Inferring Financial Sophistication:

Evidence Using Credit Card Balance Transfers and the CARD Act

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Abstract

We measure financial sophistication by observing the use of a credit card balance transfer strategy. Examining trends before and after the phase-out of this strategy due to the 2009 CARD Act, financially sophisticated borrowers are less risky, face more attractive card terms, and pay lower fees. We find no evidence that card lenders price sophistication into *initial* card terms such as APR or credit limits. The prevalence of sophisticated borrowers in a zip code strongly correlates with local graduation and unemployment rates. We also document positive spillovers of credit card sophistication onto usage and risk for other consumer loans.

Well-informed consumers, who can serve as their own advocates, are one of the best lines of defense against the proliferation of financial products and services that are unsuitable, unnecessarily costly, or abusive.

Chair of the Federal Reserve Board of Governors Ben Bernanke, 2011

1. Introduction

Continuing a trend that started before the 2008 financial crisis, consumer lending has grown considerably in recent years. As of the end of 2020, total household lending including housing products reached a record high of $14.5 trillion dollars.[2] At the same time, the complexity and availability of new loan products has also increased. Many of these new offerings require sophisticated understanding of loan terms, credit usage, and repayment schedules such as income-sharing student loans, fixed-payment amortizing credit cards, point-of-sale lending, payday loans, peer-to-peer personal loans, app-originated lending, and others. If used without a certain amount

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[2] Total household debt including housing products grow throughout 2020 while individual components such as credit card debt did see declines due to the pandemic and associated response measures. Household Debt and Credit Report. New York Fed. https://www.newyorkfed.org/medialibrary/interactives/householdcredit/data/pdf/HHDC_2020Q4.pdf

of financial literacy, there is a risk that these financial products could be a significant source of fees, poor market participation and performance (Lusardi & Tufano, 2015; Agarwal et al., 2017; Lusardi, 2011; Agarwal et al., 2015).

The ability of consumers to navigate and beneficially take advantage of financial products, both new and existing, requires financial literacy and sophistication.[3] In the economic literature, these terms have been used to define various, closely related topics: the knowledge of financial concepts or products, numeracy related to financial decision making, or optimal participation in financial activities (Hastings, Madrian, & Skimmyhorn, 2013). While financial sophistication is a broad concept, in this paper, we examine how one measure of financial sophistication – based upon the observed use of a specific credit card balance transfer strategy – affects credit card loan terms, credit card risk, and the usage of consumer loans more broadly.

Balance transfers, or BTs, are a way to refinance existing, consumer debt onto a revolving credit card line. While most commonly used for refinancing existing credit card debt, BTs can also be used to transfer other types of debt such as auto, mortgage, and student loans. These transfers are often encouraged by credit card lenders through the usage of temporary promotional interest rates that are lower – often 0% – than the cardholder's regular credit card interest rate.

Once the balance is transferred to the new credit line, a cardholder's outstanding credit card balance would be composed of a portion accruing interest at a promotional interest rate and a portion accruing interest at the regular purchase interest rate. The composition of balances becomes important when the borrower makes a payment onto his or her account that is less than the total balance owed. In these cases, the credit card firm must decide how to allocate the cardholder's payment to card balances under different interest rates.

Prior to the Credit Card Accountability, Responsibility, and Disclosure Act of 2009 (The Credit CARD Act of 2009, H.R. 627), credit card firms had discretion to apply received payments to any portion of the consumer's balance. Because BT balances are frequently encouraged with lower interest rates than regular purchases, applying new payments to the lower APR BT balance increases the total amount of interest due in that cycle.

Prior to the Card Act, the use of multiple credit lines could avoid this additional interest. Sophisticated consumers could circumvent the lender's allocation method by splitting their purchases and balance transfers onto separate cards and gaining greater control of where their payments are allocated. Less sophisticated consumers on the other hand, do not separate BT from regular purchases and incur more interest charges. After the CARD Act however, credit card firms were required to apply payments to the highest APR balance first, which eliminated the advantage of separating BT balances from regular purchases.

The proper identification of financial sophistication is challenging. The first hurdle is in the definition and measurement of financial sophistication. Many studies have identified financial illiteracy among wide swaths of groups including the young, the older, mutual fund investors,

[3] We largely use the terms literacy and sophistication largely interchangeably although Lusardi et al., 2009 draw a distinction between literacy, which is related to more basic finance understanding, and sophistication, which is composed of a more advanced understanding of a wider range of finance topics.

mortgage borrowers, credit card users, and households across the country (Lusardi et al., 2010; Alexander et al., 1998; Lee and Hogarth, 1999; Lusardi and Tufano, 2015; Christeliset al., 2010; Disney and Gathergood, 2013; Klapper et al., 2015). One method of identification has focused on surveyed and test responses in areas such as knowledge of capital markets, risk, fees, diversification, and investment attitudes (Lusardi, 2011). For example, Lusardi and Mitchell (2006) focused on financial knowledge and demonstrated surveys that measure understanding of financial concepts such as compound interest, inflation, and risk diversification. Others focused on tests of cognitive abilities and examined its relationship with financial decision making (Klapper et al, 2013; Lusardi, 2011; Allgood & Walstad, 2016). While the survey-based method has advantages in assessing a more complete *knowledge* of finance-related topics, we take a narrower approach measuring sophistication as the *knowledge and use* of this specific BT strategy prior to the CARD Act. Focusing on both the knowledge and the application of balance transfers augments the multi-dimensional aspect of overall financial literacy (Huston, 2010).

An additional challenge is that there are other explanations and potential areas of unobserved endogeneity such as from behavioral models that may rationalize many on-the-surface financially poor choices. These may include limited attention, mental accounting, uncertainty, dynamic considerations, and others (Ponce, Seira, & Zamarripa, 2017). Our approach leverages the CARD Act in a quasi-difference-in-difference approach by comparing those consumers who separate balance transfers from card purchases before and after the introduction of the CARD Act. Comparing these two groups of consumers accounts for some of the unobservable, behavioral confounds that are unaffected by the CARD Act.

The intuition is straightforward. Before the CARD Act, the choice of whether to separate purchases from BTs onto difference cards depends on financial literacy as well as unrelated, idiosyncratic borrower factors. After the CARD Act, the financially sophisticated no longer have this incentive since the payment rules required lenders to apportion payments by APR while some borrowers may still be separating purchases due to their unrelated, idiosyncratic factors. By comparing cardholders that separate prior to the CARD Act with cardholders that separate post Card Act, we are able to difference out the tendency to separate purchases that is due to financial literacy from other borrower factors that do not vary with the passage of the CARD Act.

We find that the financially less sophisticated – those cardholders who do not separate BTs from regular purchases before the CARD Act – are more likely to be delinquent on their loan payments, incur greater fees, and pay higher finance charges compared to those who do not separate BTs from regular purchases after the CARD Act. At the time period of the initial balance transfer, we find no differences in the interest rates, credit scores, credit limits, or incomes between the financially sophisticated and less sophisticated, which implies that this differentiation is not priced into initial credit terms and not observed by lenders.

However, within twelve months after the BT, interest rates increase, credit scores and credit limits decrease, and reported income falls for the less sophisticated cardholders. Back of the envelope calculations that reproduce the CARD Act rules prior to implementation suggest that the regulation reduced financing charges accrued to the financially less sophisticated by approximately $120 per cardholder in the first year after their initial BT.

We also find that our measure of financial sophistication, when aggregated to the zip code level, is strongly correlated with local area college graduation and employment rates. These findings are consistent across the financial literacy literature which have found strong correlations between financial sophistication and education and income (Hastings et al., 2013; Calvet et al., 2009). We also investigate spillovers to other uses of consumer credit to determine if the identified, financially less sophisticated credit card users also make poor use of other products. We find that the less sophisticated have increased risk for auto and mortgage debt; increased use of higher interest personal loans; increased credit inquiries; and an increased chance of bankruptcy for the financially unsophisticated. The results suggest that while financial regulation reduced balance transfer finance charges by approximately $120 due to the new payment rules, it is unlikely a panacea for the many other costly ways that the financially less sophisticated use consumer credit.

Our setting has unique advantages in addressing consumer behavior. First, we use regulatory credit card data consisting of detailed monthly histories and BT details for over 1.5 million credit card accounts. Using less granular data such as quarterly or yearly aggregates will not provide as much detail about the use of BTs and is likely to not capture monthly changes in transfers, purchases, and payment behavior in the first few months after balance transfer. Second, our data covers the passage of the CARD Act which allow us to control for many sources of unobserved endogeneity that may also explain BT use. And lastly, we are able to augment our regulatory credit card data with other measures of consumer credit data to examine the spillovers of financial sophistication onto other types of consumer debt.

