Does Getting a Mortgage Affect Credit Card Use?

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Abstract:

Buying a house changes a household's balance sheet by simultaneously reducing liquidity and introducing mortgage payments, which may leave the household more exposed to other shocks. We find that this change affects credit card use in two ways: A debt effect increases credit card spending, while a credit effect leads to higher credit limits. In the short run, a new mortgage acquisition has a robust and statistically significant positive effect on credit card utilization—the fraction of a consumer's credit card limit that is used—of approximately 11 percentage points. Before the 2008 financial crisis, the credit effect exceeded the debt effect in the long run, pushing down long-term utilization. In our sample period after the financial crisis, the debt effect dominated in the long run, and credit card utilization rates rose upon the acquisition of a new mortgage, consistent with larger down payments leaving households more constrained.

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I.   Introduction

Buying a house is a major event for most families. It simultaneously adds a large asset and a large debt to the household balance sheet. Moreover, it changes the mix of the household's portfolio, because making the down payment may leave the household "asset rich but cash poor" (Kaplan, Violante, and Weidner 2014). Furnishing a new house may require additional spending and other unexpected expenses. In addition, the simultaneous reduction in liquidity and introduction of mortgage payments may leave the household more exposed to other shocks.[1] All these factors suggest that households may turn to other sources of liquidity to fill in the gaps.[2]

We examine how this large change in the household balance sheet affects credit card use. For many people, credit cards provide an important way to build credit history and become qualified for a mortgage. They are also one of the primary sources of liquidity for all households in the United States, regardless of mortgage status. Calculations from the Survey of Consumer Finances (SCF) suggest that the median household has more available liquidity on credit cards (the total credit card limit minus the debt) than in liquid savings. The *Report on the Economic Well-Being of U.S. Households* (Board 2018) similarly suggests that credit cards are either the most or second-most (after cash) frequently used source of liquidity to cover shocks.

Studying the relationship between mortgage debt and credit card debt[3] is essential for understanding how consumers treat various types of debt. If mortgage debt and credit card debt move in opposite directions, a consumer's credit card debt will likely decline about the time he acquires a mortgage. In contrast, if mortgage debt and credit card debt are complements, a consumer's credit card debt will increase at the time of his mortgage acquisition. If credit card debt does increase, how persistent is the effect—does it go away once the initial purchases are made? To understand these relationships, we use a large panel of credit reports (the New York Fed/Equifax Consumer Credit Panel) that enables us to track changes for a given individual upon his acquisition of a mortgage, rather than comparing credit card use across individuals. Both

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[1] Although mortgage payments may not be higher than the rent payments a household used to make, there are typically high fixed costs of buying a house, including but not limited to the down payment.

[2] We define liquidity as cash and other liquid assets available to a consumer, such as bank account deposits.

[3] Credit card debt includes convenience debt, which is paid at the end of each month, as well as revolving debt, which is carried over from month to month. The data do not allow us to distinguish between these two types of credit card debt. Based on the Survey of Consumer Payment Choice (SCPC), almost 60 percent of credit card holders carried some unpaid balances during the previous 12 months (Greene and Stavins 2018).

mortgage holding and credit card use are positively correlated with income, so comparing across individuals mixes the effects of having a mortgage, credit card use, and income. Because families may plan for years to buy a house, we study credit card use during the period that precedes the acquisition of a first-time mortgage.

A new mortgage affects credit card use in two ways: A debt effect increases credit card spending, while a credit effect leads to higher credit limits. For the short run, we find a robust and statistically significant positive effect of new-mortgage acquisition on credit card utilization—the fraction of a consumer's credit card limit that is used[4]—of approximately 11 percentage points. In the long run, the credit effect exceeded the debt effect before the 2008 financial crisis, pushing down long-term utilization. In our sample period after the financial crisis, the debt effect dominated in the long run, and credit card utilization rates rose upon the acquisition of a new mortgage, consistent with larger down payments leaving households more constrained.

There is evidence that after the crisis, lending standards became more stringent: People who acquired a mortgage after the crisis had a significantly higher credit score than those who did not acquire a mortgage; before the crisis there was no significant difference between those who did and did not acquire a mortgage. The effect is significant, even though credit card supply standards became more stringent at the same time. For example, 0 percent APR credit cards, which were common before the financial crisis, became rare afterward.

The rest of the paper is organized as follows. Section II reviews the relevant literature. Section III describes the data sources used in the analysis. Section IV presents summary statistics on homeownership, mortgage holdings, and credit card use. Section V shows the regression models and their results. Section VI concludes.

II.   Literature

The literature on how the acquisition of a mortgage affects credit card use is inconclusive. Some papers suggest that mortgage debt and credit card debt or consumption serve as complements. Agarwal and Qian (2017) find that a negative shock to home equity access causes a decrease in credit card spending, but they do not measure credit card debt. Mian, Rao,

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[4] The measure includes all of a given consumer's cards, so both the credit limit and credit card balances are at an individual level.

and Sufi (2013) suggest that housing net worth functions as collateral for consumption and access to credit, and a decline in housing value may cause a negative response in credit card spending due to a credit constraint. The findings by Telyukova (2013) and Kaplan, Violante, and Weidner (2014) suggest that homeowners are more likely to use credit card debt to smooth consumption, because they have massive illiquid wealth but little liquid wealth. Therefore, as mortgage debt increases, so does credit card debt. Other evidence indicates a positive correlation between a mortgage or home equity and credit card consumption/debt (Mann 2009; Mian and Sufi 2011; Kartashova and Tomlin 2017). Mian and Sufi (2011) find that households with higher credit card utilization rates increase their debt more strongly in response to increases in home equity.

Other papers indicate that mortgage debt and credit card debt/consumption are substitutes. Brown, Stein, and Zafar (2015) discover that consumers sometimes substitute between housing debt and non-mortgage borrowing, including credit card debt. The substitution patterns are heterogeneous across consumers and vary with credit scores and with age cohorts. Scholnick (2009) finds a significant reduction in the use of credit card debt for consumption smoothing following the final mortgage payment when that payment is large. The study also finds that when the final mortgage payment is small, a significant increase in credit card consumption follows. Using Consumer Expenditure Survey data, Coulibaly and Li (2006) provide similar evidence supporting the consumption-smoothing theory.

