



DISCUSSION PAPER

PAYMENT CARDS CENTER

What Happened to the Revolving Credit Card Balances of 2009?

Larry Santucci*

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Summary: *We track the disposition of revolving credit card balances that existed as of March 2009 — the peak of outstanding balances in our data set — over a four-year period. We find that 75 percent of those balances had been paid off or charged off by February 2013. Charge-offs played a much smaller role in balance reduction than did paydown: 27.8 percent of balances were charged off, while 72.2 percent were paid down. Charge-offs accounted for a much larger share of balance reduction in the riskiest quintile and almost none of the reduction in the least risky quintile. After stratifying by risk score as of March 2009, balance, and utilization, we find that highly utilized accounts were no more likely to reduce their debt balances than low utilized accounts. We also find that low-utilization accounts were more likely to reduce their balances by paydown rather than default. By comparing accounts affected by unfavorable events, such as closures, freezes, and rate increases, with those accounts that did not experience such an event, we find that, while the aggregate results appear to be similar, there is a high degree of variation within risk quartiles, both with respect to debt reduction rates and to balance reduction shares attributed to paydown and to charge-off.*

Keywords: credit cards, revolving balances, deleveraging
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*Payment Cards Center, Federal Reserve Bank of Philadelphia, Ten Independence Mall, Philadelphia, PA 19106. E-mail: larry.santucci@phil.frb.org. The author thanks Julia Cheney, Susan Herbst-Murphy, Robert M. Hunt, Slava Mikhed, and Michael Vogan, as well as participants in a Payment Cards Center Brown Bag session for their valuable comments and suggestions. The views expressed here are those of the author(s) and do not necessarily reflect the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System. Nothing in the text should be construed as an endorsement of any organization or its products or services. No statements here should be treated as legal advice. This paper is available free of charge at www.philadelphiafed.org/consumer-credit-and-payments/payment-cards-center/publications.

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Ten Independence Mall, Philadelphia, PA 19106-1574 • 1(215)574-7220 • www.philadelphiafed.org/PCC

I. Introduction

The financial crisis and Great Recession of 2007–2009 induced an extraordinary reduction in consumer credit and debt.¹ Data from the Federal Reserve Board of Governors indicate that outstanding revolving credit peaked at \$1.021 trillion in April 2008.² Over the next three years, it would fall by 18 percent, to \$836 billion. Throughout that time, credit card portfolios experienced increasingly higher losses. Nationally, the credit card charge-off rate for all commercial banks rose from 3.85 percent in the second quarter of 2007, to 10.97 percent in the second quarter of 2010.³ While the charging off of credit card debt clearly contributed to the decline in outstanding balances, research by Brown et al. (2013), Demyanyk and Koepke (2012), and Becker (2011) indicated that some consumers were simultaneously engaging in efforts to pay down their credit card debt.

Of course, a significant fraction of credit card balances reported in the Board of Governors of the Federal Reserve System’s national statistics are purely transactional balances, paid off at some point in the following month. In this paper, we focus only on *revolving* balances — balances that are not paid off in their entirety in the following month.⁴ We ask the following questions:

¹ The literature often refers to the reduction in debt balances that occurred during and after the recession as *deleveraging*, meaning that consumers acted to bring their ratio of debt to income (or debt to assets) in line with their less optimistic expectations of the future. At times in this paper, the term *deleveraging* may be used to refer to a general reduction in outstanding debt.

² According to the Board of Governors of the Federal Reserve System, credit card loans comprise most of revolving credit, but other types of loans are also included.

³ Source: Board of Governors of the Federal Reserve System (U.S.), Charge-Off Rate on Credit Card Loans, All Commercial Banks [CORCCACBN], retrieved from FRED, Federal Reserve Bank of St. Louis <https://research.stlouisfed.org/fred2/series/CORCCACBN>, (accessed April 26, 2016).

⁴ We also include closed accounts with a nonzero balance since these balances are still owed by the accountholder and have not been charged off by the issuer.

1. What happened to the revolving credit card debt that existed at the peak of borrowing?
2. How much of it was charged off by credit card issuers and how much was paid off by consumers?
3. Were subprime consumers more likely to reduce their debt by charging off rather than paying down?
4. How much of the paydown was just consumers transferring balances from one account to another?
5. In addition, are the findings consistent with economic theory?

In this paper, we use anonymized, account-level credit card data to address each of these questions. We track the disposition of revolving balances that existed at the peak of credit card borrowing, which in these data occur in the first quarter of 2009, identifying the debt reduction attributable to both charge-off and paydown. We find that 75 percent of those balances had been paid off or charged off by February 2013. Charge-offs played a much smaller role in balance reduction than did paydown: 27.8 percent of balances were charged off, while 72.2 percent were paid down. We also find that accountholders whose March 2009 risk score fell into the riskiest 20 percent of accounts reduced their balances by 86 percent, far more than any other risk quintile. In addition, about 62 percent of the balance reduction in that quintile came from charge-off, and 38 percent from paydown. In contrast, balances in the next risk tranche declined by 73 percent, with 63 percent coming from paydown and just 37 percent from charge-off. These findings provide some evidence that, while all consumers experienced decreased debt levels during 2009–2013, consumers of differing risk quality arrived at that outcome

in very different ways. Accountholders whose risk score fell into the least risky 20 percent of accounts paid down 95 percent of their balances, leaving only 5 percent to being charged off. Lastly, we estimate that balance transfers accounted for just 1 percent of the total reduction in initial balances.

The paper is organized as follows. Section II reviews related literature, Section III introduces the data, and Section IV presents the results. We conclude in Section V with a summary of the findings.

II. Related Literature

The market forces behind the reduction in outstanding credit card debt during the recent recession have received some attention in the literature. Demyanyk and Koepke (2012) and Brown et al. (2013) found evidence of both supply- and demand-side effects at play, although neither was able to decompose the effects. On the supply side, negative net account growth (fewer new accounts opening than closing), fewer balance transfer opportunities, changes in the composition of accounts toward less risk, and account management actions, such as credit limit decreases and repricing, all played a significant role in reducing overall balances.⁵ On the demand side, consumers may pay down, increase, or transfer their credit card debt at any time, subject to individual credit availability. As suggested by Brown et al. (2013), some consumers may have been

⁵ According to the Federal Reserve Board's July 2008 Senior Loan Officer Opinion Survey on Bank Lending Practices, "about 65 percent of domestic banks — up notably from about 30 percent in the April survey — indicated that they had tightened their lending standards on credit card loans over the past three months.... In addition, considerable fractions of respondents reported having increased minimum required credit scores ... and reduced the extent to which such loans were granted to customers who did not meet their bank's credit-scoring thresholds. Finally, large net fractions of banks noted that they had lowered credit limits on credit card accounts over the past three months."

discouraged from applying for new credit cards due to the increased likelihood of being turned down. In addition, consumers may attempt to seek protection from creditors via the bankruptcy process or through the informal process of default, whereby the consumer stops making payments on the account until it is closed by the issuer.

