bureau, an indicator for married, age and age squared. The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

APPENDIX

VARIABLE INDEX

Last Balance	Measure of Debt
Purchase Amount	Sum of Purchases made that month
Payment Amount	Sum of repayments made that month
FICO Score	FICO score from Credit Bureau
Internal Behavioral Score	Internal Score from bank
Account Age	Number of years account open
APR	Annual Percentage Rate
Realized APR	APR that the consumer faces (reflects promotional APR from bank)
Credit Line	Credit Available on the account
Total Balance Across Cards	Sum of Balances reported by the Credit Bureau
Total Number of Cards with Debt	Total Number of Cards with Debt reported by the Credit Bureau
Total Number of Credit Lines	Total Number of card held by individual reported by the Credit Bureau
Income	Individual Income reported by the bank
Age	Age of individual
Age^2	Age of individual squared
Gender	=1 for male, =0 for female, missing if unknown
Marital Status	=1 if a spouse is listed on the count, =0 if spouse not listed
Cash Back Indicator	=1 if receiving cash back promotion from the bank, =0 if not
FICO Change that Quarter	Behavioral Score at t - Behavioral Score at t-1
Internal Score Change that Quarter	Internal Score at t - Internal Score at t-1

Appendix - TABLE 1A
Effects of Bonus Program on Spending and Change in Debt in Treatment Group
1 Month Before the Program Starts, 3 Months After

Spending (N=24308)

Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	68.41	12.73	5.37
Change in Behavior Score from Previous Quarter	-1.69	0.47	-3.60
Change in FICO Score from Previous Quarter	-0.58	0.44	-1.32
Account Age	24.74	31.69	0.78
Realized APR	-42.18	5.94	-7.10
Credit Line	0.03	0.02	1.74
Total Balance on All Credit Cards	0.00	0.00	-0.53
Total Credit Cards with Debt	15.65	15.72	1.00
Total Number of Credit Cards	-4.46	18.09	-0.25
Age	116.73	100.63	1.16
Age^2	-1.26	0.92	-1.36

Change in Debt (N=21674)

Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	114.85	25.05	4.58
Change in Behavior Score from Previous Quarter	-13.26	1.23	-10.81
Change in FICO Score from Previous Quarter	-0.11	0.78	-0.14
Account Age	104.02	51.97	2.00
Realized APR	-43.94	8.65	-5.08
Credit Line	0.21	0.06	3.39
Total Balance on All Credit Cards	0.00	0.01	-0.12
Total Credit Cards with Debt	18.04	25.88	0.70
Total Number of Credit Cards	7.48	27.17	0.28
Age	372.44	168.57	2.21
Age^2	-3.53	1.58	-2.24

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for change in debt for the period 1 month before and 3 months after the program starts. All values are in current dollars (2000-2002). The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

Appendix - TABLE 1B

Effects of Bonus Program on Quarterly Change in Total Balance in Treatment Group

1 Month Before the Program Starts, 3 Months After

Quarterly Change in Total Balance (N=24308)			
Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	40.26	56.91	0.71
Change in Behavior Score from Previous Quarter	5.52	3.63	1.52
Change in FICO Score from Previous Quarter	60.56	4.25	14.26
Account Age	-16.16	205.74	-0.08
Realized APR	-18.81	25.55	-0.74
Credit Line	-0.04	0.09	-0.46
Total Credit Cards with Debt	1239.07	268.33	4.62
Total Number of Credit Cards	258.50	131.63	1.96
Age	-144.76	521.02	-0.28
Age^2	1.33	5.27	0.25

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for change in debt for the period 1 month before and 3 months after the program starts. All values are in current dollars (2000-2002). The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

Appendix - TABLE 2

Effects of Bonus Program on Spending for those that Do Not have Debt Prior to the Program

1 Month Before the Program Starts, 3 Months After

	Spending (N=5286)		
Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	138.16	28.02	4.93
Change in Behavior Score from Previous Quarter	-2.19	1.07	-2.06
Change in FICO Score from Previous Quarter	0.10	1.11	0.09
Account Age	-69.87	95.58	-0.73
Realized APR	-49.85	7.98	-6.25
Credit Line	0.01	0.02	0.61
Total Balance on All Credit Cards	0.00	0.01	-0.38
Total Credit Cards with Debt	32.16	25.79	1.25
Total Number of Credit Cards	-30.77	37.50	-0.82
Age	17.70	188.52	0.09
Age^2	-0.17	1.70	-0.10