Another branch of the literature deals with prioritization of payments among the various types of debt and with liquidity preservation. Andersson et al. (2013), Cohen-Cole and Morse (2010), and Keys et al. (2014) show that households sometimes prioritize mortgage debt over credit card payments, and sometimes they do the reverse to preserve their liquidity. The priorities change with the arrival of an economic crisis and/or with changes in interest rates.

Very few studies track the same consumers over time to analyze a relationship between changes in mortgage debt or home equity and credit card debt or spending. Agarwal and Qian (2017) use panel data from a bank in Singapore to track individuals from 2010 through 2012, and Scholnick (2009) uses monthly bank account data from a Canadian bank to track individuals from 2004 through 2006. Mian and Sufi (2011) and Brown, Stein, and Zafar (2015) use US data from Equifax, but both studies focus on changes in home equity for existing homeowners. In contrast, we examine what happens to consumers' credit card debt when they acquire a mortgage for the first time (we refer to it as the first-time mortgage).

III.   Data sources

Our primary data source is the New York Fed/Equifax Consumer Credit Panel (CCP). The panel, prepared by the Federal Reserve Bank of New York, contains quarterly observations of a nationally representative, randomly drawn sample of 5 percent of all US individuals with a credit report.[5] For our sample, we use a randomly selected 5 percent of the individuals from the CCP sample. The unit of observation for these data is a consumer-quarter. The panel runs from the first quarter of 1999 to the present. We use data from the first quarter of 1999 through the fourth quarter of 2017 as our sample. Since the primary purpose for collecting these data is to help lenders price and monitor credit given to individuals, they contain extensive information on payment and loan history, including balances and payment information for credit card accounts, mortgages, and several other types of loans. Because the CCP tracks individual credit records, it does not directly provide information on households. We therefore examine the effect of acquiring a mortgage on individual credit use. This does not necessarily present problems. Because it is likely that household members, such as married couples, purchase a home jointly but have separate credit cards, measuring individual consumer's credit card use is relevant. As stated above, for each consumer, all of his or her cards are included.

To identify how many mortgages an individual has, as well as when these mortgages were opened, we use the Consumer Credit Panel's tradeline data. The tradeline data track mortgages on a quarterly basis, and a unit of observation is a consumer-mortgage-quarter. From the tradeline data, we can find the exact date when each mortgage was originated, and we can identify whether a mortgage is traditional or a home equity line of credit (HELOC)/home equity loan (HELOAN), as well as whether the loan ended in default, charge-off, or transfer.

The Equifax data for a given consumer may be missing values for a few quarters from an otherwise complete time panel. When that is the case, we impute data with reasonable values. For example, if a consumer has three open credit cards for the entire 1999–2017 period except for two quarters where the value is missing, we impute a value for those three cards for each of the two missing quarters. In a more complex example, a consumer has two open credit cards at the beginning of a string of missing values, and then the consumer reappears in the data with three credit cards. For such a situation, we fill in missing data "linearly," meaning we allow the value to rise or fall with a constant slope from the old value to the new value. If in any case the

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number of missing quarters is greater than 12, we leave the data missing. The imputation reduces the number of—but does not eliminate—missing observations in the data. For example, observations with bankcards missing dropped from 12 percent of the sample to 7 percent. The number of individuals with at least one missing value dropped from 51 percent of the sample to 27 percent. The CCP is kept demographically balanced by sampling new accounts and not updating accounts associated with individuals reported as deceased. We include accounts that started or ended between the first day of 1999 and the final day of 2017 and do not impute unless there are observations both before and after the imputation. As we show in the next section, mortgage acquisition is most common after age 35, so the sample typically includes a person for a number of years before he acquires a mortgage and a number of years after, except at the beginning and end of the sample.

We use CCP information on an individual's credit card balances, limits, and utilization in each quarter, and on whether the individual holds a mortgage. The sample includes 500,000 to 670,000 individuals in any given year (Table 1). The Equifax tradeline data hold records of every mortgage transaction. Table 2 reports the numbers of individuals in our sample who acquire a mortgage, always hold a mortgage, or never hold a mortgage during our sample period. The table also shows the numbers of individuals who pay off their mortgage and those who become delinquent on their mortgage.

To supplement our analysis, we use data from the Survey of Consumer Payment Choice (SCPC), an annual survey implemented by the Federal Reserve Bank of Boston and now conducted by the Federal Reserve Bank of Atlanta. The SCPC is a 30-minute online questionnaire focused mainly on two concepts: 1) adoption of bank accounts and payment instruments (including cash holdings) and 2) use of payment instruments (according to respondents' recall), defined as the number of payments made with each instrument from those accounts. Additionally, the survey includes information on demographics of the respondents and some household financial characteristics. The SCPC has been conducted annually since 2008, using the RAND Corporation's American Life Panel (ALP) through 2014 and using the University of Southern California's Understanding America Study (UAS) since then.[6]

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[6] See Greene, Schuh, and Stavins (2016) and Angrisani, Foster, and Hitczenko (2014) for more details about the SCPC. The SCPC questionnaire and data are available at https://www.frbatlanta.org/banking-and-payments/consumer-payments/survey-of-consumer-payment-choice.

Finally, for some of our analysis, we merge the CCP data with the data on down payments and incomes of mortgage recipients. The down payment and income information associated with each mortgage is derived from McDash data provided by Black Knight.[7] Although the McDash data do not provide down payment and income information directly, they include a debt-to-income ratio, an original loan amount, and an appraisal amount. To calculate the down payment, we subtract the original loan amount from the appraisal amount. To calculate income, we divide the original loan amount by the debt-to-income ratio.[8] The McDash data have several limitations: they start in 2005, so we can observe down payment data from only a very short time preceding the financial crisis; the income measure is derived from the debt-to-income ratio; the house-price measure is based on the appraisal amount; and only a subset of the CCP sample can be merged with the McDash data. For these reasons, we do not use these variables for the main part of our analysis. Instead, we use the data to supplement our primary specifications.