Several papers examine the relative contributions of charge-off and voluntary paydown on credit card deleveraging, including Becker (2011), Brown et al. (2013), Demyanyk and Koepke (2012), and Sanchez (2014). Becker (2011) finds that, between first quarter 2009 and first quarter 2010, credit card charge-offs amounted to \$86.6 billion (54 percent), while paydown was \$72.2 billion (46 percent). Brown et al. (2013) find that charge-offs cannot explain the entire deleveraging picture, since in 2009–2010 the change in nonmortgage debt (auto, credit card, and other) excluding charge-offs was negative. Thus, households must have paid down some portion of their outstanding debt. Demyanyk and Koepke (2012) find that much of the reduction in credit card debt was driven by consumers paying off debts, closing accounts, and limiting their search for new credit rather than by lenders closing accounts and reducing new account bookings. Sanchez (2014) finds that fewer consumers are in credit card debt in 2010 than were in 2007. Of the consumers who have some credit card debt, their balances are lower in 2010 than in 2007. He concludes that about two-thirds of the reduction in card balances occurred on the extensive margin, with both households and firms slowing the growth of new accounts.⁶

Brown et al. (2013) also attempt to distinguish between voluntary paydown — driven purely by the consumer’s motivation to reduce outstanding debt — and

⁶ The extensive margin refers to card balances incurred on new, rather than existing, accounts.

involuntary paydown, in which the consumer responds to an action taken by the credit card issuer to either reduce the supply of new credit or the price or availability of existing credit. The concept of involuntary paydown is a murky one. Consumers generally cannot be compelled to pay their credit card bill; so in some sense, any payment is strictly voluntary. Brown et al. (2013) suggest that a customer who chooses to pay down the debt when balance transfer opportunities (e.g., new cards, transfer offers on existing cards) become scarce is, in effect, involuntarily paying down the balance. Presumably, the customer would have transferred the balance to a card with a lower interest rate if the opportunity had presented itself. It would be difficult to estimate this effect since banks typically do not distinguish between cash payments and payments made via balance transfer or convenience check drawn on another credit card account. Thus, they would look the same in the data. In addition, Gross and Souleles (2002) show that even the threat of future liquidity constraints is enough to induce precautionary debt paydown, further blurring the distinction between voluntary and involuntary paydown.

An important implication of many models of consumption is that consumers tend to respond to prolonged, negative income shocks such as recessions by tightening their belts via increased savings and debt paydown.⁷ Gross and Souleles (2002) suggest that debt reduction may be motivated by consumers' desire to take precautions against future liquidity constraints. They find that credit limit increases generate higher levels of debt even for consumers who are well below their credit card limit. Such consumers have a self-imposed credit limit that is lower than their actual limit, so they behave as if they are liquidity constrained, even though their credit card utilization rate (balance divided by

⁷ See Katona (1975) for an early discussion in the behavioral literature. In contrast, Herkenhoff et al. (2015) find that access to credit enables unemployed consumers to spend more time engaged in job search, suggesting that consumers rely upon their credit to smooth consumption through employment shocks.

limit) is very low. More recently, Aydin (2016) finds evidence of consumer behavior consistent with a precautionary or buffer stock model of credit. He finds that the marginal propensity to consume out of a randomly assigned increase in credit limit is positive and significant even for consumers who are far from their credit limit.

Whether consumers pay down their credit card debt or accumulate additional balances during a recession is an important question for monetary and fiscal policy makers alike. In response to a recession, the central bank might lower short-term interest rates, thereby decreasing banks' cost of funds. We might expect that, all else equal, a lower cost of funds for banks would lead to a lower cost of credit for consumers, and thus increased borrowing. However, the relationship between cost of funds and annual percentage rates (APRs) on credit cards appears to be influenced by a variety of other factors. Calem and Mester (1995) show that interest rates on credit cards in the 1980s were generally "sticky" and tended not to respond to changes in the cost of funds.⁸ Knittel and Stango (2003) provide evidence that banks were tacitly colluding at state price cap levels during this time. Stango (2000) also notes that, until 1991, most credit cards had fixed purchase APRs that did not vary with changes in an underlying index.

Even if lower costs of credit were passed to the consumer through adjustable rate credit cards, the consumption effect could be offset by other factors. For example, banks generally tend to respond to higher loss rates during recessions by *restricting* the supply of credit via credit limit decreases, higher minimum credit score thresholds, and

⁸ Calem, Gordy, and Mester (2006) examine data from the 1998 and 2001 Survey of Consumer Finances and find that, while the level of credit card interest rates declined throughout the 1990s and early 2000s, the spread between credit card rates and short-term government notes remained at levels observed during the 1980s.

tighter underwriting standards.⁹ In addition, Agarwal et al. (2015) document an important credit rationing paradox, whereby banks are less likely to increase credit limits for consumers with a high marginal propensity to borrow than to those with low marginal propensities. Thus, Agarwal et al. (2015) conclude that reductions in banks' cost of credit during the Great Recession had a muted effect on consumption.

Likewise, fiscal programs that were designed to accelerate economic recovery by stimulating consumer spending rely upon the assumption that consumers will spend a significant fraction of a windfall credit. The U.S. tax rebates of 2001 and 2008 gave researchers the opportunity to examine their effects on consumption. Research suggests that, while consumers initially plan to use most of their rebate for debt repayment and savings accumulation, a significant fraction of the rebate ends up being spent over the next one to three quarters. Using survey data from the University of Michigan, Shapiro and Slemrod (2003) and Shapiro and Slemrod (2009) found that about 80 percent of rebate recipients planned to use most their rebate money to pay down debt or build savings. Johnson et al. (2006) and Parker et al. (2011) examined responses to questions added to the U.S. Census Bureau's Consumer Expenditure Survey. Johnson et al. (2006) found that recipients spent about one-third of their rebate during the three-month period in which they were received and about two-thirds cumulatively over the next two quarters. Parker et al. (2011) found that 50 percent to 90 percent of rebate money was spent on consumption during the first three months. Using credit card data, Agarwal et al. (2011) found that rebate recipients initially saved some of the rebate (by paying down

⁹ Refer to the July 2008 Senior Loan Officer Opinion Survey on Bank Lending Practices, as well as Eric Dash and Andrew Martin "Banks Brace for Credit Card Write-Offs," *New York Times*, May 10, 2009.

credit card debt), although spending increased shortly thereafter.¹⁰ Interestingly, debt declined (savings rose) the most for consumers who likely were not liquidity constrained and increased the most for consumers who were likely to be constrained.

Calem, Jagtiani, and Lang (2015) examined the windfall arising from households withholding payment on their mortgage while going through the foreclosure process. They found that households in foreclosure used their mortgage payment money to pay down credit card debt, resulting in lower card balances and delinquency rates.

III. Data and Methodology

The data used in this analysis come from an anonymized 10 percent random sample of the Credit Card Metrics (CCM) data set compiled by the U.S. Office of the Comptroller of the Currency. The CCM contains monthly account-level credit card data from several banks that issue credit cards, beginning in January 2008. It includes data on each bank's general purpose, private label, and small business credit card portfolios. Along with product information, such as the original and current credit limits, current purchase APR, and whether the account is secured, banks report statement summary data that include purchases, balance transfers, fees and finance charges, and actual and required payment amounts. In addition, there are several fields related to account delinquency status, as well as charge-off amount and reason. Accounts receiving a credit limit increase or decrease are flagged, though it is not possible to identify whether a limit increase was initiated at the consumer's request. APR changes are observable, though the reason for the change (e.g., end of promotional period, penalty repricing) is not specified.

¹⁰ Paying off debt has the same effect as savings on the consumer's budget constraint.

There are also flags to indicate whether an account is in a debt workout program or if the credit line has been frozen. Account closures are recorded as either customer- or bank-initiated. Importantly, the data contain recent information on the consumer's credit score as well as the score at the time of account origination.

For the sake of generalizability, we restrict our attention to unsecured general-purpose credit cards. Due to computing constraints, we further sampled down the CCM to a 0.05 percent sample (0.5 percent of 10 percent).¹¹ Out of concern for data quality issues, we eliminated data from January to March 2008 as well as all data from several of the smaller banks. Importantly, we removed records of charged-off and closed (no balance) accounts after they first appeared in the data.

In this paper, we track the disposition of balances that existed at the peak of outstanding credit card balances in the data set. It is important to note that this type of analysis addresses a narrow portion of the overall credit card deleveraging picture. More generally, the process of reducing the ratio of household debt to income — known as deleveraging — was the result of a complicated interaction of multiple supply and demand forces, as discussed in Section II.

[Figure 1](#) shows that the outstanding credit card balance peak occurs in the first quarter of 2009.¹² We selected all accounts with a positive statement balance at the beginning of March 2009. To eliminate the effect of convenience balances on the debt reduction picture, we then selected accounts whose balance had been revolving for the

¹¹ We verified the main results using a 0.1 percent sample.