Our work contributes to several strands of the consumer finance literature. One such strand is empirical support for connecting financial literacy to financial outcomes such as credit usage and risk (Lusardi & Mitchell, 2014; Bianchi, 2017; Guiso & Viviano, 2015) stock market participation (van Rooij, Lusardi, & Alessie, 2011; Lusardi, Mitchell, & Curto, 2009), retirement planning (Lusardi & Mitchell, 2006), and wealth outcomes (Behrman, Mitchell, Soo, & Bravo, 2012). A related paper to ours by Ponce, Seira, and Zamarripa (2017) examines that customers are not price sensitive when deciding to allocation purchases across different credit cards, which reinforces one of the challenges of identifying financial literacy from other behavioral factors such as limited attention that could also explain financial behavior. Agarwal, Driscoll, Gabaix, and Laibson (2009) find that financially poor uses of credit, including balance transfers, have a life-cycle component with the elderly and vulnerable more likely to make financial mistakes. Using pre and post-CARD Act behavior, our difference-in-difference strategy helps us to separate the impact of being financially sophisticated from other confounding factors.

There is also an increasing number of research papers that rely on identification strategies outside of survey and test-based methods. For example, Calvet et la., (2009) determined sophistication based on investment activities whereas Agarwal et al., (2017) used mortgage refinancing decision and suboptimal use of mortgage points to identify sophistication. In a study on credit card, Agarwal et al., (2015) used consumer's choice between two credit card contracts and found that a substantial portion of consumers were unsophisticated in choosing cost-minimizing credit cards. Separately, research has also focused on using natural experiments to measure literacy and its effects on EITC take-up (Chetty, Friedman, & Saez, 2013). Others

focused on cognitive abilities and examined its relationship with financial decision making (Klapper et al, 2013; Lusardi, 2011; Allgood & Walstad, 2016). We provide additional evidence to work examining survey and laboratory measures of financial literacy using revealed credit behavior.

We also supplement the literature on the effect of financial regulation specifically the CARD Act. Researchers have studied many dimensions of the CARD Act including its effect on credit origination (Jambulapati & Stavins, 2014), subprime cards (Han, Keys, & Li, 2018), the personal loan market (Elliehausen & Hannon, 2018), the effect on young borrowers (Debbaut, Ghent, & Kudlyak, 2016), and on interest rate effects (Agarwal, Chomsisengphet, Mahoney, & Stroebel, 2015). While we find that the CARD Act reduced interest charges on balance transfers for the less sophisticated by approximately $120 in the first year, this represents only a small portion of the overall cost of being financially unsophisticated. To the extent that financial regulation is focused on specific practices rather than a more general improvement in financial literacy, this may constrain the efficacy of such regulation on consumer welfare.

Section 2 provides the background of related literatures, and the data. Section 3 outlines our empirical strategy. Section 4 examines the results on measures of credit card usage. Section 5 looks at alternative measures of credit usage, the local determinants of financial sophistication, and the benefit of the CARD Act. Section 6 concludes.

2. Background

CARD Act Reforms

Balance transfers are a way to refinance existing, household debts onto a revolving credit card line.[4] In many cases, credit card firms solicit such transfers using a combination of reward points and promotional interest rates, oftentimes at low rates and sometimes 0% for a certain period of time. The median promotional balance period is approximately 13 months. After the promotional period, if the transferred amount is not repaid, then the entire account balance generally becomes subject to the higher purchase interest rate.

According to the CFPB, overall balances transferred increased 38 percent from 2015 through the end of 2018 to $54 billion. This is higher than the growth in card balances and purchase volume during this period. Figure 1 shows that average balance transfers peaked in early 2009 at around $5,800 with balance transfer patterns relatively stable in the post-crisis period at around $4,200.

The use of balance transfers is also heavily concentrated among the super-prime (72 percent) and prime (25 percent) cardholder segments; very few offers are given to subprime borrowers. Borrowers in the super-prime and prime segments are not as likely to be credit-constrained as the subprime population – utilization rates for prime cardholders are roughly 5-15% while

[4] While many balance transfers are from other credit cards, balance transfer offers can generally transfer existing auto debt, mortgage payments, and other bill payments. Many balance transfers use a "convenience check" which may also have characteristics of a cash advance. (CFPB Consumer Credit Card Market Report 2019)

approaching 90% for subprime cardholders – suggesting that this pool of cardholders may be more comfortable and have more experience with utilizing different credit products.

Despite in many instances featuring 0% promotional interest rates, the poor use of balance transfers could still lead to substantial finance charges. This is because the promotional interest rate does not alter the regular purchase interest rate on the credit line. For cardholders that continue to make regular purchases on the card with the balance transfer, the amount outstanding combines a balance at a promotional interest rate and another portion at the regular purchase interest rate. Before the CARD Act, lenders could determine their own payment rules, which oftentimes led to payments being applied to lower APR yielding balances first.

Introduced into Congress in January 2009 and signed into law in May 2009, the CARD Act created a set of enhanced consumer protection, disclosure, and prohibition statues into the credit card market. Among these are regulations that increase offer and contract transparency, limits on certain types of fees, disclosure requirements, some restrictions on marketing to young consumers, and for balance transfers, updated rules for credit card payments.[5] The new payment rules specify that "the card issuer shall apply amounts … first to the card balance bearing the highest rate of interest, and then to each successive balance bearing the next highest rate of interest, until the payment is exhausted."

The updated payment rules prioritized higher interest yielding balances before lower interest yielding balances, with the result that BT balances would be paid off only after regular purchase balances are depleted. This decreased the proportion of high interest rate purchase balances on the account and, all else equal, will decrease total interest charges.

Data

We use several sources of data in our analysis. First, in order to catalogue cardholders by their balance transfer and purchase behavior, we need detailed, high-frequency credit card data, which we gather form the Y-14M Schedule D regulatory report. Second, in order to examine the spillovers of credit card sophistication onto other types of loans, we use Equifax® credit bureau data from the Consumer Credit Panel. Additionally, we use data from the American Community Survey to investigate local determinants of financial sophistication.

Our primary source of credit card data is the loan-level Y-14M Schedule D regulatory report from the Federal Reserve. Reported at a monthly frequency for all large bank-holding-companies with more than $50 billion in assets, the Y-14M represents a substantial part of the US credit card market with $686 billion out of the total domestic market of $880 billion as reported using the Equifax® Consumer Credit Panel.[6] The data collection starts in January 2008 and continues through to the present although the data period analyzed here covers through 2012.

Beyond the size and scope of the collection, there are many advantages of using the Y-14M for credit card analysis. The data is at a high-frequency monthly level which allows for following the

[5] Please see https://www.ftc.gov/sites/default/files/documents/statutes/credit-card-accountability-responsibility-and-disclosure-act-2009-credit-card-act/credit-card-pub-l-111-24_0.pdf
[6] https://www.newyorkfed.org/medialibrary/interactives/householdcredit/data/pdf/hhdc_2019q3.pdf

path of payments, balances, and interest charges in a highly granular manner. This is especially important because the month over month snapshot is crucial in determining whether purchases continue to happen during the balance transfer promotional period. Additionally, the data includes many fields unavailable in other commonly used sources such as balance transfer balances, promotional balances, promotional interest rates, status of multiple credit cards, and extensive breakdowns of different types of fees. To the best of our knowledge, these data fields have not been analyzed in the credit card literature.

Because being able to separate purchases from balance transfers implies a certain amount of liquidity available, we restrict our data based on a Y-14M flag that determines whether the cardholder has another credit card relationship *with the same bank*.[7] This is likely to be an underestimate of the borrowers with multiple credit cards because customers may have cards with different banks. Additionally, the typical profile of a balance transfer client is prime and super-prime, which will generally have more than one credit card available. According to the CFPB, super-prime and prime cardholders have on average more than four open credit cards while subprime has more than three.

We further restrict the sample to those that have a balance transfer where the promotional APR is less than the purchase APR. This results in 1,516,049 accounts for which we have their complete account history including purchases, finance charges, payments, promotional balances, and account balances.

Another advantage of the Y-14M is the geographic detail that allows for augmenting to credit bureau data. Using the Y-14M data to catalogue cardholders by financial sophistication, we are also able to leverage the Equifax® Consumer Credit Panel (CCP) to gather additional detail on non-credit card loan products held by analogous borrowers with the same mix of geography and loan characteristics. The CCP is a 5% representative, random sample of US households that contains credit bureau data on loan performance and histories for auto, credit card, mortgage, student loan, and other consumer lending. The data is a quarterly snapshot of the consumer's loan liabilities that also includes a proprietary Equifax® Risk Score, which is not equivalent to the FICO credit score found in the Y-14M data.

Because of the difference between the Equifax® Risk Score and FICO, identifying analogous borrowers between the two datasets is at best only a fuzzy-match. Beyond the zip code and calendar variables, analogous card accounts are identified if they have similar levels for credit limit, account balance, and credit score where credit scores are allowed to vary up to a 25 point difference. Of the 1,516,049 accounts in our sample, we identify 5.4% or 82,702 accounts with an analogue in the CCP. This is approximately the same magnitude as the overall sampling rate of the CCP, which is 5% of households and all of its members.