IV.   Summary statistics

A.   Homeownership and mortgage holding

The Survey of Consumer Finances (SCF), a triennial survey of consumers conducted by the Federal Reserve Board, shows that from 2010 through 2016 the median annual household income for homeowners was more than twice the size of the median annual household income for those who did not own a home (Table 3). Based on SCPC data, the fraction of consumers who own a home increased monotonically with the income cohort in every year of the survey (Table 4). In 2017, 85 percent of consumers in the top income bracket (those with an annual household income of more than $100,000) owned a home, compared with 34 percent in the lowest income group (an annual household income of less than $25,000). Overall, the rate of homeownership declined slightly over time (last column of Table 4), with the lowest-income group seeing the largest drop.

All of the data related to mortgage acquisition refer to first-time mortgage acquisitions. The reason we focus on first-time mortgages is that refinances or second mortgages do not fundamentally change the household's balance sheet, whereas a first-time mortgage does. We

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[7] https://www.blackknightinc.com/what-we-do/data-services/
[8] This measure of debt is exclusively mortgage debt. The data come from HMDA, and the information was provided by loan originators.

show how mortgage holding and first-time mortgage acquisition are distributed over time and with age. Figure 1a shows the percentage of individuals who hold a mortgage by age, while Figure 1b shows the percentage of individuals who acquire a mortgage for the first time by age.[9] Both distributions have an inverse U shape, as the fraction of consumers with a mortgage increases with age until its peak at age 48, when 44 percent of consumers hold a mortgage, and then declines monotonically with age. The percentage of consumers acquiring a mortgage at each age is skewed to the left: The percentage rises quickly with age and peaks at age 40, when 2.7 percent of consumers acquire a mortgage.

Looking at the distribution over time (Figure 2a), we see that the fraction of consumers holding a mortgage remains more or less steady until 2008, and then it gradually declines each year until the end of the sample in 2017. The distribution for the rate of mortgage acquisition by year (Figure 2b) reflects a similar decline after the financial crisis: The percentage of consumers acquiring a mortgage after 2008 is lower than it is during the years prior to 2008. The lowest rate of mortgage acquisition is in 2017, when less than 1 percent of consumers acquire a mortgage.

Although we do not specifically study the impact of paying off or defaulting on a mortgage, it is useful to look at the two major ways that mortgages come off a household's balance sheet. Figures 3a and 3b show the percentage of mortgage holders who default on their mortgage, by age and by year, respectively. The rate of default by age mirrors the distribution of mortgage holding: It rises with age until its peak between ages 40 and 50, and then it declines.

The rate of mortgage default by year sees a large increase starting in 2008 with the financial crisis, peaks in 2010, and then declines every year until the end of our sample period. At its peak, the mortgage-default rate was 2.3 percent. An additional 3.9 percent of mortgage holders were delinquent on their mortgages in 2010.[10]

Figures 4a and 4b show the percentage of consumers who pay off their mortgage by age and year, respectively. The percentage of consumers who paid off their mortgage in full is higher before the financial crisis than after the crisis.

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[9] Mortgages that were paid off, sold, or defaulted on before 1999 are not observed in the data. However, all mortgages held as of 1999 are in the data, and we can see the date of their acquisition even if they were acquired before 1999.

[10] According to the Equifax definition, a mortgage is in default if payment is more than 120 days past due. The default rate is the percentage of all mortgage holders who have a mortgage in default. A mortgage is delinquent if the payment is at least 30 days past due, excluding those with payments that are more than 120 days past due.

B. Credit card use and homeownership

Credit card holding and use are different for consumers who own a home compared with those who do not; among homeowners, there are differences in credit card debt[11] between those who have a mortgage and those who do not. Using 2016 SCPC data, Table 5 shows the rate of credit card holding (adoption), credit card use (the share of all transactions paid with a credit card), and the dollar value of unpaid credit card balances. All of the statistics are calculated for all homeowners, mortgage holders, outright owners (no mortgage), and non-homeowners.

Homeowners (with or without a mortgage) are much more likely to hold a credit card than are non-homeowners. Among credit card holders, homeowners (with or without a mortgage) have significantly higher shares of credit card transactions compared with non-homeowners. Non-homeowners also have lower unpaid credit card balances, on average, than do homeowners with a mortgage. However, homeowners who do not have a mortgage (outright owners) have lower unpaid credit card balances compared with homeowners who have a mortgage. This last finding indicates a positive correlation between mortgage debt and credit card debt—suggesting that the two types of debt are complements rather than substitutes—but not between homeownership and credit card debt. Because these statistics do not control for income or any other variables, they do not allow us to make any causality inferences.

Using Equifax data, Table 6 shows credit card adoption rates, mean balances, limits on all credit cards, and credit card utilization (balances divided by limits) for first-time mortgage holders and non-mortgage holders. All of the statistics are at a person-quarter level and include all credit card accounts for a given person. The results are qualitatively similar to those based on the SCPC data in Table 5: Mortgage holders are more likely to have a credit card, higher credit card balances, and higher credit card limits. However, even though mortgage holders have nearly three times as much as non-mortgage holders in credit card balances, the two groups use very similar fractions of their respective credit card limits; that is, the utilization rates for the two subsamples are nearly the same. This is because credit card limits are proportionally higher for mortgage holders. With regard to credit cards, mortgage holders act differently in many ways from non-holders, but not necessarily because they have a mortgage. In the next section, we examine how individual credit card use changes over time around the acquisition of a mortgage.

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[11] Credit card debt includes convenience debt as well as revolving debt.

C.   Credit card use and mortgage status over time

We first examine how overall credit card use evolved for mortgage holders and non-mortgage holders over the sample period. Figure 5 depicts the average credit card limits, balances, and utilization for mortgage holders and non-mortgage holders over the 1999–2017 period, based on the Equifax data. Compared with non-mortgage holders, mortgage holders, on average, have higher credit card limits and higher balances throughout the sample period (blue lines), but their credit card utilization (the percentage of the credit card limit that a cardholder uses) is nearly the same as that of non-mortgage holders. Credit card limits dropped during the financial crisis for those with and those without a mortgage, but so did the credit card balances, leaving credit card utilization approximately constant throughout the sample period.

The differences between mortgage holders and non-mortgage holders could be due to some underlying differences between the two subgroups of consumers, but it is also possible that credit card utilization or debt changes over time as a result of acquiring a mortgage. Below, we examine how these measures change over time when consumers obtain a mortgage.