¹² Mian and Sufi (2010) find that overall, household deleveraging began in the second quarter of 2008, although credit card availability (i.e., unused credit line) kept increasing through the third quarter of 2008.

past three months.¹³ To this, we added all accounts whose status was recorded as closed with a balance, since these accounts, while without transactional privileges, are engaged in debt paydown. We then track these account balances over a four-year period, from March 2009 to February 2013.

To isolate the portion of March 2009 balances that were subsequently charged off, we developed an algorithm to track changes in those balances as well as buildup and paydown of newer balances.¹⁴ Thus, we are able to identify what portion of any charge-off amount came from March 2009 balances versus those incurred in subsequent months.

While the CCM data set is rich in many ways, it has several important limitations. First, it is an account-level — rather than consumer-level — data set, with no way to identify a consumer across accounts or banks. Thus, if a consumer closes one account and transfers the balance to another, the first account will appear to have been paid down, although the consumer has merely shifted the balance to another card. In addition, the data do not contain information on new applications for credit, mail solicitations, or any other means of estimating the supply of new credit and its effect on credit card balances.

IV. Results

In 2009, consumers shifted from balance accumulation to balance reduction, paying their credit card balances in full more often. [Table 1](#) compares the 12-month period from March 2008 to February 2009 to the subsequent 12-month period. During the first period, total balances increased by 26.7 percent. The median accountholder revolved

¹³ Using actual and required minimum payment amounts, we can distinguish between revolving balances, of which some portion will roll over from month to month, and transactional or convenience balances, which are paid off each month.

¹⁴ For additional information, see Appendix I.

a balance seven out of 12 months, with 67.7 percent of accounts revolving at least three times. In contrast, during the period between March 2009 and February 2010, balances fell by 20 percent. The median accountholder revolved a balance just five out of 12 months, and that balance was \$30 lower than during the previous period. The percentage of accounts revolving a balance at least three times fell by more than 6 percent, and the percentage of accounts revolving a balance at least six times fell by 7 percent.

A. Balance Reduction

As discussed in Section II, many models of consumption suggest that consumers will accelerate repayment of existing debt balances as their expectations of the future sour. Interestingly, when compared with a postrecession debt cohort, the static sample of March 2009 accounts does not appear to have reduced its debt much faster. [Table 2a](#) presents the percentages of initial balances reduced (via paydown or default) over a 12-month period.¹⁵ During that time, balances fell by 37.1 percent in the March 2009 static sample, just 2.6 percent greater than in a similar March 2012 static sample. This finding appears to run counter to theory, although it is plausible that consumer expectations of the future did not improve significantly from 2009 to 2010 and 2012 to 2013. We note that the average unemployment rate from March 2012 to February 2013 was still relatively high at 8 percent.¹⁶

[Table 2b](#) shows that paydown (rather than charge-off) accounted for 11 percent less of the total debt reduction in the March 2009 sample than default. This suggests that,

¹⁵ Herein, we use the phrase “initial balances” to refer specifically to the cycle beginning balances on accounts in the March 2009 sample.

¹⁶ Source: U.S. Bureau of Labor Statistics, Civilian Unemployment Rate, retrieved from FRED, Federal Reserve Bank of St. Louis, <https://research.stlouisfed.org/fred2/series/UNRATE> (accessed April 25, 2016).

while the recession may not have influenced the overall rate of debt reduction, it may have influenced the means by which the debt was reduced. With one exception, both of these observations hold true within each risk score quintile.¹⁷

Over the broader four-year observation window, initial balances on the March 2009 static sample fell by 75 percent. Balances in the riskiest quintile (those risk scores below 623) fell the most, to 14 percent of initial balances. [Figure 2](#) plots the decline in balances over time. The riskiest and least risky quintiles experienced the greatest reduction in balances, while accounts in the middle three quintiles behaved similarly, reducing initial balances by 70 percent to 72 percent. [Figure 3](#) presents the annual change by risk quintile. For all quintiles, the greatest reduction in balances occurred during the first year, from March 2009 to February 2010. Balances in the extreme quintiles fell the most during the first year, by 47 percent in the riskiest quintile and by 42 percent in the least risky quintile (risk scores over 758).

It is worth noting that, as March 2009 balances declined, many accounts were replacing old revolving balances with new ones. Balance replacement was much more likely to occur in low risk quintiles than in high risk ones. As shown in [Figure 4](#), accounts in the riskiest three quintiles added new balances, but those balances were never more than what was owed on initial March 2009 balances. In contrast, accounts in the least risky two quintiles accumulated new balances in excess of what was owed on the March 2009 balances. Thus, while some repayment did occur on the riskiest 60 percent of accounts, in general, these accounts tended to accumulate balances during the 2009–2012 period.

¹⁷ In the ≥ 759 score quintile, the percentage of initial balances reduced in the March 2012 sample is 0.1 percent greater than the March 2009 sample, but the statement holds true otherwise.

B. Charge-Off versus Paydown

Overall, we find that charge-offs played a much smaller role in balance reduction than did paydown. Of the \$2.4 billion in initial balances in our sample data, \$542 million (27.8 percent) was charged off, while \$636 million (72.2 percent) was paid down. [Table 3](#) presents the paydown and charge-off proportions by risk score quintile. Charge-off accounts for a much larger share of balance reduction in the riskiest quintile and almost none of the reduction in the least risky quintile. In the riskiest quintile, for every \$1 of debt reduced by paydown, \$1.66 was charged off. The share of balance reduction due to charge-off decreases as risk score increases so that charge-off represents just 5.3 percent of reduced balances in the least risky quintile. As discussed in Section II, some economic theories suggest that consumers will accelerate repayment of existing debt balances as their expectations of the future sour. While [Table 3](#) shows that the paydown share of balance reduction is almost three times as much as that of charge-off, the finding does not shed light on whether consumers tightened their belts any more during the period March 2009–February 2013 than they would have otherwise. On the contrary, as shown in [Table 2a](#), from March 2009 to February 2010, initial balances were reduced by just 2.6 percent more than during the first 12 months of a March 2012 static sample.

As noted previously, Gross and Souleles (2002) found that some consumers behave as if they are liquidity constrained although their credit card utilization rate is very low. To investigate differences in paydown behavior between constrained and unconstrained accounts, we examined balance reduction rates in the March 2009 static sample by (initial) utilization quartile. [Figure 5a](#) shows there is an inverse relationship

between utilization and balance reduction *within* each risk score quintile. At the same time, balance reduction varies by no more than 11 percent *across* utilization quartiles: lower utilized accounts reduced their initial debt balance by a slightly larger percentage than more highly utilized accounts. [Figure 5b](#) shows that the paydown share of debt reduction is also decreasing in utilization, so paydown accounted for a larger share of balance reduction than charge-off for lower utilized accounts. The only subgroup for which charge-off represented more than half of the reduced balances is the highest risk/highest utilization group (rightmost point on blue line). Such accountholders would likely have been screened out of offers for new credit.

Some of the difference in observed paydown shares could be the result of lower balances on lower utilized accounts rather than any precautionary motive. To determine whether this was the case, we examined accounts with an initial balance in the 75th to 95th percentile of balances (about \$7,000–\$17,000). [Figure 6a](#) shows that, for high balance accounts, balance reduction rates display no clear relationship with utilization. High utilization accounts were no more likely to reduce their debt balances than low utilization accounts. However, [Figure 6b](#) shows that low utilization accounts were more likely to reduce their balances by paydown rather than default.¹⁸ This effect becomes more pronounced as risk increases. For example, within the highest risk quintile, balances declined by about the same amount (87–88 percent) across utilization quartiles, but the mix of paydown to charge-off varies widely by utilization, with the lowest utilized accounts paying down 75 percent of their reduced balances and the highest utilized accounts paying down 31 percent and defaulting on 69 percent.

¹⁸ Figure 6b also shows that accounts in the highest risk and utilization tranche (rightmost point on blue line) had the lowest paydown share, which suggests that they might have been screened out of offers for new credit or balance transfers.