Effects of Bonus Program on Spending for those that DO have debt prior to the program

1 Month Before the Program Starts, 3 Months After

	Spending (N=19022)		
Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	47.47	14.21	3.34
Change in Behavior Score from Previous Quarter	-1.48	0.52	-2.82
Change in FICO Score from Previous Quarter	-0.76	0.45	-1.69
Account Age	47.37	32.58	1.45
Realized APR	-38.25	7.96	-4.81
Credit Line	0.03	0.02	1.72
Total Balance on All Credit Cards	0.00	0.01	-0.46
Total Credit Cards with Debt	9.50	19.32	0.49
Total Number of Credit Cards	4.19	20.83	0.20
Age	140.81	117.79	1.20
Age^2	-1.53	1.08	-1.42

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for spending for the period 1 month before and 3 months after the program starts. All values are in current dollars (2000-2002). The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

Appendix - TABLE 3

Effects of Bonus Program on Change in Debt for those that Do Not have Debt Prior to the Program
1 Month Before the Program Starts, 3 Months After

	Change in Debt (N=4002)		
Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	133.92	28.80	4.65
Change in Behavior Score from Previous Quarter	-6.58	1.90	-3.46
Change in FICO Score from Previous Quarter	-0.36	1.72	-0.21
Account Age	2.23	83.98	0.03
Realized APR	-47.16	9.16	-5.15
Credit Line	0.01	0.09	0.08
Total Balance on All Credit Cards	0.01	0.01	0.78
Total Credit Cards with Debt	-2.78	19.30	-0.14
Total Number of Credit Cards	21.51	21.45	1.00
Age	215.12	242.56	0.89
Age^2	-1.65	2.06	-0.80

Effects of Bonus Program on Change in Debt for those that DO have debt prior to the program
1 Month Before the Program Starts, 3 Months After

	Change in Debt (N=17672)		
Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	114.04	30.19	3.78
Change in Behavior Score from Previous Quarter	-14.62	1.41	-10.37
Change in FICO Score from Previous Quarter	0.02	0.87	0.02
Account Age	130.84	59.01	2.22
Realized APR	-42.37	11.71	-3.62
Credit Line	0.23	0.07	3.50
Total Balance on All Credit Cards	0.00	0.01	-0.40
Total Credit Cards with Debt	26.12	33.68	0.78
Total Number of Credit Cards	3.01	34.51	0.09
Age	400.05	199.36	2.01
Age^2	-3.82	1.86	-2.05

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for spending for the period 1 month before and 3 months after the program starts. All values are in current dollars (2000-2002). The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

Appendix - TABLE 4

Effects of Bonus Program on Quarterly Change in Total Balance for those that Do Not have Debt Prior to the Program
1 Month Before the Program Starts, 3 Months After

	Change in Total Balance (N=5286)		
Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	293.49	122.26	2.40
Change in Behavior Score from Previous Quarter	20.32	8.63	2.36
Change in FICO Score from Previous Quarter	63.74	9.94	6.41
Account Age	746.88	623.35	1.20
Realized APR	49.79	42.98	1.16
Credit Line	0.12	0.15	0.81
Total Credit Cards with Debt	1797.16	607.02	2.96
Total Number of Credit Cards	52.46	270.52	0.19
Age	1734.26	1396.63	1.24
Age^2	-14.41	13.79	-1.05

Effects of Bonus Program on Change in Debt for those that DO have debt prior to the program
1 Month Before the Program Starts, 3 Months After

	Change in Total Balance (N=19022)		
Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	-12.35	64.71	-0.19
Change in Behavior Score from Previous Quarter	2.62	4.00	0.66
Change in FICO Score from Previous Quarter	60.41	4.65	13.00
Account Age	-149.95	209.92	-0.71
Realized APR	-49.82	31.75	-1.57
Credit Line	-0.07	0.11	-0.63
Total Credit Cards with Debt	951.42	119.23	7.98
Total Number of Credit Cards	376.15	103.49	3.63
Age	-706.11	540.85	-1.31
Age^2	6.42	5.53	1.16