In the analysis that follows, we examine how each consumer's credit card debt and utilization changed around the time he acquired his first mortgage. Figure 6 examines credit card debt and utilization for those who acquired their first mortgage at some point during our sample period. For mortgage acquirers, we analyze the data for each of the 25 quarters before they got their mortgage and each of the 25 quarters after they got it, plus the quarter when the mortgage was obtained (labeled as Quarter 0 in the graph).

For every analysis in this paper, we use all of the observations available, even for consumers with incomplete panels. Thus, even though we show observations from 25 quarters before through 25 quarters after the acquisition of a mortgage, our analysis includes people who are in the sample for any amount of time, not just for the entire 12 years. This is because the tradeline data track individual mortgages and include the date when a given mortgage was opened. If a person exists in the data for only one quarter and has a mortgage, we can infer from the data when that mortgage was opened, and thus for every quarterly observation for that person, we can calculate how long he has had the mortgage. We then can label each observation in terms of the number of quarters that elapsed relative to the acquisition. For example, if we

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observe a person in Q1 of 2003 and see that his mortgage was opened in Q1 of 1999, we include the observation and mark it as 16 quarters after the mortgage was opened.[12]

As Figure 6 shows, the level of credit card debt (left axis, solid line) increases steadily before the mortgage acquisition. Then it rises more rapidly, beginning in the quarter when the mortgage is acquired and continuing for several quarters afterward, before returning to the steady rate of increase. Credit card utilization (right axis, dashed line) declines prior to the mortgage acquisition but then rises at a steep rate, beginning with the quarter when the mortgage is acquired. After rising for several quarters, it starts declining again, even when credit card debt continues to increase, suggesting that mortgage holders' credit limits increase a few years after they acquire their mortgage. It is possible that credit card issuers raise credit limits in response to the steep increase in credit card spending, and thus utilization eventually returns to its pre-mortgage levels.

Figures 6a and 6b break down the sample period into two periods: before the 2007–2009 financial crisis and after it. The pre-crisis period includes every observation from Q1 of 1999 through Q3 of 2007. The crisis period runs from Q4 of 2007 through Q2 of 2009. The post-crisis period is defined as Q3 of 2009 through Q4 of 2017, the end of our sample period. To be included in the pre-crisis subsample, a mortgage must have been acquired before Q4 of 2007. To be included in the post-crisis subsample, a mortgage must have been acquired after Q2 of 2009. As stated above, observations are included regardless of how many of the sample's quarters they appear in.[13]

As shown in Figures 6a and 6b, both before and after the crisis, consumers' credit card debt rises steeply about the time they acquire a mortgage. However, before the crisis, consumers' credit card debt does not start rising steeply until after they get their mortgage (the increase prior to their obtaining a mortgage is less steep). In contrast, after the crisis, consumers begin substantially increasing their debt much earlier: a few quarters before getting a mortgage. This could be because after the crisis, mortgage-lending standards in general—and down payment requirements in particular—became much stricter. After the crisis, as consumers prepared to make their down payment, they may have been more liquidity constrained than homebuyers were

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[12] If a person obtained a mortgage prior to the beginning of our sample, we cannot determine if it is a first-time mortgage acquisition.

[13] For robustness tests discussed below, we impose a constraint to include only those mortgages that were acquired at least 24 quarters before the crisis or at least 24 quarters after the crisis. The results remained qualitatively unchanged, but the number of observations was much smaller.

before the crisis, and therefore they relied more heavily on credit cards for their liquidity needs and as a source of credit.

D. Risk score and mortgage

A borrower's Equifax risk score is one of the measures lenders use to determine whether to approve a loan. If they approve the loan, lenders also use the risk score to help set the terms of the loan. The exact formula used to calculate the risk score is proprietary, but it is a good predictor of whether the consumer is likely to repay a mortgage, credit card balances, and other loans on schedule. An Equifax risk score can range from 280 to 850. The higher the score, the lower the credit risk. A borrower's FICO score, which is more commonly used, can range from 300 to 850. A higher FICO score also indicates lower credit risk. Although the values of the two measures may differ, the Equifax risk score and the FICO score quantify the same concept and are correlated.

In each period until 2008, the average Equifax risk score of mortgage acquirers was roughly equal to that of non-acquirers (Figure 7). After the financial crisis, the average risk score of acquirers increased substantially, while the average risk score of non-acquirers rose only slightly, leading to a large difference between the two groups of consumers. The large increase in the average risk score for consumers who got their first mortgage after the financial crisis is consistent with the hypothesis that mortgage-lending standards became more stringent. A two-sample t-test confirms that the gap between acquirers and non-acquirers increased significantly from the pre-crisis period to the post-crisis period. Before the crisis, the average risk score for mortgage acquirers was not significantly different from that for non-acquirers, indicating that the lending criteria were relatively loose.[14] Note that the acquirers include only the individuals who got a mortgage in that particular quarter.

V. Credit card use before and after the acquisition of a mortgage

In the previous section, we analyzed average measures of credit card debt and utilization for the whole sample and a few subsamples. In this section, we estimate the effect of getting a mortgage at the individual level by tracking the same people over time. We begin by showing a full event study model that allows for effects to differ at each quarter before and after the

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[14] It is also possible that demand for buying a first home was lower before the crisis, and people with good credit scores opted to rent rather than own.

acquisition of a mortgage. We then move to a simpler model that estimates the short- and long-term differences and allows us to consider interactions with risk scores.

A.   Full event study model

We estimate the following full event study model:

$$y_{j,t} - y_{j,t-1} = \Delta y_{j,t} = \sum_t \beta_t(i_{j,t} - i_{j,t+1}) + f(Age_{j,t}) + \epsilon_{j,t} \quad for -25 \le t \le 25, \qquad (1)$$

where $y_{j,t}$ is the dependent variable: credit card balances, limits, or utilization for individual j at time t; $i_{j,t}$ is an indicator for quarter t relative to the quarter when j's mortgage was acquired; $\Delta y_{j,t}$ is a one quarter change; and $f(Age_{j,t})$ is an age polynomial (age and age squared). We estimate β_t for 51 quarters: 25 quarters before getting a mortgage, 25 quarters after getting a mortgage, and the quarter of mortgage acquisition. As a baseline, we normalize to 0 the constant for the period when the mortgage was acquired.[15] Because the dependent variables are first differences, individual fixed effects drop out so that we can control for any fixed but unobservable individual effects. For example, fixed differences in income between individuals will drop out with the first difference.