[7] Beyond this binary flag of whether the customer has another credit card with the same bank, the Y-14M does not have a common account ID across or within banks to match different credit cards to the same account.

3. Empirical Strategy

Quasi-Difference-in-Difference

Our empirical strategy relies on the passage of the CARD Act, which specifically decreased the financing cost from comingling balances or BTCP (balance transfer and continued purchases) onto the same credit card line. Before the CARD Act, payment rules allowed lenders to apply cardholders' payments to the lowest APR yielding balance first, which increased financing costs if purchases and BT balances were comingled. For the financially sophisticated consumers, these additional financing costs are entirely avoidable by spreading purchases and BT over multiple cards, while those less sophisticated that were not aware of the payment rules would continue to use the same card and accrue higher finance charges.

After the CARD Act, the updated payment rules specified that the highest APR yielding balance must be paid down first which eliminated the cost for comingling balances. Since there is no longer any financial incentive to splitting purchases from BT, the sophisticated and the less sophisticated types are more willing to pool into comingling balances due to convenience or other factors. Additionally, to the extent that mental accounting, convenience, or other behavioral factors lead the financially sophisticated to nonetheless comingle balances prior to the CARD Act, our estimate of the effect of financial sophistication is likely to be an under-estimate.

This policy change creates a novel quasi-difference-in-difference strategy where some financially sophisticated cardholders had an incentive to split purchases before the CARD Act but not after. We are interested in the effect of this group of cardholders. By analyzing the behavior of customers that split versus comingle their purchases before and after the CARD Act, we can isolate the impact of this financially sophisticated group that split purchases before from the other confounding factors that influence balance transfer behavior. For example, the same consumers who may engage in comingling prior to the CARD Act due to limited attention, small dollar bias, convenience costs, or other factors are assumed to continue doing so even after the CARD Act.

One potential cofound to our identification is time-varying explanations that vary with the CARD Act for those that comingle versus those that do not comingle. This confound must be time-varying. For example, credit constraints may prevent consumers from shifting balances because the cardholder is only constrained to only one card. As long as the credit constraint is equally binding before and after the CARD Act, this should not violate our identification assumption as we can difference out the non-time-varying component. What would affect identification is if the CARD Act led to greater credit constraints for those that comingle in the post CARD Act period; given that most balance transfer cardholders are targeted towards prime and super-prime cardholders, this is unlikely to be the case. Additionally, we introduce controls for utilization and restrict our analysis only to cardholders with multiple cards. However, in other instances of time-varying explanations, we augment our analysis with extensive controls including the cardholders' credit score, which can be thought of as a sufficient statistic for credit risk.

This identification strategy motivates separating cardholders into four groups based on when their balance transfer occurred and if they engaged in comingling of purchases (BTCP). These four types that can be seen below. The first difference in behavior between Pre CARD Act and Post

CARD Act are time trends which, in addition to explicit year-month controls, control for time-varying trends in the card industry during this period. The second difference between those that comingle and those that do not difference out the uncorrelated factors that may also explain relative propensities between comingling and not.

	Comingling (BTCP)	Separated (No BTCP)
Pre CARD Act	Less Sophisticated	Sophisticated
Post CARD Act	Both Types	Both Types

Differences across Cardholder Types

Before the regression analysis, it is useful to examine the unconditional trends in credit usage and risk for the four cardholder types. Figure 2 maps the balance transfer amount, purchases, promotional balance, and cycle ending balance for the four types of cardholders following the point of balance transfer. The average amount is approximately $5,500 with those that comingle (BTCP) transferring a slightly lower amount at approximately $4,500. Multiple balance transfers are rare overall and particularly in the first two years after an initial balance transfer.

Average purchases show that there is almost no difference in the pre and post CARD Act cardholders for those that do not comingle, which is unsurprising given that purchases are required to be zero while there is still a promotional balance on the account. For customers that comingle, average purchases are higher after the CARD Act which may reflect that in the post period, pooling from more sophisticated customers leads to higher spending as there is no longer a financing cost to comingling balances. In these cases, other factors such as convenience or credit card loyalty may encourage higher levels of purchase.

Promotional balance is the portion of the balance transfer that is under a promotional interest rate that is lower than the purchase interest rate. This balance is affected by the speed of payoff as well as the length of the original promotional, which could be anywhere from a few months to a year or more depending on the specific cardholder terms. For the cardholders that comingle balances, there appears to be no discernable difference in promotional balances before or after the CARD Act. For those that do not comingle however, there is a slight increase in promotional balance prior to the CARD Act. This could be due to slightly longer promotions in the pre period that the financially sophisticated are better able to take advantage compared to the less sophisticated. Cycle ending balance includes the promotional balance as well as purchases minus payments. Here the patterns are fairly similar for the four groups minus a time trend before and after the CARD Act.

The intuition behind the empirical specification can also be clearly seen in Figure 3 which shows the cumulative days past due for the four types of cardholders. Days past due is the number of days past the grace period of 30 days after payment is due. Lenders are generally required to charge-off bad credit card loans at the 120 day mark (or 90 days past due). Graphically, there is a time trend

that represents the difference between the dashed and solid lines showing that delinquency rates were higher prior to 2009 than after 2009 as balance transfers from 2009 were omitted. This more or less reflects the effect of the financial crisis on credit card delinquencies.

The difference between the blue and red lines reflects that those customers who comingle may be selected for on unobservable trends that could be due to convenience, behavioral trends, liquidity constraints, and others. One way to account for these other determinants of comingling is to apply the second difference and compare the relative increase in the solid red to the solid blue with the increase from the dashed red to the dashed blue. The pattern that emerges is that those cardholders who comingle prior to the CARD Act have comparatively higher delinquencies versus those cardholders who comingle after the CARD Act. This thinking is formalized under the empirical specification.

Empirical Specification

Our empirical specification is given by the following equation:

$$y_{it} = \alpha + \beta BTCP_i + \gamma Pre_t + \delta(BTCP_i \times Pre_t) + X_i + \epsilon_{i,t}$$

where $BTCP_i$ is an indicator for comingling balances. This is defined as making a purchase onto a card with a promotional balance and a promotional APR lower than the purchase APR that is not immediately repaid.

Pre_t is whether the cardholder's first observed balance transfer occurred before the CARD Act, y_{it} is a series of outcomes, and the parameter of interest δ measures the effect of being financially less sophisticated on y_{it}. γ accounts for time-varying trends, while β controls for the propensity to comingle that is constant before and after the CARD Act. The coefficient of interest is δ which represents the difference-in-difference estimate of the effect of the group that no longer comingles after the CARD Act, assumed to be the sophisticated, on outcomes y_{it}. X_i is an exhaustive list of extensive loan-level controls that includes year by month effects, zipcode, lender identity, credit score, account balance, utilization, loan origination channel, age, balance transfer volume, credit limit, reported income, APR, and others.

Each observation represents a cardholder taken at the point of earliest snapshot or account origination. In practice, this snapshot can also be taken at any point prior to the balance transfer. This is because the CARD Act is not a treatment effect that is typical of traditional difference-in-difference estimators. Specifically, the CARD Act does not explicitly increase the level of financial literacy,[8] but instead changes the composition of the financially sophisticated and less sophisticated that comingle their card balances. The parallel trends assumption common with difference-in-difference does not hold in this context because the population groups are different before and after their balance transfers. The cardholder that is labeled to be less sophisticated by comingling is still unsophisticated prior to his or her balance transfer – there is no reason to suppose that the groups will have similar patterns beforehand. While the main results track credit

[8] It is the case that while many of the statues of the Card Act require enhanced disclosure of card contract terms, there is evidence that simply providing information is unlikely to increase financial literacy or take-up without more explicit interventions (see (Chetty, Friedman, & Saez, 2013)).

usage and risk from the point of earliest observation, the Appendix will also report results at the point of balance transfer. The empirical results are largely the same starting from either anchoring point.

4. Results

Measures of Risk

The main results examine changes in credit card characteristics and risk measures at different time horizons. Table 2 shows the effect on days past due from 3 to 24 months after the first snapshot. The coefficient on the interaction term covers pre CARD Act comingling, δ, starts low and is indistinguishable from zero and then increases steadily throughout the time horizon. At 12-months, the less sophisticated are likely to be late an additional .9 and then an additional 2.1 days at 24 months.

While the magnitude may appear small, these values do represent sizeable increases in risk. This can be seen when the difference is calibrated to credit scores equivalent for the near-prime (credit scores between 600-700 points) and prime (credit scores between 700-800 points). One year after earliest snapshot, the average days past due for a near-prime cardholder is approximately .95 while it is .16 for prime. At two years after, the average is 2.55 and .41 for near-prime and prime cardholders respectively. Roughly speaking, the effect of being less sophisticated is approximately the same magnitude of impact on days delinquent as a 100-point decrease from the prime score range.[9]

Table 3 shows the regression results for four outcome measures of risk at the 12-month mark after the account's earliest snapshot. In addition to repeating the days past due column from Table 2, the additional outcomes include whether a late fee was assessed (binary), finance charges ($), and whether an over limit fee was assessed (binary). At the 12-month point, the financially unsophisticated that comingle prior to the CARD Act are more likely to be assessed a late fee, pay greater finance chargers, and more likely to go over their credit limit. These effects are even stronger at the 24-month snapshot.