In [Table 4](#), we regress the percentage of balances paid down over a 12-month period on initial account utilization, controlling for balance, risk score, and account age, as of March 2009. Paydown performance is observed during the March 2009–February 2010 time period. Since the objective is to understand what role utilization plays in paydown, accounts that charged off during this time are excluded from the analysis. For ease of interpretation, we use a linear regression form. Column 1 presents the baseline regression specification with linear and quadratic utilization. Column 2 introduces linear and quadratic controls for balance as well as an interaction term. Lastly, column 3 adds linear and quadratic control variables for risk score and account age.¹⁹ The first regression predicts a convex relationship between utilization and paydown, whereby higher utilization levels correspond to lower paydown rates, which is consistent with [Figure 5a](#). In the second regression, all three balance terms are highly significant. All else equal, accounts with higher initial balances tend to pay down less of that balance over time. The interaction term is positive, implying that higher initial balances create a drag effect on the negative utilization coefficient whose net effect is to “flatten” out the paydown rate at higher levels of utilization, as shown in [Figure 6a](#).

In the third regression, we control for risk score and account age. There are several interesting observations here. First, controlling for risk score and account age decreases the absolute size of the utilization coefficient from -0.33 to -0.24 , so that utilization is less influential to paydown when other factors are considered. Thus, an increase of 1 percent in the utilization rate would decrease the percentage of balances paid down by 0.24 percent. Nonetheless, we find that adding these controls does not change the statistical significance or the sign of the utilization and balance coefficients.

¹⁹ Account age is measured in years from account opening.

Second, the coefficient on risk score is positive and significant, while the coefficient on account age is negative and significant. A 10 point increase in risk score would increase the percentage of balances paid down by 0.85 percent, while a one-year increase in account age would decrease the percentage of balances paid down by 0.65 percent. Thus, after controlling for initial utilization and balance, lower risk accounts paid down more than higher risk accounts (albeit at a decreasing rate), and newer accounts paid down more than older accounts.

The significance of account age is important for two reasons. First, higher paydown rates on newer accounts may be a sign of consumers transferring balances from one account to another, rather than paying down the debt balance with savings or income. The opportunity to transfer balances is addressed more in Subsection D. Second, credit card portfolios tend to behave differently as they age. This phenomenon, known as seasoning, often leads to higher charge-offs, lower revolve rates, more active accounts, and lower balances in younger portfolios when compared with older ones. Additional testing in our data set revealed that seasoning played a minor role in debt reduction and paydown mix. Its effect was most pronounced in accounts that were less than two years old as of March 2009; however, it was not large enough to warrant further investigation.

C. Voluntary or Involuntary Paydown

Brown et al. (2013) draw a distinction between voluntary credit card paydown, induced by actions taken by credit card issuers, and involuntary paydown, occurring independent of issuer actions. This distinction is important for understanding whether consumers decided to clean up their balance sheets by paying off debt in the middle of a

recession, or if they were responding to a change in credit supply. We considered several instances in which involuntary paydown might have occurred, such as if the bank closed or froze an account, thereby requiring the consumer to cease transacting and instead pay off the balance. Likewise, a consumer receiving a credit limit decrease or APR increase (for any reason) on an account might have felt compelled to pay down faster or transfer the balance to another account. In either case, the consumer's payment trajectory might have been lower if not for some unfavorable action taken by the issuing bank, either contractual, and thus, able to be anticipated (such as a rate reset), or unanticipated (such as penalty repricing).²⁰

In [Table 5](#), we compare accounts affected by one or more such unfavorable events with those that experience none over the four-year observation period. Overall, there is little difference between the two groups. Each group reduced its balance by about 75 percent, with about 27 percent to 28 percent of the balance reduction attributable to charge-off. However, [Figures 7a](#) and [7b](#) show that the differences are more pronounced within risk quartiles. Affected accounts in the upper 80 percent of the risk distribution tended to reduce their balances by more than unaffected accounts and do so more through charge-off than paydown. Among the riskiest 20 percent of accounts, the results were just the opposite. Risky accounts affected by an unfavorable event reduced their balances by less but were more likely to do so by paydown rather than charge-off.²¹ Thus, with the exception of the riskiest 20 percent of accounts, there is some evidence that paydown was adversely influenced by unfavorable account changes.

²⁰ Our analysis does not distinguish between anticipated and unanticipated events.

²¹ This may be the result of an income or asset constraint hindering the consumer from making her preferred payment amount.

D. Paydown or Balance Transfer

With paydown accounting for over 70 percent of the decline in peak balances, it is important to investigate the extent to which this finding may be the result of balances moving from one account to another, as opposed to payments made from savings or current income. While our data do not allow us to directly observe balance transfers between a consumer's various credit card accounts, it does provide some insight into the aggregate rate of balance transfer activity occurring during the observation period. Using the full data sample, we find that overall balance transfer activity — measured as the percentage of open accounts with an inbound balance transfer in the current month — declined throughout the 2007–2009 recession and continued into the first quarter of 2010. [Figure 8](#) shows that balance transfer activity accounted for just under 3 percent of cycle ending balances in the beginning of 2008. By the first quarter of 2010, it had dropped to below 1 percent. In addition, on average, only about 0.5 percent of open accounts had an inbound balance transfer in any month following the recession.

To gauge the effect of outbound balance transfers on the paydown of peak revolving balances, we devised a method to identify payments that were likely to have been the result of a balance transfer onto another credit card. We first identified accounts in which balances were paid off in full after revolving for at least three months consecutively. Of these accounts, we then selected only the accounts that either were closed or became inactive for at least three months. Lastly, we compared the distribution of payoff amounts with the known distribution of inbound balance transfer volume and excluded accounts whose payoff amount was below the fifth percentile, which translated

to \$125.²² The results of this analysis are shown in [Table 6](#). Overall, balance transfers accounted for about 1 percent of the reduction in initial balances. Also, the balance transfer share of debt reduction is decreasing in risk, accounting for 0.1 percent of the reduction in the riskiest quintile, but 1.9 percent in the least risky quintile. Even if our balance transfer proxy is overly restrictive, thereby leading us to underestimate the balance transfer share, it would have to be off by an order of magnitude for balance transfer to have a meaningful effect in debt reduction during the time period being examined.

V. Conclusion

In early 2009, outstanding credit card debt reached a prerecessionary peak that was followed by several years of rapidly declining balances and a prolonged flattening out period. In this paper, we track the disposition of revolving credit card balances that existed at the peak of outstanding balances over a four-year period. Our analysis addresses a narrow portion of the overall credit card deleveraging picture, since deleveraging was the result of a complicated interaction of supply and demand forces not easily captured in any one data set.

Over the four-year observation window, initial balances fell by 75 percent. Charge-offs played a much smaller role in balance reduction than did paydowns. In our data set, 27.8 percent of balances were charged off, while 72.2 percent were paid down. Balances in the riskiest quintile fell the most, to 14 percent of initial balances. Charge-

²² Before removing accounts whose paydown was under \$125, the median payoff amount was \$229.

offs accounted for a much larger share of balance reduction in the riskiest quintile, and almost none of the reduction in the least risky quintile.

After controlling for balance amount, we found that highly utilized accounts were no more likely to reduce their debt balances than low utilization accounts. We also find that low utilization accounts were more likely to reduce their balances by paydown rather than default. These results are consistent with Gross and Souleles (2002), who find that consumers with low utilization will often behave as if they are highly utilized due to their desire to maintain a precautionary line of credit.

Overall, we find little difference between accounts affected by unfavorable events such as freezes and rate increases to those that experience no such event. However, there is greater variation within risk quartiles, both with respect to debt reduction rates and paydown/charge-off shares. In the upper 80 percent of the risk distribution, accounts affected by an unfavorable event reduce their balances by more than unaffected accounts and did so more by charge-off than paydown. In the riskiest 20 percent of the distribution, affected accounts reduced their balances by less than unaffected accounts and did so more by paydown than charge-off. Thus, there is some evidence that paydown was influenced by unfavorable account changes, although the net effect may be very small.