We estimate equation (1) for individuals who acquired their first mortgage at some point during our sample. The coefficient of interest is β_t, which shows the change in $y_{j,t}$ relative to the period when individual j acquired a mortgage. For mortgage acquirers, each of individual j's observations is normalized such that period 26 is set to the period of acquiring a mortgage. Figures 8, 9, and 10 show estimated coefficients on the consecutive quarters for each dependent variable of interest $y_{j,t}$. The distribution of the estimated coefficients over time shows changes before and after the acquisition of a mortgage.

In addition to estimating the full-sample regression (1999–2017), we separate the effect of mortgage acquisition on credit card use before (1999–2007) and after (2009–2017) the financial crisis. We include an interaction term for each quarter with a dummy variable equal to 1 for observations after the financial crisis:[16]

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[15] The variables are demeaned by subtracting the pre-event average (the average before relative quarter –5) to control for any unobserved trends before the mortgage acquisition.

[16] In addition to estimating the specification with the interaction terms, we estimate separate regressions for the time period before the financial crisis, from Q1 1999 through Q3 2007, and the time period after the financial crisis, from Q3 2009 through Q4 2017. The coefficients from the separate regressions are in Tables 7, 8, and 9 and are qualitatively very similar to the interaction term results.

$$\Delta y_{j,t} = \sum_t \beta_t (i_{j,t} - i_{j,t-1}) * postCrisis + f(Age_{j,t}) + \epsilon_{j,t} \quad for \ -25 \le t \le 25, \qquad (2)$$

where $postCrisis$ is a dummy variable equal to 1 for quarters after the financial crisis.

Table 7 and Figure 8 show the estimated coefficients $\hat{\beta}_t$ from estimating equation (1) with the change in $y_{jt} \equiv$ {credit card balances} as the dependent variable, using OLS. The top panel in Figure 8 shows the estimated coefficients for the entire sample period, while the bottom panel displays the pre-crisis and post-crisis results based on the interaction term specification (determined by whether the mortgage was acquired before or after the crisis). Before and after the crisis, credit balances rise about the time a consumer obtains his mortgage. However, after the crisis, consumers increase their credit card balances one quarter before they get their mortgage. In contrast, before the crisis, the increase in credit card balances does not occur until after the mortgage is obtained, and the increase is smaller in magnitude. So the effect of a new mortgage on credit card debt is greater after the financial crisis. This is consistent with the hypothesis that after the crisis, consumers relied on their credit cards while saving for a down payment to a larger degree than they did before the crisis. The coefficient on age in Table 7 is negative, which may seem odd because credit card debt and limits typically increase with age (Fulford and Schuh 2015). However, because the regression is in first differences, the negative coefficient implies that the *change* in age—not age—is negatively related to credit card debt.[17]

Table 8 and Figure 9 display the estimated coefficients $\hat{\beta}_t$ from estimating equation (1) with changes in credit card limits as the dependent variable. Limits increase more prior to and immediately following a mortgage acquisition in the period after the crisis than in the period before it. We characterize the increase in credit limit upon obtaining a mortgage as a credit effect.

The difference in credit card utilization during the two time periods is the most dramatic (Table 9 and Figure 10): Utilization rises upon mortgage acquisition in both periods; however, after the crisis, utilization increases substantially during the quarter immediately before the mortgage acquisition, whereas before the crisis, the increase is more modest and doesn't take

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[17] If the true model were: $y_{j,t} = \alpha_j + \sum_t \beta_t i_{j,t} * postCrisis + \gamma_1 Age_{j,t} + \gamma_2 Age_{j,t}^2 + \epsilon_{j,t}$, then when taking first differences the constant would absorb γ_1. Because: $\Delta Age_{j,t}^2 = Age_{j,t}^2 - (Age_{j,t} - .25)^2 = 0.5 Age_{j,t} - 0.0625$, the coefficient on age in the difference equation is a linear multiple of the coefficient on age squared in the level equation and has the same sign. Note that our data are quarterly and the credit bureau reports only year of birth, not the birth date, so age is updated only annually.

place until after the mortgage acquisition. This result also is consistent with the hypothesis that after the crisis, mortgage lending standards became stricter, and larger down payments were required to obtain a mortgage. As a result, consumers might have begun relying on credit cards for liquidity—and thus increased their credit card utilization—while preparing to make a down payment.

B.   Mortgage and credit card utilization

We next employ a simpler model that pools the effects estimated in the event study but allows us to study interactions with risk scores. More specifically, for each mortgage acquirer we estimate short-term and long-term effects of mortgage acquisition to test how long those effects last:

$$\Delta Util_{short} = \beta_0 + \beta_1 postCrisis + \beta_2 riskScore + \beta_3 riskScore^2 + \beta_4 riskScore * postCrisis + \lambda^S f(age) + \epsilon, \tag{3}$$

where $\Delta Util_{short}$ is the average utilization for the two quarters after acquisition minus the average utilization for the two quarters before acquisition:[18]

$$\Delta Util_{short} = (Util_{j,t+2} + Util_{j,t+1})/2 - (Util_{j,t-1} + Util_{j,t-2})/2, \tag{4}$$

and $riskScore$ is a mean of the Equifax risk scores for the two quarters prior to the mortgage acquisition. We similarly define the long-term change in utilization $\Delta Util_{long}$ as the difference in the average utilization over relative quarters –24 to –5 and 5 to 24 (that is, 24 quarters before/after the acquisition, but excluding the four quarters immediately before/after):[19]

$$\Delta Util_{long} = \alpha_0 + \alpha_1 postCrisis + \alpha_2 riskScore + \alpha_3 riskScore^2 + \alpha_4 riskScore * postCrisis + \lambda^L f(age) + \epsilon, \tag{5}$$

where $\Delta Util_{long}$ is the average utilization from relative quarters 5 to 24 minus the average utilization for relative quarters –24 to –5.