One of the CARD Act regulations reduced lender's reliance on fee income with increased disclosure requirements and prohibitions on certain business practices.[10] This can be seen in the time trend that in the prior period, the chance of incurring fees is higher for all cardholders. At the same time, those that comingle in the prior period are approximately 1% more likely to be late on their 12th payment. Figure 4 plots the progression of the coefficient of the interaction term at different horizon levels. Despite a substantial amount of variation, the mean estimate is roughly unchanged even extending to the 24th snapshot. The results for over limit fees, which are assessed

[9] This effect is not linear as the risk substantially increases when examining scores between 500-600 points. For these subprime cardholders, average days past due at 12-months is 22 days, and is 39 days at 24 months.
[10] For example, before the Card Act, a sudden credit line decrease could push a cardholder above his or her credit limit and result in fees.

when cardholders go past their maximum credit line, are similar with cardholders 1.5% more likely to be assessed an over limit fee if they comingle in the pre period.

Finance charges after the initial snapshot are similarly higher for those that comingle in the pre period. At the one year mark, monthly finance charges are approximately $12.30 higher for this group compared to otherwise similar cardholders that comingle in the post period. This regression controls for the main effect of comingling and for the size of the balance transfer and purchases. This implies that those that comingle in the pre period end up being exposed to higher finance charges, which may be due to higher interest rates assessed after the initial snapshot. Figure 4 shows the path of additional finance charges in the 24 months after initial snapshot. The pattern shows an elevated increase in finance charges in the immediate months after the initial snapshot.

Measures of Credit Characteristics

Having identified that measures of risk are higher for this less sophisticated pool of accounts, Table 4 displays the effect on credit characteristics including interest rates, credit limit, the credit score, and self-reported income. The interest rate is higher at the 12-month period, but this more likely reflects the higher level of late fees and days delinquent for the less sophisticated pool rather than differences at the point of origination or choice of product. We show in the following section no differences in initial account differences between the sophisticated and unsophisticated. Figure 5 shows the APR differences across time. Conditional on the initial level of the APR, the less sophisticated show an increase in account interest rate up through the 12-month period and then a slight reversion as the uncertainty of the estimate increases.

Credit limit in the months after the snapshot also falls for the less sophisticated as risk-based pricing increases interest rates and decreases credit limits following higher late charges and delinquency risk for this group. Credit score also drops in the months after origination with an average decrease of approximately 6 points at the 12-month mark. Reported income shows an imprecise estimate as the self-reported data is generally not validated by the lender.

These results are from the earliest initial observation, which could suffer from potential survivorship bias as all of these accounts are conditioned to survive to the point of balance transfer, which could occur years after the initial snapshot. The Appendix provides results 12-months from the point of the balance transfer so that each observation is centered by the period of the balance transfer rather than the initial origination quarter. Starting from the period of balance transfer is also not perfect because there may be a significant amount of pre-balance transfer information that is relevant for predicting outcomes. For example, credit card firms may have used proprietary spending, transaction, or usage data to target cardholders with balance transfer offers, which would not be the case if the account was newly created.

Nonetheless, the results are qualitatively and quantitatively similar with the exception of credit limit that shows a slight increase in credit limit at the 12-month mark. While only significant at the 10% level, this increase could be due to the higher utilization on the account from the balance transfer itself.

Differences at the Point of Balance Transfer

As we have shown that the less sophisticated are relatively riskier as their accounts age, we also investigate the degree to which credit card firms understand this trend and whether they appropriately use risk-based pricing when determining interest rates and credit limits. We do this by investigating account characteristics for those accounts that are newly created or observed through a balance transfer. Using a sparse set of controls that only include product, bank, time, and solicitation controls, Table 5 shows the regression on outcomes such as credit score, APR, credit limit, and reported income defined at the month of initial balance transfer.

Column 1 shows the difference-in-difference specification on credit score, which finds that the less sophisticated do not have significantly different credit scores compared to the more sophisticated. On the surface this result is puzzling as the less sophisticated cardholders would have had prior behaviors that would lead to a lower score. Our interpretation is this result reflects the limited capacity of the specific credit score rather than an implication that the less sophisticated are identical to the more sophisticated.

Consistent with the credit score result, the risk-based pricing variables such as interest rate and credit limit are also approximately indifferent between the less and more sophisticated. The borrower's reported income is also statistically insignificant for the less sophisticated group. The results imply that much of this information is not priced into initial loan terms, but instead evolves over time as lenders learn about their cardholders from the observed use of their credit lines and repayment behavior. This result is broadly in line with (Stango, Victor, & Zinman, 2016) that find that dispersion in credit card offers is much more related to advertising intensity than underlying credit risks.

5. Additional Credit Risk Measures

Credit Bureau Data

Given the differences in credit card loan characteristics and risk following a BT, with credit bureau data, we can observe a more complete picture of the cardholder's overall financial picture in terms of consumer credit beyond just credit card usage. Of the 82,702 credit card accounts for which we can identify a similar analogue in the CCP data, 70,916 have a mortgage loan, 72,791 have an auto loan, and 24,999 have a student loan. We caution that because of differences in credit scores between Equifax® and the regulatory credit card data, these are not guaranteed to be the same account. With that said, these accounts are similar on a number of attributes including location, calendar dates, account balances, and card characteristics.

Using these analogue accounts identified in the CCP data, the same empirical specifications can be performed as on the regulatory credit card data examining risk outcomes. Table 6 shows the results for delinquency measures in the four consumer credit portfolios reported in the CCP as well as a set of other instances in the CCP data that point to less sophisticated consumer credit usage. Columns 1 through 4 show the empirical relationship for loan defaults for credit cards, auto loans, student loans, and mortgage loans, respectively. With the exception of student loans,

for which defaults are rare and the analogous sample is small, the financially less sophisticated in terms of balance transfer behaviors are also riskier for other lending products such as auto and mortgage delinquency. The increased credit card risk that these less sophisticated credit card users have are also likely to spillover and affect non-credit card loans as well.

Columns 5 through 8 show results for other outcomes available in the CCP data including the auto loan term, number of credit inquiries, the chance of bankruptcy, or the use of a personal loan lender in any loan product. Typically speaking, longer auto loan terms frequently lead to high payments and negative equity during trade-in, the number of credit inquiries is frequently cited as being a negative impact to a high credit score, and the use of a personal loan lender often implies a higher interest rate product all else equal.[11] These actions in isolation are not conclusive of solely financial sophistication given many other reasons for credit inquiries, use of personal loans, and others. However, the correlation of these actions along with comingling BT card balances for those cardholders with multiple credit cards does point to financial literacy as an important, driving factor.

Similar to the main specifications on the regulatory credit card data, while the magnitude of the effects are small, this does point to spillovers to other credit products beyond credit cards. Cardholders that comingle balances and accrue unnecessarily high finance charges are also more likely to use other loan products inefficiently and in a riskier manner. Not being able to optimize over one dimension of credit on a relatively sophisticated financial maneuver may be predictive of financial literacy more broadly.

Local Determinants of Sophistication

The analysis can be aggregated to a higher geographic level to determine the correlation with the pre and post-CARD Act comingling rate. The data come from the 2011 American Community Survey of zip code characteristics where we include state and aggregate card controls such as average balance, balance transfer volume, utilization, payment, purchases, credit limits, APR, and credit score.

The regressor of interest is defined to be

$$Ratio = \frac{Average\ Pre\ Card\ Act\ BTCP\ Rate}{Average\ Post\ Card\ Act\ BTCP\ Rate}$$

where the average BTCP rate is the proportion of card balances held by those that comingle purchases and balance transfers. As the ratio increases, the proportion of the less sophisticated increases relative to the proportion that is more sophisticated.

Table 7 shows that of the local area characteristics, the college graduation rate, finance employment share, and the local unemployment rate are all correlated with the ratio even conditioning on state and local area factors such as average credit score, card balances, utilization, and others. The cross-sectional regressions show that higher unemployment, lower

[11] Unfortunately, the CCP data does not contain interest rates to measure the actual cost of these loans.

finance shares, and lower college graduation rates are all associated with a relatively less sophisticated pool of cardholders.

Effect of the CARD Act on Finance Fees

One way to determine the impact of the CARD Act on excess financing fees is to implement the CARD Act rules in the pre-CARD Act period. By forcing payments to be applied to the purchase APR first, a counterfactual finance charge can be created. The calculation assumes that the path of payments before the CARD Act is unchanged and that the promotional APR, which is unavailable in the data, is approximately a fifth of the purchase APR.