To gauge the effect of balance transfers on debt reduction, we devised a proxy method to identify payments that were likely to have been the result of a balance transfer. The overall effects were small, with balance transfers accounting for about 1 percent of the reduction in initial balances.

Appendix I. Computer Algorithm to Track Changes in March 2009 Revolving Balances

To isolate the portion of March 2009 existing balances that were subsequently charged off versus those that were paid down, we developed an algorithm to track changes in those balances as well as buildup and paydown of newer balances. For each monthly record, we calculated the amount that payment (purchases, balance transfers, convenience checks, cash advances, and other debits) plus fees, interest charges, and other credits exceeded usage. With the account level records in chronological order, we then calculated running tallies for the March 2009 balance and the balances incurred after March 2009, both net of payments.

For the March 2009 billing statement, a positive net payment reduced the March 2009 balance by that amount and did not generate a new balance. If the net payment was equal or greater to the March 2009 balance, then that balance was considered paid off and was set to zero. A zero or negative net payment was treated as a new balance, in which case, the post-March 2009 balance increased and the March 2009 balance was unchanged.

For subsequent billing statements, a positive net payment was first allocated to new balances, then any remainder was allocated to March 2009 balances until they were reduced to zero. A negative net payment was added to the net new balance tally.

For the vast majority of charged-off accounts, the charged-off balance was (correctly) equal to the remaining March 2009 and post-March 2009 balances. In this case, the charged-off balance was distributed to the remaining March 2009 and post-

March 2009 balances, in that order. However, for some accounts, we observed that the charged-off amount was less than the sum of remaining balances, in which case, we treated the difference as an unobserved payment or account credit, and allocated it to post-March 2009 balances then March 2009 balances, respectively. For other accounts, we observed that the charged-off amount was greater than the sum of the remaining balances, in which case we charged off the remaining balances in both categories.

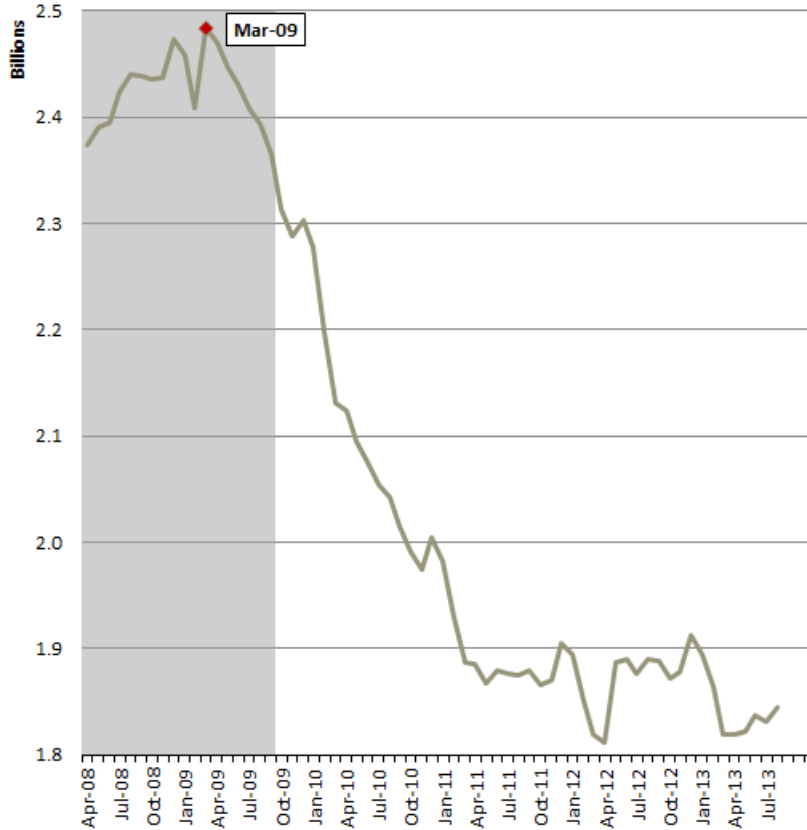
With these quantities calculated, we then went back and observed instances in which March 2009 balances were reduced from the prior billing statement and recorded the reduction as a payment. We did the same for balances incurred after March 2009. The computed payment and charge-off balances are then used to generate the results found in Section IV.

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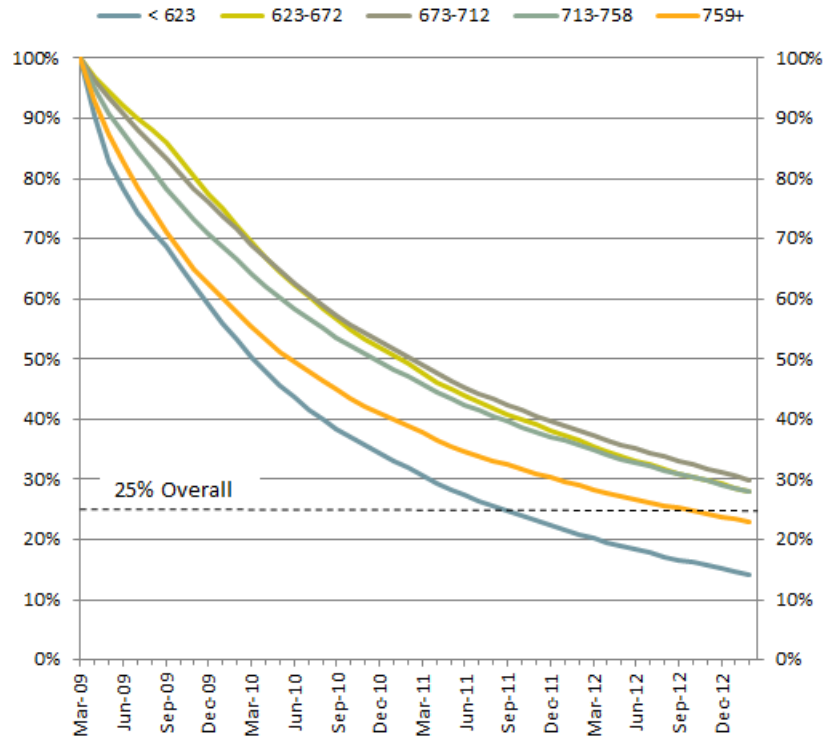
Figure 1. Total Balances Outstanding



Source: Author's calculations using CCM data set

Notes: Total cycle end balances on a sample of unsecured general purpose credit cards from April 2008 to August 2013. Sampling and data preparation are discussed in detail in Section III. Recession shading added. Balances peak at \$2.48 billion in March 2009.

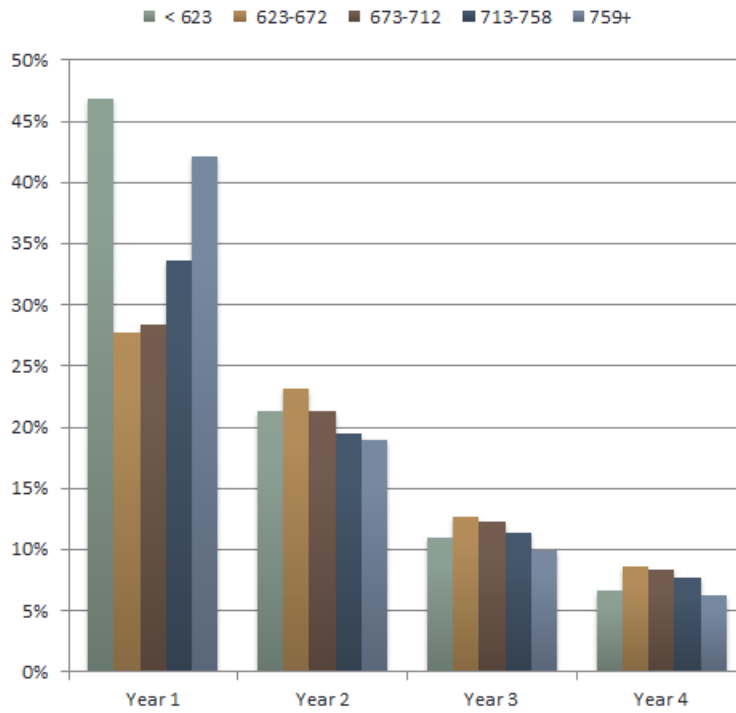
Figure 2. Percent of March 2009 Balances Remaining, By Risk Score Quintile



Source: Author's calculations using CCM data set

Notes: Score quintiles are static and are determined by accountholder's most recent credit score value as of March 2009.