The first column of Table 10 shows the short-term change:

$$\Delta Util_{short} = \beta_0 + f(age_j) + \epsilon_j, \tag{6}$$

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[18] To test for robustness, we tried alternative numbers of quarters, and the results were qualitatively similar.
[19] To measure the long-term change, we exclude the four quarters immediately before and after the quarter when the mortgage was acquired, as they are included in the short-term utilization change.

where the coefficient β_0 captures the average short-term change in utilization. Column II includes a dummy variable for the post-crisis period, and Column III adds the risk score, risk score squared, and an interaction term of post-crisis and risk score. The average short-term increase in utilization upon acquiring a mortgage is 11.1 percentage points. Consistent with Figure 10, the increase is significantly larger after the crisis, at 12.9 percentage points (Column II). Interacting with the risk score suggests that the increase in utilization is larger among those with higher risk scores, but this effect is smaller post-crisis.

One explanation for the larger post-crisis increase in utilization could be a change in the composition of mortgage acquirers. In Figure 7, we document that the average risk score of mortgage acquirers post-crisis was higher than it was pre-crisis. However, the increase in utilization after the crisis is approximately the same whether risk score is included or not. While risk score does affect the change in utilization, it does not explain the increase after the crisis.

Table 11 shows similar regressions for the long-term change in utilization. As the event study coefficients in Figures 8, 9, and 10 show, the short-term impact is much larger than the long-term effect. Overall, the long-term impact is not statistically significant (Column I). However, there is a substantial difference between the two time periods: The long-term effect is negative before the crisis, but it becomes positive and significant after the crisis. Credit utilization is 1.0 percentage point higher in the long term for those who acquire a mortgage after the crisis (Column II), and the effect is even greater after we control for risk score (Column III). The long-term increase in credit utilization rises with risk score, but this effect diminishes after the crisis (Column III).

The change over time in the long-term effect of a new mortgage on credit card utilization suggests that before the crisis, the debt effect (increased borrowing) was relatively small, but the credit effect (increased limits) seems to have been larger, pushing down long-term utilization rates. After the crisis, the reverse was true: The debt effect was larger, but the credit effect was smaller. As a result, long-term utilization dropped before the crisis but increased after the crisis.

If liquidity-constrained people are the only ones who change their credit card utilization, the impact of a mortgage may be much larger for individuals who use more of their credit. To test whether short-term changes in utilization differ depending on the level of utilization, we estimate the following equation:

$$\Delta Util_{short} = \delta_0 + \delta_1 avgUtil + \delta_2 postCrisis + \delta_3 avgUtil * postCrisis + \delta_4 riskScore + \delta_5 riskScore^2 + \delta_6 riskScore * postCrisis + \delta_7 riskScore * avgUtil + \delta_8 riskScore * avgUtil * postCrisis + f(age)\lambda^A + \epsilon, \tag{7}$$

where $avgUtil$ is the average utilization from relative quarters –24 to –5. The results are presented in Table 12, but because results with multiple interactions are difficult to interpret, we show the predictive margins at various pre-mortgage average utilization ($avgUtil$) and risk scores in Figure 11. Before the crisis, the short-term change in utilization generally decreases as risk scores rise, and it decreases with utilization. In general, credit card utilization increases for people with low credit scores and low utilization and decreases for those with higher credit scores or higher utilization. Acquiring a mortgage appears to affect credit card utilization in very different ways across the risk-score and utilization distributions. The relatively small average effect of acquiring a mortgage before the crisis appears to be the result of relatively large positive and negative effects balancing out each other.

Post-crisis, the impact shifts in important ways that differ across the utilization and risk-score distributions. First, at low pre-mortgage average credit card utilization, short-term utilization following the acquisition of a mortgage increases by several percentage points for all risk scores. Second, an increase in pre-mortgage utilization has a smaller negative effect on the post-mortgage change in utilization. For the lowest risk scores, higher pre-mortgage utilization tends to mean larger increases in utilization, which is the opposite of the effect pre-crisis. The combined shift means that, even when we hold the distributions of pre-mortgage credit utilization and risk scores constant, there is a much larger increase in credit card utilization post-crisis driven by an increase at all utilization levels and risk scores.

In summary, credit card utilization spikes upon the acquistion of a mortgage, and the increase is larger post-crisis. After the first two quarters following the acquisition of a mortgage, credit utilization falls, but on average it remains higher in the long term. The long-term impact appears to be stable before and after the crisis, with the difference mostly explained by the higher risk scores of post-crisis mortgage acquirers.

C.   Effect of a down payment on utilization

To test our hypothesis that changes in the utlization-mortgage relationship are caused by lending criteria becoming more stringent after the financial crisis, we merge the Equifax data with the McDash data to include down payment and income information for each mortgage. We test

whether the effect of a mortgage acquisition on credit card utilization can be explained by differences between down payments before the crisis and those after the crisis.

If the increase in credit card utilization were caused by lenders' requiring higher down payments, then a higher down payment would have a positive effect on credit card utilization. Down payment requirements are typically specified in terms of a percentage of the house sale price, and the minimum required down payment may vary with a buyer's income. For example, a lender could require a minimum down payment of 20 percent of the price of the house as a condition for approving a mortgage. We want to test whether that requirement became more stringent after the financial crisis. To control for the effect of changes in house prices, we include the down payment as a ratio of down payment to sale price. The McDash data do not include sale prices of houses, but they do include appraisals, which we use as proxies for sale prices. We also estimate a specification with the ratio of down payment to income.

We estimate the following equation:

$$\Delta Util_{short} = \gamma_0 + \gamma_1 postCrisis + \gamma_2 riskScore + \gamma_3 riskScore^2 + \gamma_4 riskScore * postCrisis + \gamma_5 \, downpayment + \gamma_6 income + f(age)\lambda^D + \epsilon. \tag{8}$$

Table 13 shows the regression results. Unfortunately, the McDash data have several limitations, and the merged sample is substantially smaller than the original CCP/Equifax sample. Column I replicates the specification in equation (3);[20] Column II shows the results with the down payment and income included as a ratio of down payment/income; Column III includes the down payment and income separately in log form; Column IV includes the ratio of down payment to appraisal (proxy for sale price); and Column V shows the results with the down payment and appraisal included separately in logs. The effect of the size of the down payment on short-term utilization change (controlling for income or sale price) is negative. This suggests that while larger down payments may have an effect on liquidity, the liquidity effect is less important than the selection effect of being the kind of person who has saved enough to have a larger down payment (holding income constant). One possible explanation is that "impatient" people do not save for large down payments, so the impact of a mortgage or mortgage payments on other liquidity is larger for them. The down payment becomes insignificant in the long run in the credit card utilization rates regressions (Table 14).