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for spending for the period 1 month before and 3 months after the program starts. All values are in current dollars (2000-2002). The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

Appendix - TABLE 5

Effects of Bonus Program on Spending for those that Do Not have Debt and Use the Card Prior to the program

1 Month Before the Program Starts, 3 Months After

	Spending (N=2113)		
Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	26.86	44.41	0.60
Change in Behavior Score from Previous Quarter	-1.94	1.30	-1.49
Change in FICO Score from Previous Quarter	-0.65	1.21	-0.54
Account Age	-49.09	115.12	-0.43
Realized APR	-30.80	14.61	-2.11
Credit Line	0.01	0.03	0.34
Total Balance on All Credit Cards	-0.01	0.01	-0.64
Total Credit Cards with Debt	97.62	54.32	1.80
Total Number of Credit Cards	-156.33	98.99	-1.58
Age	172.60	174.06	0.99
Age^2	-1.70	1.61	-1.05

Effects of Bonus Program on Spending for those that Do Not have Debt and DO Not Use the Card Prior to the program

1 Month Before the Program Starts, 3 Months After

	Spending (N=3095)		
Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	219.61	38.16	5.75
Change in Behavior Score from Previous Quarter	-2.75	1.70	-1.62
Change in FICO Score from Previous Quarter	0.65	1.64	0.40
Account Age	-76.57	145.01	-0.53
Realized APR	-56.47	9.44	-5.98
Credit Line	0.01	0.03	0.39
Total Balance on All Credit Cards	0.00	0.01	0.05
Total Credit Cards with Debt	4.99	28.28	0.18
Total Number of Credit Cards	24.96	25.38	0.98
Age	-153.03	293.05	-0.52
Age^2	1.66	2.64	0.63

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for spending for the period 1 month before and 3 months after the program starts. All values are in current dollars (2000-2002). The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

Appendix - TABLE 6

Effects of Bonus Program on Change in Debt for those that Do Not have Debt and Use the Card Prior to the program

1 Month Before the Program Starts, 3 Months After

	Change in Debt (N=1624)		
Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	95.32	34.65	2.75
Change in Behavior Score from Previous Quarter	-4.12	1.85	-2.23
Change in FICO Score from Previous Quarter	-2.38	1.56	-1.53
Account Age	-90.39	47.73	-1.89
Realized APR	-33.22	17.72	-1.88
Credit Line	-0.04	0.15	-0.29
Total Balance on All Credit Cards	0.01	0.01	1.31
Total Credit Cards with Debt	17.77	26.15	0.68
Total Number of Credit Cards	-9.82	29.49	-0.33
Age	156.84	320.51	0.49
Age^2	-1.75	2.77	-0.63

Effects of Bonus Program on Change in Debt for those that Do Not have Debt and DO Not Use the Card Prior to the program

1 Month Before the Program Starts, 3 Months After

	Change in Debt (N=2318)		
Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	166.66	45.63	3.65
Change in Behavior Score from Previous Quarter	-9.29	3.28	-2.84
Change in FICO Score from Previous Quarter	0.72	2.54	0.28
Account Age	63.39	138.35	0.46
Realized APR	-51.64	10.70	-4.82
Credit Line	0.08	0.11	0.72
Total Balance on All Credit Cards	0.00	0.01	0.41
Total Credit Cards with Debt	-12.47	26.44	-0.47
Total Number of Credit Cards	29.70	29.52	1.01
Age	155.98	343.55	0.45
Age^2	-0.27	2.94	-0.09

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for spending for the period 1 month before and 3 months after the program starts. All values are in current dollars (2000-2002). The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

Appendix - TABLE 7

Effects of Bonus Program on Quarterly Change in Total Balance for those that Do Not have Debt and Use the Card Prior to the program
1 Month Before the Program Starts, 3 Months After

	Quarterly Change in Total Balance (N=2113)		
Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	244.38	183.82	1.33
Change in Behavior Score from Previous Quarter	8.83	11.91	0.74
Change in FICO Score from Previous Quarter	69.28	14.48	4.78
Account Age	423.11	704.02	0.60
Realized APR	-92.11	73.89	-1.25
Credit Line	0.00	0.18	0.00
Total Credit Cards with Debt	1348.70	282.79	4.77
Total Number of Credit Cards	215.99	295.81	0.73
Age	3594.61	1926.52	1.87
Age^2	-36.44	19.83	-1.84