In the post CARD Act period, the imputed finance charge and the actual finance charge are extremely close. As a crude comparison of the imputation with the actual finance charge calculation, the correlation between imputed finance charge and the actual finance charge is 92% in the post CARD Act period. As shown in Table 8, in the first year after balance transfer in the post CARD Act period, average finance charges are approximately the same for the sophisticated and the less sophisticated. The imputation difference due to calculation and data quality is less than 15%. Beyond additional reason for why the sophisticated experience lower interest charges in this analysis is that we do not factor in the interest accrued on purchases made on other cards, that is, purchase volume is mechanically set to 0 for the sophisticated set of borrowers.

Pre CARD Act, actual finance charges were $334 per year compared to $347 under the imputed calculation for the sophisticated. For the less sophisticated, imputed interest charges under the CARD Act are $120 less than actual interest charges. The approximate $120 dollar difference represents the average savings a less sophisticated balance transfer cardholder would gain had the CARD Act payment rules been active throughout the entire period.

While this is a substantial amount of savings in credit card interest charges, representing approximately 22% reduced finance charges after balance transfers for the less sophisticated, this is still likely to be a small amount relative to the costs of being less sophisticated. As shown previously, the additional late fees due to delinquencies, effects on credit score, inefficient use of other loan products such as personal loans, all may overshadow this reduction in finance cost. While the CARD Act's payment rules largely succeeded in reducing this aspect of financial literacy, there are still many areas where the less sophisticated are paying avoidable, excessive costs to access credit.

6. Conclusion

Identifying financial literacy apart from the many other factors that contribute to decision-making is a difficult task. Using the 2009 phase-out of a relatively obscure, but sophisticated, balance transfer strategy, we identify the effect of this sophisticated population by comparing those that engaged in the strategy with those that did not. We found that this measure of sophistication based on actual usage of credit explains many aspects of credit card risk including delinquencies, fees, and interest charges.

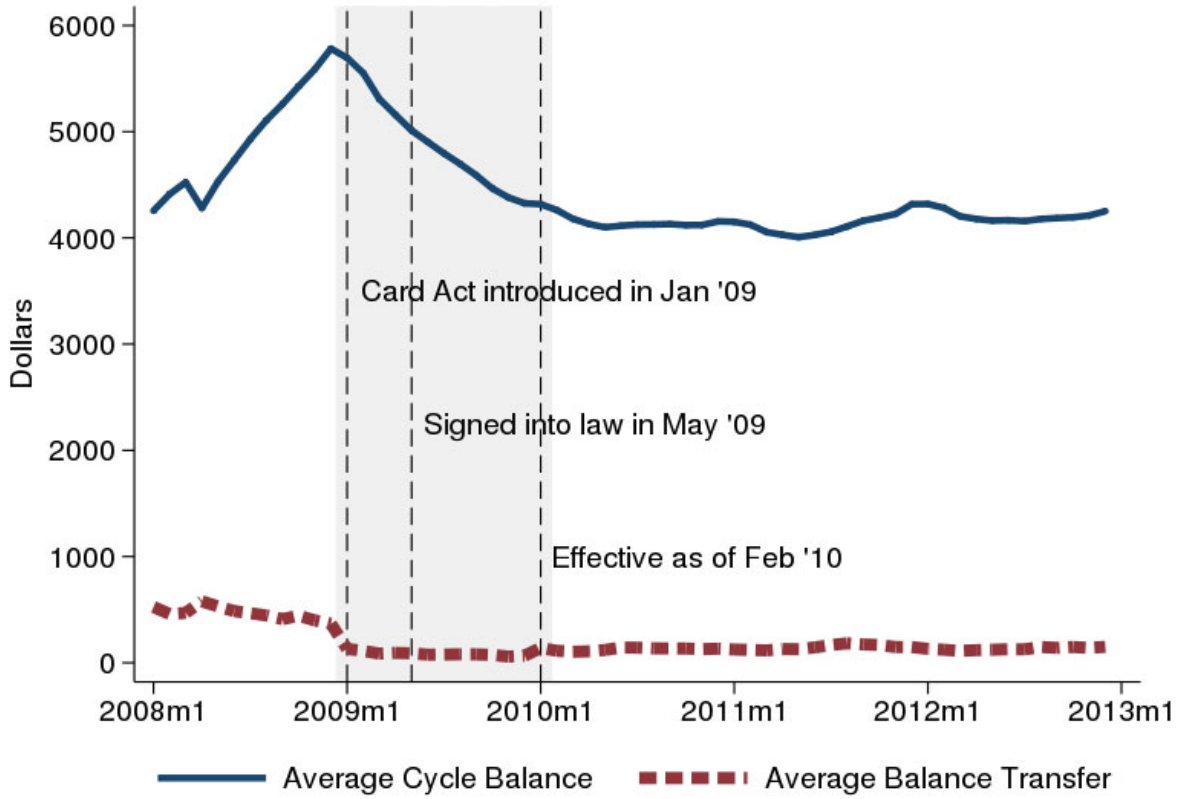
At the same time, lenders did not appear to discriminate these borrowers on initial loan terms priced by credit scoring models. We found differences in APR, credit limit, credit score, and

reported income only after the initial balance transfer. Additionally, we find that there are significant spillovers to other kinds of loan products, which imply that financial sophistication for credit card balance transfers is not domain-specific and is an extension of human capital more broadly. At the local geographic level, this measure of sophistication is correlated with local unemployment and educational achievement which provides further evidence of spillovers to other domains.

The CARD Act reduced finance charges due to this poor usage of balance transfers. On average, we find a reduction of $120 in finance charges which represents 22% of total balance transfer related interest charges to the less sophisticated. However, the $120 fee reduction is relatively small compared to higher late fees, over limit charges, and overall higher APR rates that the less sophisticated are also more prone to receiving on their use of credit cards and other consumer lending.

7. Tables and Figures

Figure 1. Balance Transfers through Time



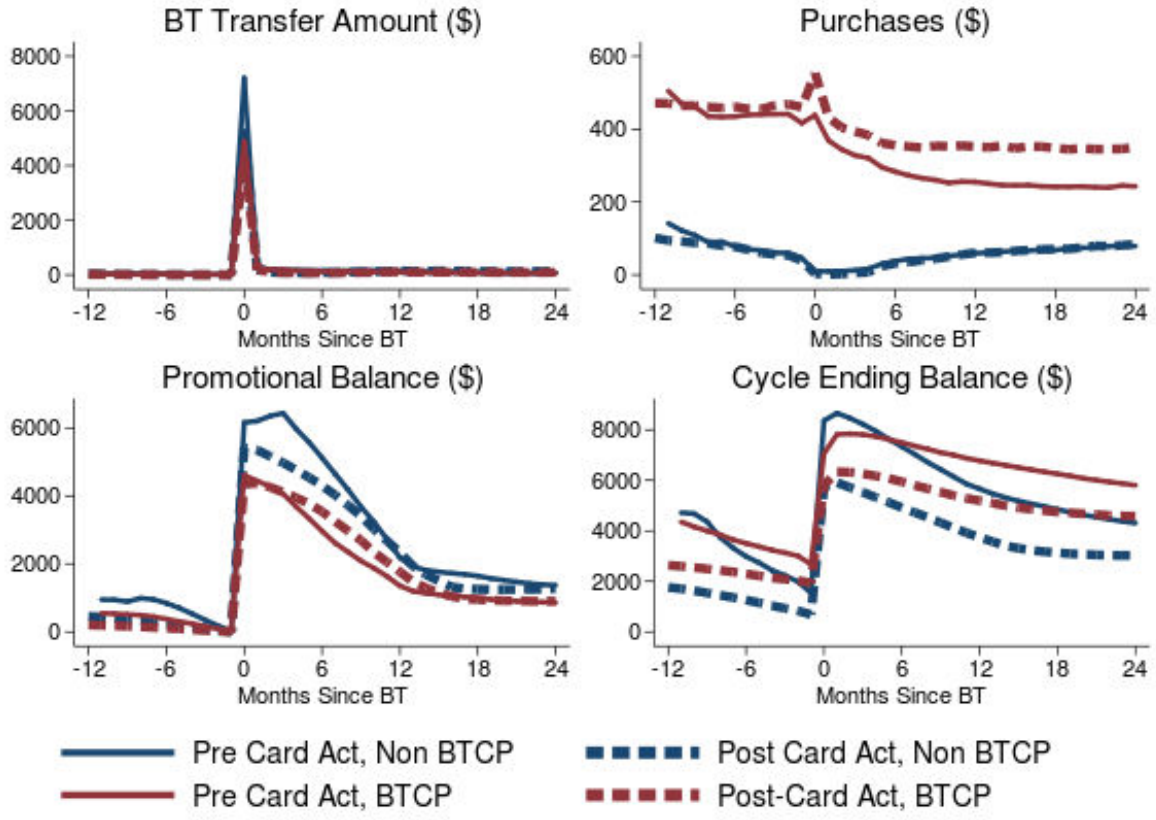
Notes: The CARD Act was introduced in the House of Representatives on January 22, 2009, signed into law on May 22, 2009. The major amendments, including the payment rules regarding high APR balances, took effect on February 22, 2010. Credit card firms had the option to begin implementing changes prior to February 22, 2010.