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[20] The results differ slightly from those in Column III of Table 10, because only observations with the McDash data are included in the estimation here. In contrast, Table 10 shows the results of estimating (3) using the full sample.

Keys et al. (2014) find that a decline in the size of mortgage payments due to lower mortgage rates leads to a reduction in credit card debt among credit-constrained households. But a decline in the size of mortgage payments can be generated by larger down payments, even if mortgage rates remain unchanged. A larger down payment required by the lender also would reduce the size of the mortgage and therefore lead to smaller mortgage payments, even without changes in mortgage interest rates. Thus, a larger down payment—and the resulting smaller mortgage payments—could lead to lower credit card debt and lower credit card utilization.

D. Borrowing against home equity: HELOC and HELOAN

When a consumer buys a house and acquires a mortgage, he might have access to other types of loans that were not previously available to him, namely a home equity line of credit (HELOC) or a home equity loan (HELOAN). HELOCs and HELOANs both extract value from the equity on a home and add to the homeowner's debt. A HELOAN is a lump sum, whereas a HELOC allows the borrower to draw money as needed. So instead of increasing his credit card debt and credit card utilization, a consumer might increase his borrowing through these other loans. Brown, Stein, and Zafar (2015) find that there is a nearly one-for-one substitution of home equity debt for credit card debt after a change in home equity. Alternatively, perhaps the liquidity impact of a mortgage is small if the equity is immediately available as a HELOC or HELOAN.

We use the Equifax tradeline data as a source of information on HELOCs and HELOANs. Of the 145,899 first-time mortgage acquirers in our sample, 14.9 percent have at least one HELOC record. One can obtain a HELOC immediately after purchasing a home, and the acquisition process involves fewer steps than are required for a mortgage. In our sample of mortgage acquisitions, 6.3 percent of the people who obtained a HELOC did so within one month of acquiring a mortgage, and 16 percent got their HELOC within the first year. The timing suggests that, while HELOCs may be a longer-term source of liquidity for some households, for most they are not a direct substitute for credit cards in the short term after the acquisition of a mortgage. The mean length of time between getting a mortgage and getting a HELOC is nearly five years, but the distribution is skewed right, so the median is much shorter.

HELOANs are somewhat more common than HELOCs in our data and are more likely to be taken out soon after a mortgage acquisition: 23 percent of HELOAN holders acquired theirs in the same month that they got a mortgage, and 31 percent obtained a HELOAN within one year

of getting a mortgage. In our data, the mean length of time between getting a mortgage and getting a HELOAN is 34 months.

We look for evidence that consumers substitute HELOCs or HELOANs for credit card debt after getting a mortgage. For consumers who open a HELOC or HELOAN account, we observe quarterly changes in their credit card balances for two years after the account is opened. We do not find any evidence that consumers systematically substitute for their credit card balances: Approximately one-third of the consumers with a HELOC of HELOAN increased their credit card balances, one-third lowered them, and one-third did not substantially change their credit card balances. Mean credit card balances declined very slightly in the first quarter following the acquisition of a HELOC or HELOAN, but balances were higher after a year. Regardless of whether the loan was a HELOC or HELOAN, the result was the same for credit card balances.

HELOCs and HELOANs were much more common before the crisis, which may explain both the lack of clear substitution between HELOCs or HELOANs and credit cards, and why there is so small a relationship between credit cards and mortgages before the crisis. Figure 12 shows that for several years before the crisis, HELOCs and HELOANs were very common. From 2003 through 2007, there was approximately 0.4 new HELOC/HELOAN for every new mortgage, suggesting it was quite easy to generate liquidity from home equity. From 2009 on, however, there was less than 0.2 new HELOC/HELOAN for every new mortgage. The number of new mortgages was much lower after 2008, but the number of new HELOC/HELOANs was even lower. Before the crisis, HELOC/HELOANs may have been the easiest and cheapest way to deal with liquidity issues following the acquisition of a mortgage, whereas after the crisis households may have turned to credit cards as HELOC/HELOANs became more difficult to obtain.

VI.   Conclusion

We find that acquiring a first-time mortgage affects credit card use in two ways: A debt effect tends to increase credit card spending, and a credit effect leads to higher credit limits, possibly because lenders see timely mortgage payments. We find a robust and statistically significant effect of new-mortgage acquisition on credit card utilization, or the fraction of a consumer's credit card limit that is used. In the short term, the effect is strong and positive. The long-term effect on utilization changed over time: We find that before the 2007–2009 financial

crisis, the debt effect was relatively small, but the credit effect seems to have been larger, pushing down long-term utilization. In our sample period after the crisis, the reverse apparently was true: The debt effect of obtaining a new mortgage was higher, consistent with larger down payments leaving households more constrained.

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Table 1: Number of Individuals by Year, Full 1999 Q1–2017 Q1 Sample

Year	Number of Individuals
1999	539,934
2000	540,173
2001	574,755
2002	589,815
2003	592,009
2004	596,666
2005	601,412
2006	608,091
2007	610,635
2008	601,090
2009	596,161
2010	595,555
2011	599,398
2012	596,084
2013	600,728
2014	631,667
2015	640,918
2016	649,306
2017	661,253

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Table 2: Number of Individuals by Subpopulation, Full 1999 Q1–2017 Q1 Sample

Subpopulation	Number of Individuals
Mortgage acquirers	213,909
First-time mortgage acquirers	145,899
Always holds a mortgage	117,169
Never holds a mortgage	880,632
Pays off a mortgage	231,981
Goes delinquent on a mortgage	72,659
Defaults on a mortgage	25,071

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Table 3: CPI-adjusted median annual household income by homeowner status and homeownership rates, by year

Year	CPI-adjusted median household income ($)		Homeownership rate (percent)
	Homeowner	Non-Homeowner	
2010	68,400	30,780	65
2013	70,200	31,320	62
2016	72,000	32,000	66

Source: 2010–2016 Survey of Consumer Finances and authors' calculations (income), 2010, 2013, and 2016 Survey of Consumer Payment Choice (homeownership rate).