Effects of Bonus Program on Quarterly Change in Total Balance for those that Do Not have Debt and DO Not Use the Card Prior to the program
1 Month Before the Program Starts, 3 Months After

	Quarterly Change in Total Balance (N=3095)		
Variable	Coefficient	Standard Error	T-Stat
Cashback Dummy (Receiving Cashback=1, Not in Program=0)	276.80	159.70	1.73
Change in Behavior Score from Previous Quarter	30.14	12.43	2.42
Change in FICO Score from Previous Quarter	62.18	13.47	4.62
Account Age	984.41	942.20	1.04
Realized APR	98.54	51.72	1.91
Credit Line	0.20	0.20	1.00
Total Credit Cards with Debt	1940.09	779.58	2.49
Total Number of Credit Cards	15.21	329.80	0.05
Age	859.82	1867.58	0.46
Age^2	-3.73	17.79	-0.21

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the cashback indicator variable in equation (1) for spending for the period 1 month before and 3 months after the program starts. All values are in current dollars (2000-2002). The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

Appendix - TABLE 8A

Effects of APR Reduction on Spending in Treatment Group
1 Month Before the Program Starts, 3 Months After

	Spending (N=4633)		
Variable	Coefficient	Standard Error	T-Stat
APR Reduction Dummy (Receiving APR Reduction=1)	1097.79	84.80	12.95
Change in Behavior Score from Previous Quarter	-15.74	1.88	-8.37
Change in FICO Score from Previous Quarter	2.43	2.33	1.04
Account Age	-387.62	155.90	-2.49
Realized APR	-12.65	6.47	-1.96
Credit Line	0.05	0.08	0.65
Total Balance on All Credit Cards	0.01	0.01	0.47
Total Credit Cards with Debt	-69.78	71.12	-0.98
Total Number of Credit Cards	4.78	66.09	0.07
Age	6.84	622.06	0.01
Age^2	-3.86	6.08	-0.64

Effects of APR Reduction on Quarterly Change in Total Balance in Treatment Group
1 Month Before the Program Starts, 3 Months After

	Quarterly Change in Total Balance (N=4633)		
Variable	Coefficient	Standard Error	T-Stat
APR Reduction Dummy (Receiving APR Reduction=1)	636.15	432.67	1.47
Change in Behavior Score from Previous Quarter	14.22	8.70	1.63
Change in FICO Score from Previous Quarter	98.92	21.24	4.66
Account Age	97.99	395.68	0.25
Realized APR	-0.12	50.01	0.00
Credit Line	0.36	0.28	1.28
Total Credit Cards with Debt	59.94	628.03	0.10
Total Number of Credit Cards	385.37	481.07	0.80
Age	1243.31	2040.60	0.61
Age^2	-6.33	23.91	-0.26

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the APR indicator variable in equation (2) for change in credit card balances at the credit bureaus for the period 1 month before and 3 months after the program starts. All values are in current dollars (2000-2002). The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

Appendix - TABLE 8B

Effects of APR Reduction on Change in Debt in Treatment Group
1 Month Before the Program Starts, 3 Months After

	Change in Debt (N=4022)		
Variable	Coefficient	Standard Error	T-Stat
APR Reduction Dummy (Receiving APR Reduction=1)	1058.65	117.51	9.01
Change in Behavior Score from Previous Quarter	-26.81	2.72	-9.84
Change in FICO Score from Previous Quarter	2.79	2.84	0.98
Account Age	-336.92	163.22	-2.06
Realized APR	-16.02	8.43	-1.90
Credit Line	0.10	0.11	0.87
Total Balance on All Credit Cards	0.00	0.02	0.06
Total Credit Cards with Debt	-34.43	88.32	-0.39
Total Number of Credit Cards	-35.98	84.86	-0.42
Age	-263.55	775.01	-0.34
Age^2	-1.27	7.60	-0.17

Notes: This table reports the coefficient value, the standard error, and the t-statistics for the APR indicator variable in equation (2) for change in card debt for the period 1 month before and 3 months after the program starts. All values are in current dollars (2000-2002). The results control for individual fixed effects and clustered standard errors that are adjusted for heteroscedasticity across individuals and correlation within.

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