Table 1. Summary Statistics OCC

		At Initial Snapshot				At Balance Transfer			
	Count	Mean	1st Percent	99th Percent	StD	Mean	1st Percent	99th Percent	StD
Observations									
Pre Card Act	885,064								
Post Card Act	630,985								
BTCP	748,929								
Pre Card Act BTCP	405,555								
Product Types (Indicators)									
Cobrand Card	1,516,049	8.9%				8.8%			
Oil and Gas Card	1,516,049	0.3%				0.3%			
Affinity Card	1,516,049	13.0%				12.5%			
Student Card	1,516,049	0.5%				0.5%			
Account Characteristics									
Account Age (Months)	1,516,049	62	0	330	72	77	0	347	76
Credit Score	1,516,049	731	577	847	79	738	596	850	65
Borrower Income ($)	1,516,049	$35,184	$0	$250,000	$108,526	$36,638	$0	$250,000	$118,917
Cycle Ending APR (%)	1,516,047	13.5%	0%	30.0%	6.1%	14.0%	5%	30.0%	5.2%
Credit Limit ($)	1,516,049	$12,839	$800	$45,000	$9,354	$13,499	$1,000	$46,800	$9,692
Risk Drivers									
BT Volume ($)	1,516,049	$742	$0	$14,550	$3,124	$5,522	$74	$30,000	$6,568
Promotional Balance ($)	1,516,049	$3,389	$0	$25,421	$5,890	$6,841	$34	$32,790	$7,206
Cycle Balance ($)	1,516,049	$1,086	$0	$17,136	$3,459	$5,403	$0	$29,391	$6,407
Card Utilization (%)	1,516,044	26.4%	0%	99.7%	53.8%	54.8%	0%	100.2%	53.9%
Payment Amount ($)	1,516,049	$435	$0	$8,126	$1,855	$405	$0	$7,092	$1,688
Purchase Volume ($)	1,516,049	$264	$0	$4,020	$1,027	$245	$0	$3,649	$869

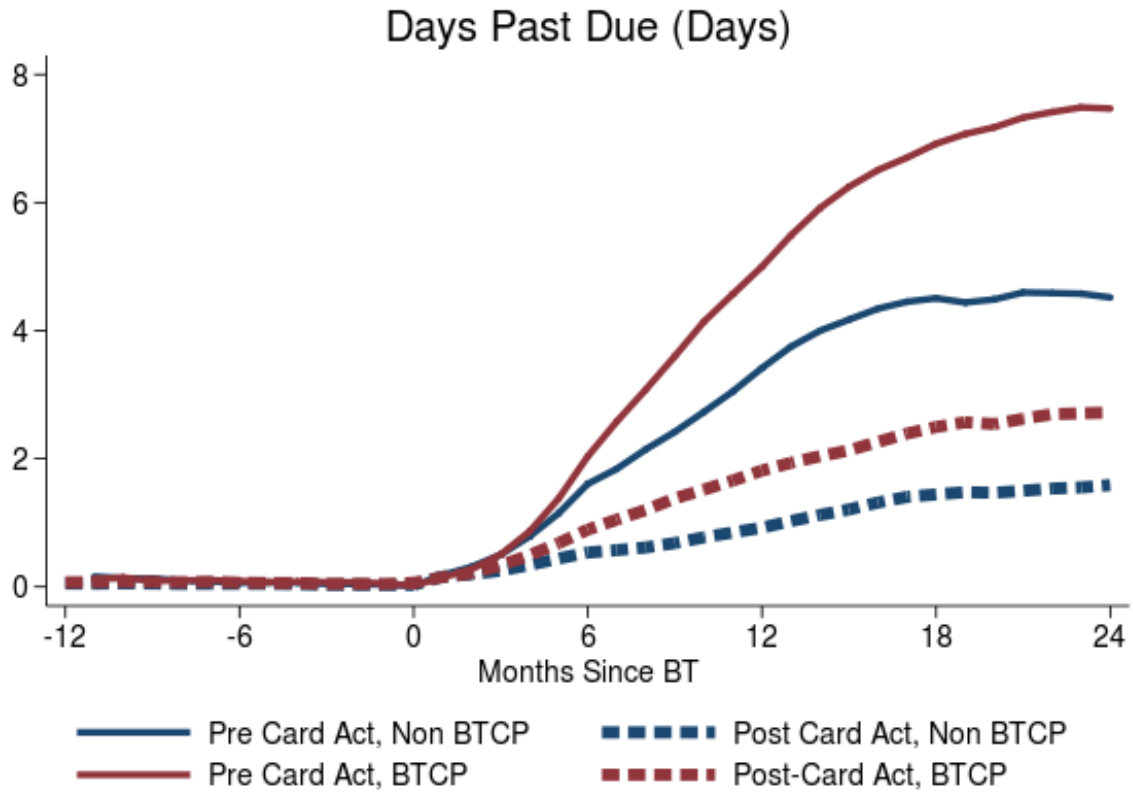
Notes: BTCP is an indicator marking whether a cardholder continues to purchase after a balance transfer under a promotional APR. Pre CARD Act refers to balance transfers prior to 2009. Post CARD Act are balance transfers between 2010 and 2012. At initial snapshot refers to the first observed card period, which may not necessarily be the period of card origination.

Figure 2. Account Characteristics since BT



Notes: BTCP is an indicator marking whether a cardholder continues to purchase after a balance transfer under a promotional APR. Pre CARD Act refers to balance transfers prior to 2009. Post CARD Act are balance transfers between 2010 and 2012. Months since BT refers to the months since the first BT instance.

Figure 3. Risk Outcomes since BT



Notes: BTCP is an indicator marking whether a cardholder continues to purchase after a balance transfer under a promotional APR. Pre CARD Act refers to balance transfers prior to 2009. Post CARD Act are balance transfers between 2010 and 2012. Months since BT refers to the months since the first BT instance.

Table 2. Days Past Due from Initial Snapshot

	3 Months Ahead	6 Months Ahead	12-months Ahead	18 Months Ahead	24 Months Ahead
Pre CARD Act	0.118***	0.444***	1.861***	3.571***	4.272***
	(0.0194)	(0.0431)	(0.0942)	(0.139)	(0.163)
BTCP	0.0125	0.0304	0.221***	0.138	-0.0528
	(0.0136)	(0.0287)	(0.0577)	(0.0883)	(0.106)
Pre CARD Act x BTCP	-0.0365	0.110*	0.877***	1.785***	2.065***
	(0.0240)	(0.0638)	(0.146)	(0.215)	(0.256)
Additional Controls	✓	✓	✓	✓	✓
Observations	150,211	150,193	149,491	147,363	144,210
R^2	0.147	0.129	0.150	0.158	0.166

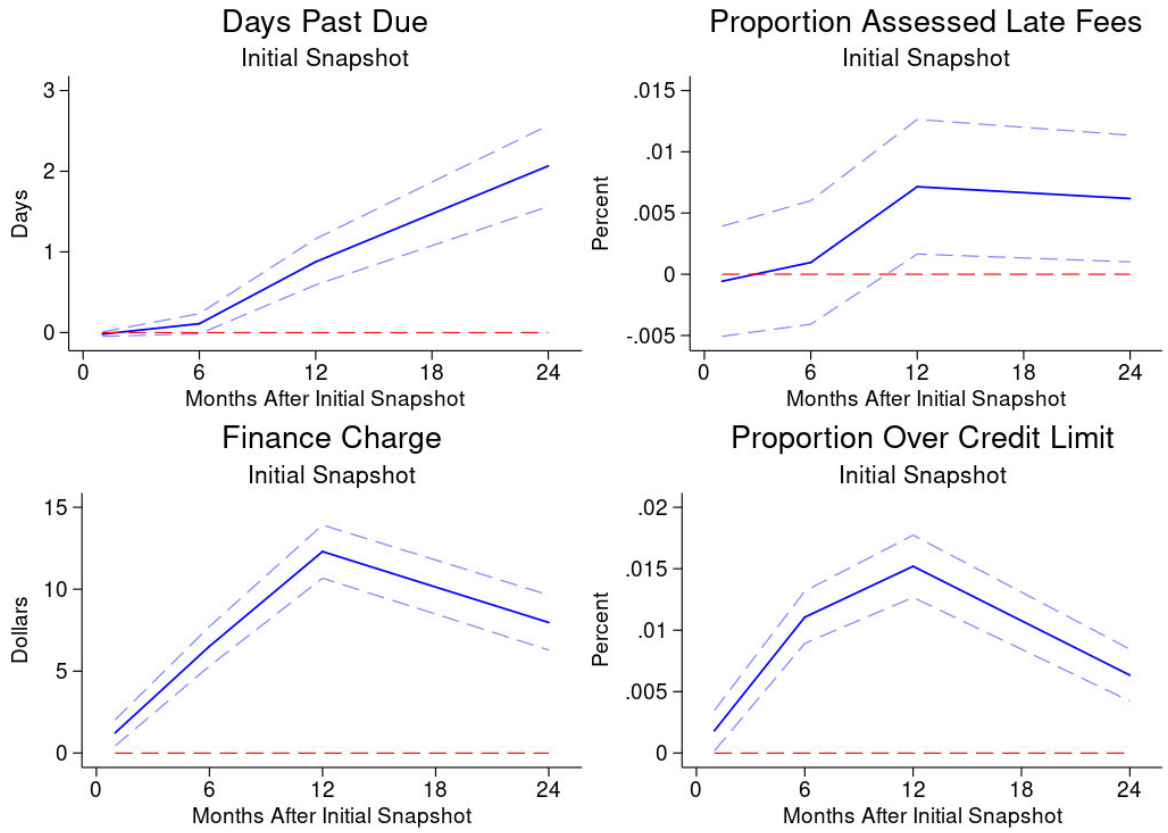
Notes: BTCP is an indicator marking whether a cardholder continues to purchase after a balance transfer under a promotional APR. Pre CARD Act refers to balance transfers prior to 2009. Post CARD Act are balance transfers between 2010 and 2012. The snapshot is taken at the earliest observed month for each cardholder. Additional controls include 5-digit zip code, year by month indicators, bank identifiers, and the full set of available card characteristics. The sample is a 10% sample of the Y-14M data. See Appendix B for the full list of coefficients. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3. Risk Characteristics 12-months from Initial Snapshot