Figure 3. Annual Reduction in March 2009 Balances, By Risk Score Quintile

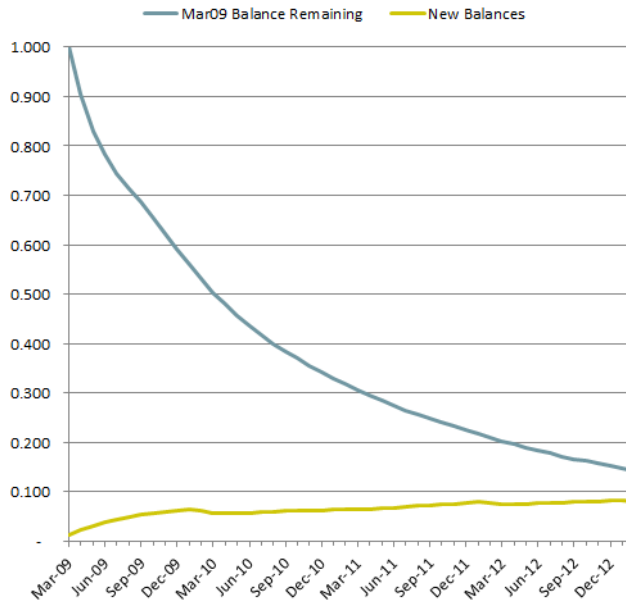


Source: Author's calculations using CCM data set

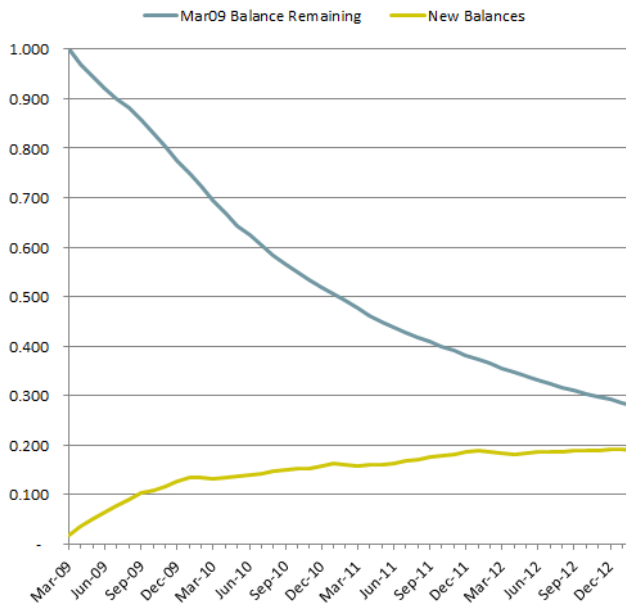
Notes: Score quintiles are static and are determined by accountholder's most recent credit score value as of March 2009. Year 1 corresponds to the March 2009 to February 2010 time period. Years 2-4 are defined similarly.

Figures 4a–4e. Decay and Accumulation of New and Existing Balances

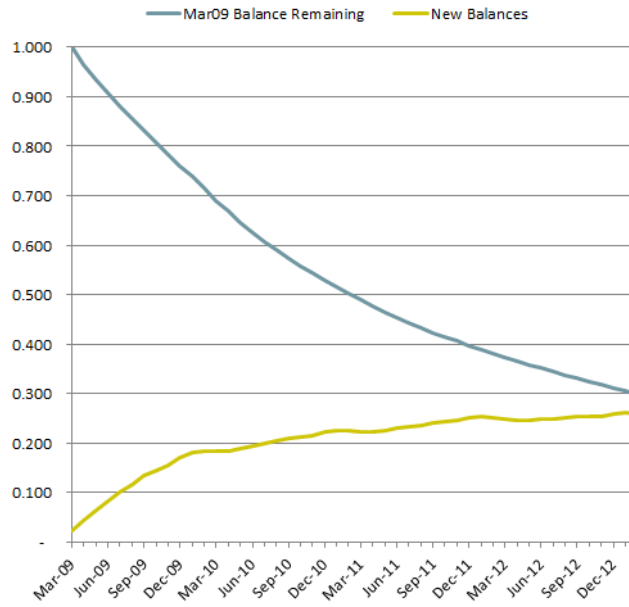
4a. Risk Score < 623



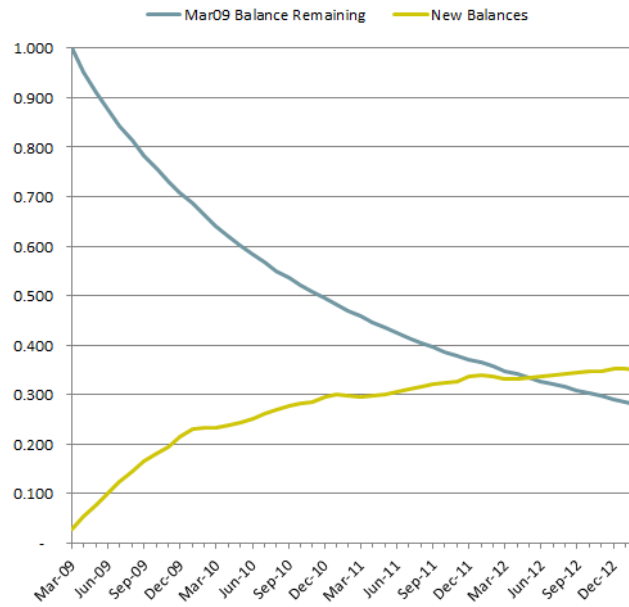
4b. Risk Score 623–672



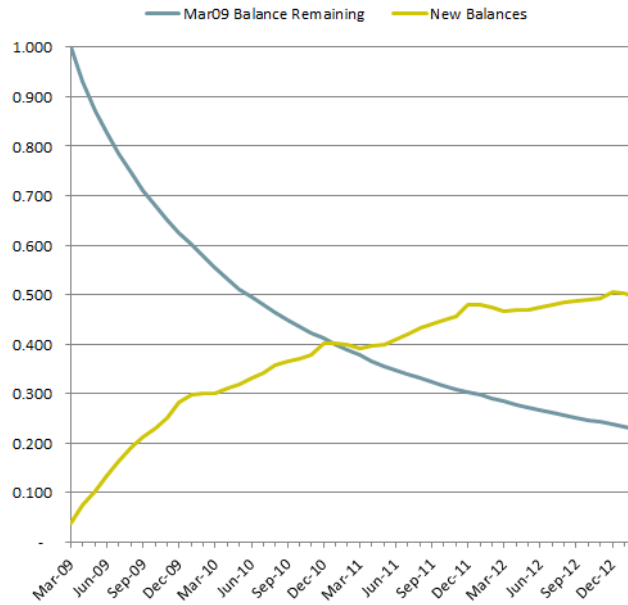
4c. Risk Score 673–712



4d. Risk Score 713–758



4e. Risk Score 759+



Source: Author's calculations using CCM data set

Notes: Index value of 1 corresponds to balance as of March 2009. Score quintiles are static and are determined by accountholder's most recent credit score value as of March 2009.