	Days Past Due	Late Fee	Finance Charge	Over Limit Fee
Pre CARD Act	1.861***	0.0357***	20.59***	0.00765***
	(0.0942)	(0.00196)	(0.626)	(0.000799)
BTCP	0.221***	0.0156***	6.843***	0.00258***
	(0.0577)	(0.00184)	(0.436)	(0.000651)
Pre CARD Act x BTCP	0.877***	0.00715**	12.30***	0.0152***
	(0.146)	(0.00280)	(0.828)	(0.00129)
Additional Controls	✓	✓	✓	✓
Observations	149,491	149,491	149,491	149,491
R^2	0.150	0.156	0.375	0.156

Notes: BTCP is an indicator marking whether a cardholder continues to purchase after a balance transfer under a promotional APR. Pre CARD Act refers to balance transfers prior to 2009. Post CARD Act are balance transfers between 2010 and 2012. The snapshot is taken at the earliest observed month for each cardholder and the outcome measures are 12-months afterwards. Additional controls include 5-digit zip code, year by month indicators, bank identifiers, and the full set of available card characteristics. The sample is a 10% sample of the Y-14M data. See Appendix B for the full list of coefficients. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 4. Estimated Diff-in-Diff Plots by Risk (Regression Plot)



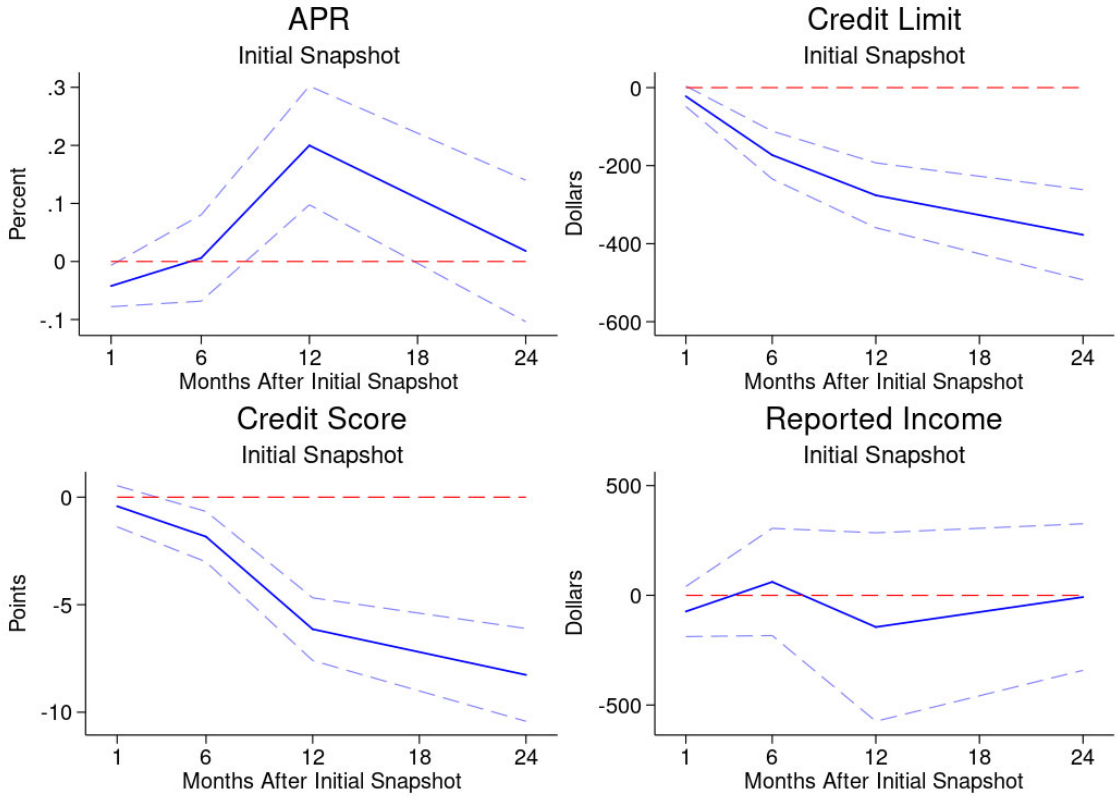
Notes: Plotted coefficients of the Pre CARD Act x BTCP indicator. BTCP is an indicator marking whether a cardholder continues to purchase after a balance transfer under a promotional APR. Pre CARD Act refers to balance transfers started prior to 2009. The snapshot is taken at the earliest observed month for each cardholder. Additional controls include 5-digit zip code, year by month indicators, bank identifiers, and the full set of available card characteristics. Dashed lines represent the 95% confidence intervals calculated from robust standard errors.

Table 4. Card Characteristics 12-months from Initial Snapshot

	APR (%)	Credit Limit ($)	Credit Score	Income ($)
Pre CARD Act	0.401***	682.5***	-26.51***	149.1
	(0.0379)	(33.40)	(0.591)	(137.2)
BTCP	0.0923**	373.6***	-2.441***	148.0
	(0.0366)	(26.39)	(0.505)	(206.2)
Pre CARD Act x BTCP	0.200***	-276.0***	-6.139***	-144.5
	(0.0521)	(42.41)	(0.744)	(219.1)
Additional Controls	✓	✓	✓	✓
Observations	149,403	149,491	149,491	149,491
R^2	0.519	0.867	0.390	0.947

Notes: BTCP is an indicator marking whether a cardholder continues to purchase after a balance transfer under a promotional APR. Pre CARD Act refers to balance transfers prior to 2009. Post CARD Act are balance transfers between 2010 and 2012. The snapshot is taken at the earliest observed month for each cardholder and the outcome measures are 12-months afterwards. Additional controls include 5-digit zip code, year by month indicators, bank identifiers, and the full set of available card characteristics. The sample is a 10% sample of the Y-14M data. See Appendix B for the full list of coefficients. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 5. Estimated Diff-in-Diff Plots by Characteristics (Regression Plot)



Notes: Plotted coefficients of the Pre CARD Act x BTCP indicator. BTCP is an indicator marking whether a cardholder continues to purchase after a balance transfer under a promotional APR. Pre CARD Act refers to balance transfers started prior to 2009. The snapshot is taken at the earliest observed month for each cardholder. Additional controls include 5-digit zip code, year by month indicators, bank identifiers, and the full set of available card characteristics. Dashed lines represent the 95% confidence intervals calculated from robust standard errors.

Table 5. Observed Account Differences

	Initial Snapshot Balance Transfers			
	Credit Score	APR	Credit Limit	Income
Pre CARD Act	-13.58	-5.111***	3,846	20,482
	(24.84)	(1.816)	(4,850)	(33,960)
BTCP	-13.21**	-0.0961	-1,024*	-3,008
	(5.359)	(0.412)	(603.0)	(5,144)
Pre CARD Act x BTCP	3.108	0.209	479.0	2,760
	(5.660)	(0.427)	(642.2)	(5,336)
Additional Controls	✓	✓	✓	✓
Observations	19,571	19,571	19,571	19,571
R^2	0.556	0.573	0.631	0.622

Notes: BTCP is an indicator marking whether a cardholder continues to purchase after a balance transfer under a promotional APR. Pre CARD Act refers to balance transfers prior to 2009. Post CARD Act are balance transfers between 2010 and 2012. The sample includes only those borrowers who originated their account through a balance transfer. The sample is a 10% sample of the Y-14M data. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6. Other Consumer Credit Outcomes

	Card Delinquency	Auto Delinquency	Student Delinquency	Mortgage Delinquency	Auto Loan Term	Number of Credit Inquiries	Chance of Bankruptcy	Personal Loan Lender
Pre CARD Act	0.0942***	0.0629***	0.0509***	0.0700***	-0.521	0.460***	0.0443***	0.00982***
	(0.00404)	(0.00400)	(0.00575)	(0.00313)	(0.340)	(0.0351)	(0.00267)	(0.00255)
BTCP	0.0460***	0.0256***	0.0208***	0.0130***	0.313	0.117***	0.0150***	0.00491*
	(0.00417)	(0.00408)	(0.00573)	(0.00299)	(0.366)	(0.0357)	(0.00264)	(0.00265)
Pre Card x BTCP	0.0108*	0.0163***	-0.00699	0.0132***	1.587***	0.158***	0.00709*	0.0106***
	(0.00612)	(0.00608)	(0.00863)	(0.00490)	(0.511)	(0.0534)	(0.00419)	(0.00389)
Additional Controls	✓	✓	✓	✓	✓	✓	✓	✓
Observations	82,702	72,791	24,999	70,916	72,791	82,702	82,702	82,702
R^2	0.113	0.056	0.084	0.070	0.030	0.091	0.030	0.010

Notes: BTCP is an indicator marking whether a cardholder continues to purchase after a balance transfer under a promotional APR. Pre CARD Act refers to balance transfers prior to 2009. Post CARD Act are balance transfers between 2010 and 2012. The sample includes only those borrowers who originated their account through a balance transfer. The sample is from both the Equifax® CCP data to the Y-14M credit card data. Please see section 2 for details. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7. Determinants of Local BTCP Rate

	Ratio of Pre to Post BTCP Rate
Local Unemployment Rate	0.00241***
	(0.000601)
Local Finance Labor Share	-0.000907*
	(0.000510)
Local Population Age 16+	-1.63e-07
	(3.79e-07)
Local Average Income	0.0157
	(0.0103)
Local College Graduation Rate	-0.00107***
	(0.000274)
State and Card Controls	✓
Counties	21,950
R^2	0.070

Notes: BTCP is an indicator marking whether a cardholder continues to purchase after a balance transfer under a promotional APR. The local BTCP rate is the percentage of BTCP cardholders within a zip code. Pre CARD Act refers to balance transfers prior to 2009. Post CARD Act are balance transfers between 2010 and 2012. The finance and business share is the zip code level fraction of employment in finance and business as defined by the 2011 American Community Survey. Additional controls include state indicators and the full set of available card characteristics averaged to the zip code level. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8. Imputed Interest Charges

	Post CARD Act		Pre CARD Act	
	Sophisticated	Less Sophisticated	Sophisticated	Less Sophisticated
Actual Finance Charge	$111	$340	$334	$565
Imputed Finance Charge (CARD Act Rules)	$125	$322	$347	$445
Difference				$120

Notes: Less sophisticated borrowers are cardholders that continue to purchase after a balance transfer and mix purchases and BT balances. Sophisticated borrowers are those cardholders that separate purchases after balance transfers. Pre CARD Act refers to balance transfers prior to 2009. Post CARD Act are balance transfers between 2010 and 2012. The imputed finance charge follows the CARD Act rules for payment allocation where payments are first applied to high APR balances and then applied to promotional APR balances.

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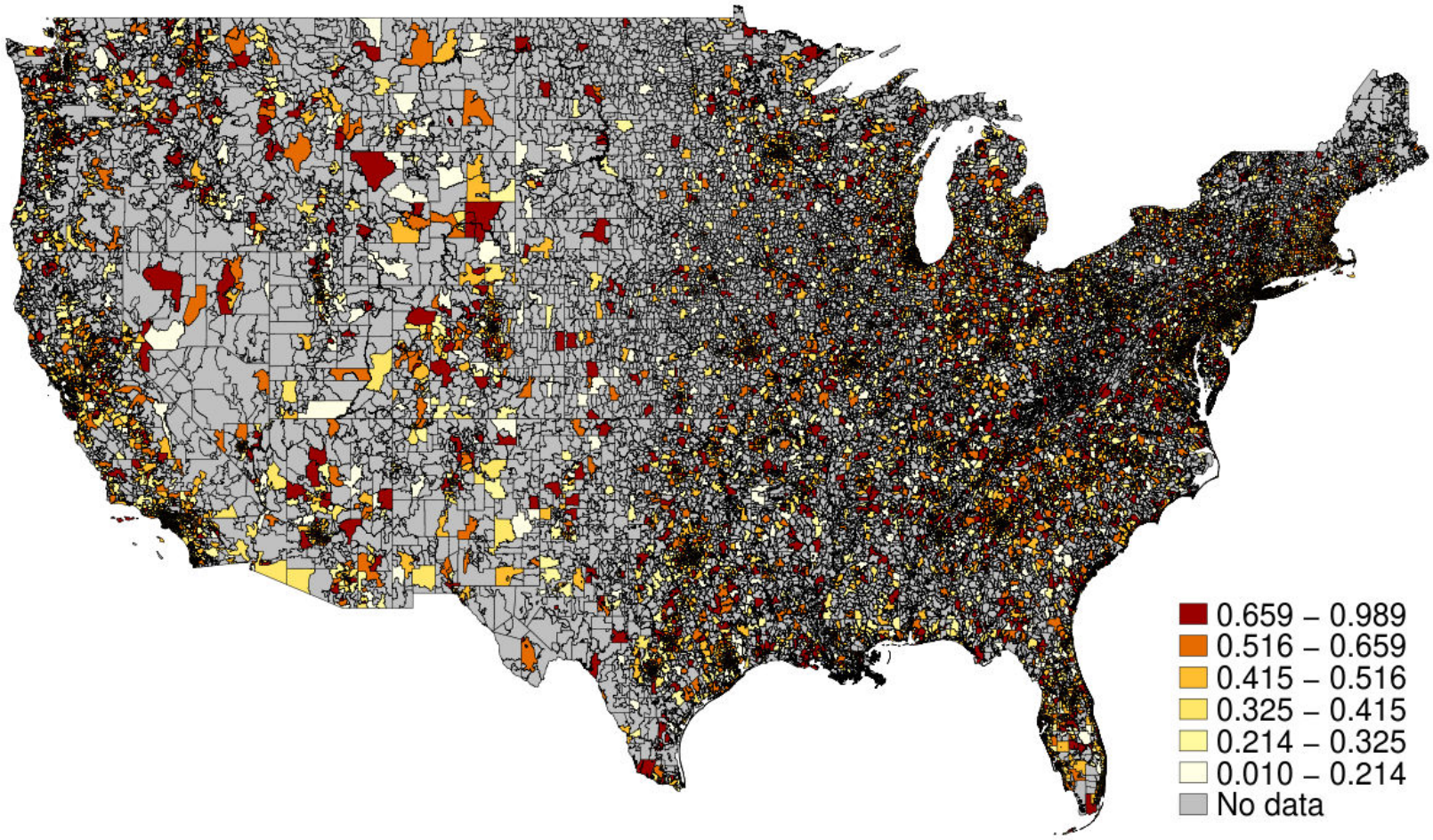
Appendix Table A. Account Status 12-months from Balance Transfer

	Days Past Due	Late Fee	Finance Charge	Over Limit Fee	APR (%)	Credit Limit ($)	Credit Score	Income ($)
Pre Card Act	2.119***	0.0370***	15.68***	0.0103***	-0.661***	896.8***	-25.20***	-2,909***
	(0.381)	(0.00665)	(1.829)	(0.00201)	(0.0964)	(90.69)	(2.220)	(707.7)
BTCP	0.666***	0.0161***	13.49***	-0.000278	-0.0957***	168.9***	-8.975***	379.1
	(0.124)	(0.00199)	(0.512)	(0.000444)	(0.0264)	(23.14)	(0.615)	(277.2)
Pre Card Act x BTCP	0.858***	0.00517*	5.117***	0.0138***	0.445***	69.88*	-1.715*	-627.3**
	(0.211)	(0.00289)	(0.825)	(0.00118)	(0.0477)	(38.30)	(0.889)	(298.4)
Additional Controls	✓	✓	✓	✓	✓	✓	✓	✓
Observations	147,667	147,667	147,667	147,667	147,563	147,667	147,667	147,667
R^2	0.150	0.156	0.397	0.153	0.551	0.886	0.379	0.934

Notes: BTCP is an indicator marking whether a cardholder continues to purchase after a balance transfer under a promotional APR. Pre Card Act refers to balance transfers prior to 2009. Post Card Act are balance transfers between 2010 and 2012. The snapshot is taken at the period of first balance transfer. Other controls include 5-digit zip code, year by month indicators, and bank identifiers. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Figure B. Pre Card Act Local BTCP Rate



Notes: BTCP is an indicator marking whether a cardholder continues to purchase after a balance transfer under a promotional APR. The local BTCP rate is the percentage of BTCP cardholders within a zip code. Pre Card Act refers to balance transfers prior to 2009. Post Card Act are balance transfers between 2010 and 2012.