Figure 5a. Percent of March 2009 Balances Reduced, By Risk Score Quintile

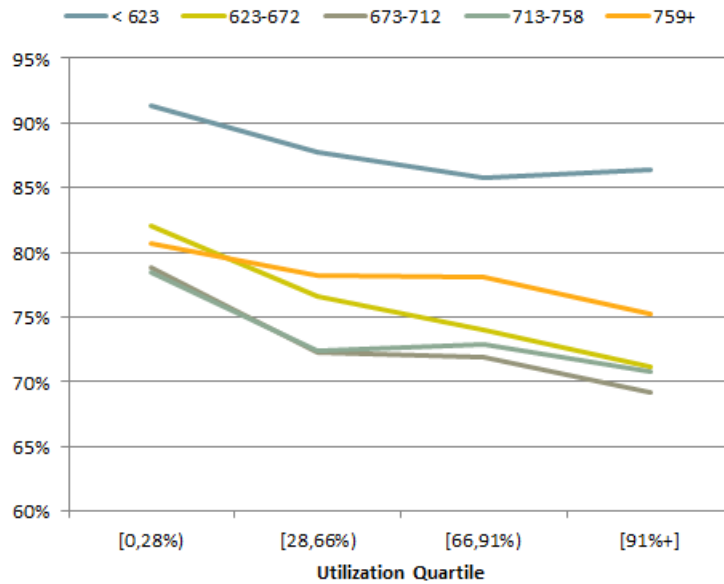
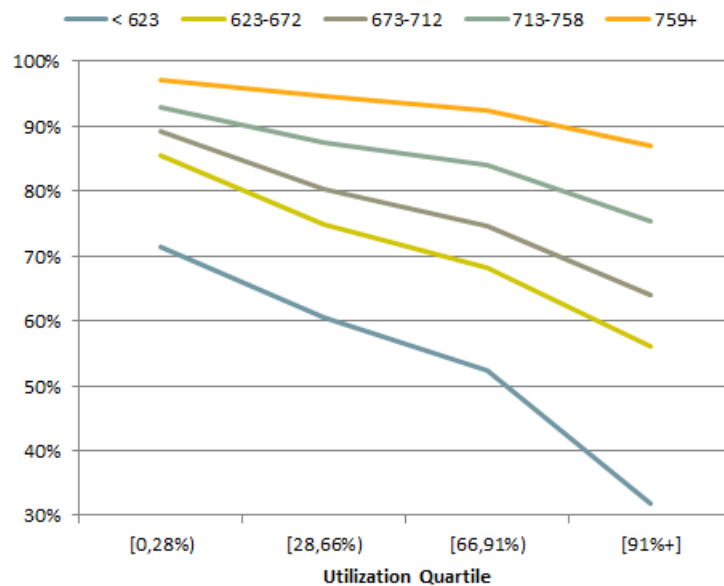


Figure 5b. Share of Balance Reduction Attributable to Paydown, By Risk Score Quintile



Source: Author's calculations using CCM data set

Notes: Score quintiles are static and are determined by accountholder's most recent credit score value as of March 2009. Utilization quartiles are static and are determined by credit limit utilization (balance divided by credit limit) as of March 2009.

Figure 6a. Percent of March 2009 Balances Reduced (High Balance Accounts Only), By Risk Score Quintile

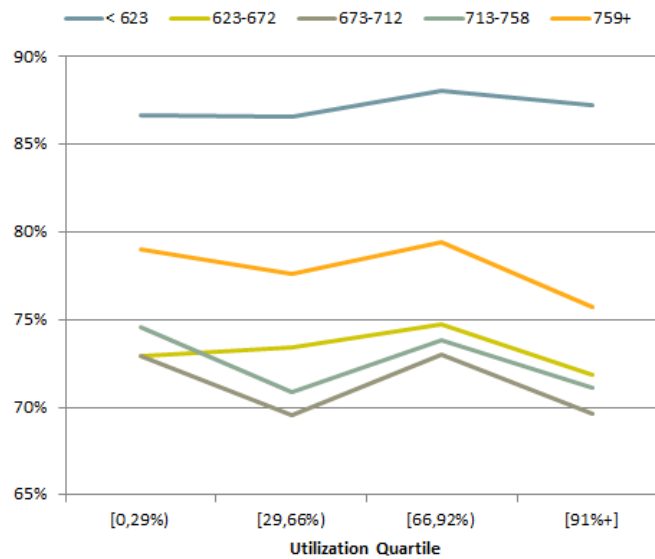
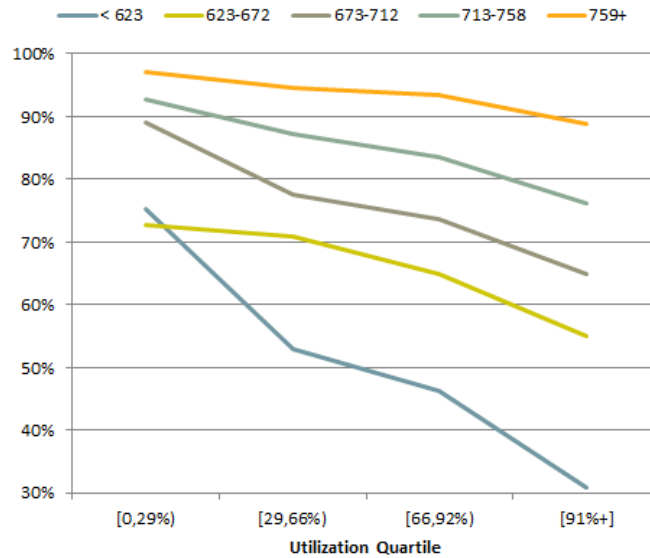


Figure 6b. Share of Balance Reduction Attributable to Paydown (High Balance Accounts Only), By Risk Score Quintile



Source: Author's calculations using CCM data set

Notes: Score quintiles are static and are determined by accountholder's most recent credit score value as of March 2009. Utilization quartiles are static and are determined by credit limit utilization (balance divided by credit limit) as of March 2009. High balance accounts had a balance in the 75th to 95th percentile as of March 2009, corresponding to a range of \$7,000 to \$17,000.

Figure 7a. Percent of March 2009 Balances Reduced, By Risk Score Quintile

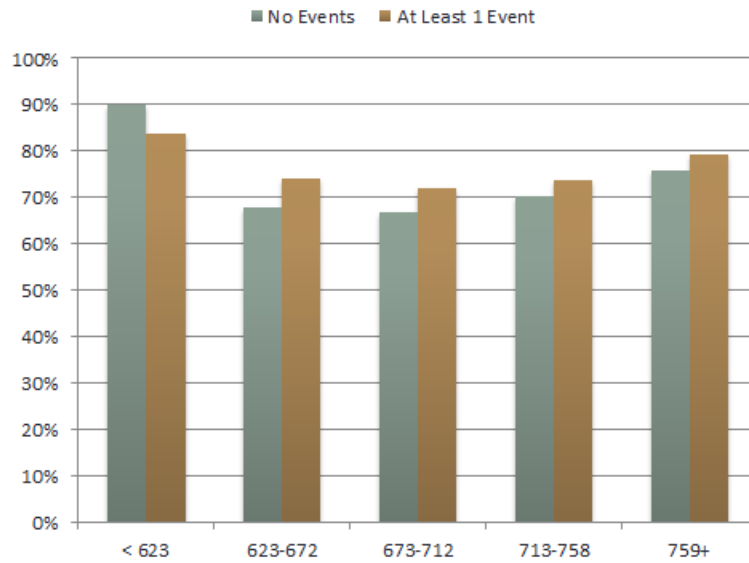
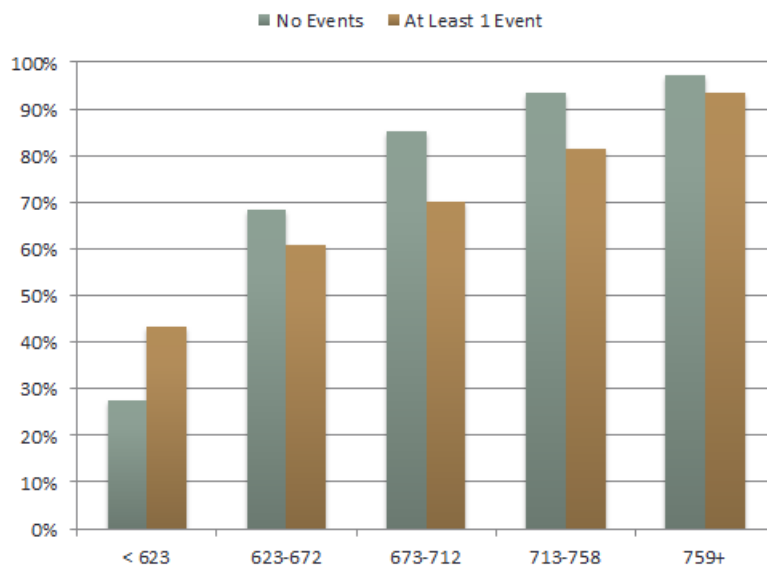


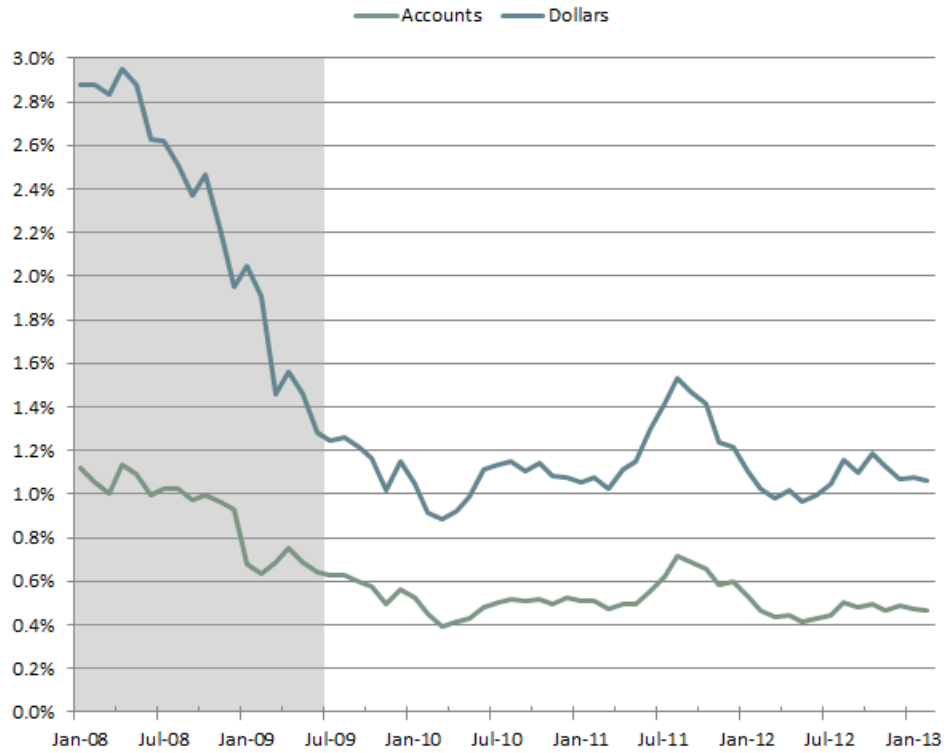
Figure 7b. Share of Balance Reduction Attributable to Paydown, By Risk Score Quintile



Source: Author's calculations using CCM data set

Notes: Score quintiles are static and are determined by accountholder's most recent credit score value as of March 2009. Events include (a) bank-initiated account closure, (b) bank-initiated account freeze, (c) credit limit decrease, or (d) APR increase (for any reason).

Figure 8. Balance Transfers per Open Account



Source: Author's calculations using CCM data set

Notes: Figure based on full data sample rather than March 2009 static sample. Balance transfer activity is defined as the percentage of open accounts with an inbound balance transfer in the current month.

Table 1. Comparison of Balance and Revolve Behavior over Two 12-Month Periods

	March 2008 to February 2009	March 2009 to February 2010
Change in Total Balance	26.7%	-20.1%
Change in Average Balance	8.9%	-8.5%
Median # Months w/Revolving Debt	7	5
Median Revolving Balance	\$2,334	\$2,304
% Accounts revolving \geq 3 months	67.7%	61.4%
% Accounts revolving \geq 6 months	56.0%	48.8%

Source: Author's calculations using CCM data set

Notes: The first column summarizes the behavior of accounts open during the March 2008–February 2009 time period, while the second column summarizes the behavior of accounts open during the March 2009–February 2010 time period. The term *revolving* refers to balances not paid off in full by the next payment due date.

Table 2a. Twelve-Month Balance Reduction Rates, by Risk Score Quintile

Risk Score Quintile	March 2009	March 2012
< 623	47.9%	42.2%
623–672	29.6	27.9
673–712	30.1	28.1
713–758	35.7	32.8
≥ 759	45.8	45.9
Overall	37.1	34.5

Table 2b. Percentage of Balance Reduced by Paydown, by Risk Score Quintile

Risk Score Quintile	March 2009	March 2012
< 623	31.5%	43.7%
623–672	72.6	82.8
673–712	85.0	91.7
713–758	94.5	96.6
≥ 759	98.6	99.0
Overall	78.1	89.1

Source: Author’s calculations using CCM data set

Notes: The March 2009 column header presents data from the static sample of March 2009 revolving accounts, while the March 2012 column header presents data from a similar sample of March 2012 revolving accounts. Score quintiles are static and are determined by accountholder’s most recent credit score value as of March 2009 or March 2012, respectively.

Table 3. Paydown and Charge-Off Proportions, By Risk Score Quintile

Risk Score Quintile	Percent Reduction in Initial Balances	Percentage Paid Down	Percentage Charged Off
< 623	86.1%	37.6%	62.4%
623–672	72.8	62.6	37.4
673–712	71.0	73.5	26.5
713–758	73.0	84.8	15.2
≥ 759	78.4	94.7	5.3
Overall	75.4	72.2	27.8

Source: Author’s calculations using CCM data set

Notes: Score quintiles are static and are determined by accountholder’s most recent credit score value as of March 2009.

Table 4. Regression on Percentage of Balances Paid Down

Variables	(1) Initial Utilization	(2) With Balance	(3) With Other Control Variables
Utilization	-0.30927 (0.00151)	-0.33584 (0.00194)	-0.24065 (0.00237)
Utilization ²	0.00335 (0.00004)	0.00208 (0.00004)	0.00120 (0.00005)
Balance		-0.01853 (0.00029)	-0.02010 (0.00029)
Balance ²		0.00013 (0.000005)	0.00017 (0.000005)
Utilization*Balance		0.01494 (0.00037)	0.01376 (0.00036)
Risk Score			0.08548 (0.00115)
Risk Score ²			-0.00081 (0.00004)
Account Age			-0.00652 (0.00020)
Account Age ²			0.00015 (0.00001)
Observations	459,853	459,853	459,853
Adjusted R-Squared	0.0839	0.0931	0.1091

Notes: Dependent variable is the percentage of balances paid down during the first 12 months (March 2009 to February 2010). Excludes charged-off accounts. Standard errors are in parentheses. Balance is in thousands. Risk score is in hundreds. Account Age is measured in years from account opening. All variables are significant at 1%.

Table 5. Comparison of Affected Versus Unaffected Accounts

	No Events	At Least One Event
Reduction in March 2009		
Balances	74.4%	75.8%
Percent Charged Off	26.7%	28.2%
Percent Paid Down	73.3%	71.8%

Source: Author's calculations using CCM data set

Notes: Events include (a) bank-initiated account closure, (b) bank-initiated account freeze, (c) credit limit decrease, or (d) APR increase (for any reason).

Table 6. Effects of Balance Transfer on Balance Reduction, By Risk Score Quintile

Risk Score Quintile	Percent Change in Initial Balances	Percentage Paid Down	Percentage Balance Transfer	Percentage Charged Off
< 623	86.1%	37.6%	0.1%	62.4%
623–672	72.8	62.2	0.4	37.4
673–712	71.0	72.8	0.7	26.5
713–758	73.0	83.3	1.6	15.2
≥ 759	78.4	92.8	1.9	5.3
Overall	75.4	71.2	1.0	27.8

Source: Author’s calculations using CCM data set

Notes: Score quintiles are static and are determined by accountholder’s most recent credit score value as of March 2009.



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