Table 4: Percentage of consumers who are homeowners, by household income group

Annual household income	2009	2010	2011	2012	2013	2014	2015	2016	2017	Average Annual % change
Overall	67	65	64	65	62	64	62	66	64	-0.47
<$25K	42	37	33	33	33	36	34	39	34	-2.13
$25-49K	64	65	63	63	54	58	51	59	54	-1.65
$50-74K	79	74	71	74	71	74	71	73	71	-1.33
$75-99K	84	75	78	81	78	78	74	79	74	-1.35
>100K	87	91	90	85	87	84	84	86	85	-0.23

Source: Authors' calculations from 2009–2016 Survey of Consumer Payment Choice.

Table 5: Credit card statistics by homeowner and mortgage status (SCPC)

	All Homeowners	Mortgage Holders	Outright Owners	Non-Homeowners
Credit Card Adoption Rate	85.8%	89.1%	78.8%	53.5%
Credit Card Shares	23.3%	22.4%	24.9%	11.5%
Unpaid Credit Card Balances (adopters only)	$5,622	$6,199	$3,410	$3,057

Source: Authors' calculations based on 2016 Survey of Consumer Payment Choice.

Table 6: Credit card statistics by mortgage status (Equifax)

All observations	Mortgage-holding quarters	Non-mortgage holding quarters	All consumer - quarters
Credit Card Adoption Rate	94.1%	65.8%	69.8%
Number of Credit Cards	5.3	2.9	3.3
Credit Card Balances	$4,675	$1,605	$2,073
Limits	$18,304	$7,568	$9,199
Utilization	0.35	0.35	0.35

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Table 7: Estimated coefficients for relative quarters –12 to 12, where mortgage was acquired in quarter 0, for mortgage adopters only. Dependent variable is **credit card balances**.

Variable	Full Sample		Pre-crisis		Post-crisis	
Mortgage -12 quarters	-10.3		-12.2		38.4	
Mortgage -11 quarters	-13.1		-11.9		12.2	
Mortgage -10 quarters	-18.7		-5.8		1.5	
Mortgage -9 quarters	-37.5	***	-38.3		-6.1	
Mortgage -8 quarters	13.2		21.4		44.8	**
Mortgage -7 quarters	-1.2		-5.2		38.7	*
Mortgage -6 quarters	-4.9		-4.3		22.0	
Mortgage -5 quarters	-8.7		2.5		10.8	
Mortgage -4 quarters	19.1		31.8		61.0	***
Mortgage -3 quarters	13.7		19.1		46.9	***
Mortgage -2 quarters	-17.9		8.6		-9.9	
Mortgage -1 quarters	-22.7		19.0		-57.5	***
Mortgage acquisition	69.3	***	-7.0		193.6	***
Mortgage +1 quarters	95.1	***	19.1		230.9	***
Mortgage +2 quarters	166.6	***	181.8	***	201.1	***
Mortgage +3 quarters	105.6	***	112.1	***	165.0	***
Mortgage +4 quarters	68.1	***	62.7	***	161.1	***
Mortgage +5 quarters	38.4	***	22.0		136.8	***
Mortgage +6 quarters	16.1		10.2		91.8	***
Mortgage +7 quarters	-9.5		-25.6		123.8	***
Mortgage +8 quarters	2.9		-6.5		88.2	***
Mortgage +9 quarters	-25.9	*	-42.5	**	71.6	***
Mortgage +10 quarters	-19.6		-33.6		97.1	***
Mortgage +11 quarters	-15.6		-10.0		76.4	***
Mortgage +12 quarters	-22.4		-23.4		69.3	***
Age/10	-19.0	***	-20.3	***	-16.983	***
(Age/10)-squared	0.3		-0.4		-1.406	
Observations	5411195		2725235		1584843	
R-squared	0.0003		0.0003		0.0015	

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Note: For clarity, coefficients on dummy variables for the other quarters are not shown. Quarters –25 to +25 were included in the regression.

Table 8: Estimated coefficients for relative quarters –12 to 12, where mortgage was acquired in quarter 0, for mortgage adopters only. Dependent variable is **credit card limits**.

Variable	Full Sample		Pre-crisis		Post-crisis	
Mortgage -12 quarters	15.3		-5.9		18.1	
Mortgage -11 quarters	36.3		72.4		62.0	
Mortgage -10 quarters	16.0		-0.3		20.4	
Mortgage -9 quarters	39.9		16.6		84.4	***
Mortgage -8 quarters	83.2	***	82.7		101.5	***
Mortgage -7 quarters	83.9	***	59.5		176.0	***
Mortgage -6 quarters	74.0	***	51.8		170.9	***
Mortgage -5 quarters	84.0	***	56.1		154.5	***
Mortgage -4 quarters	188.7	***	190.8	***	245.3	***
Mortgage -3 quarters	131.8	***	92.7	**	224.8	***
Mortgage -2 quarters	71.4	***	14.5		232.4	***
Mortgage -1 quarters	99.7	***	76.9		184.3	***
Mortgage acquisition	277.3	***	280.4	***	276.8	***
Mortgage +1 quarters	187.5	***	151.8	***	319.9	***
Mortgage +2 quarters	100.6	***	76.4	*	248.2	***
Mortgage +3 quarters	134.8	***	128.0	***	292.6	***
Mortgage +4 quarters	151.1	***	148.4	***	342.9	***
Mortgage +5 quarters	110.3	***	113.5	***	330.1	***
Mortgage +6 quarters	89.9	***	83.9	*	335.6	***
Mortgage +7 quarters	15.1		-17.7		302.2	***
Mortgage +8 quarters	0.9		-23.9		321.3	***
Mortgage +9 quarters	-4.7		-3.5		222.1	***
Mortgage +10 quarters	22.6		59.0		244.7	***
Mortgage +11 quarters	-30.1		-8.0		222.8	***
Mortgage +12 quarters	1.1		37.2		232.9	***
Age/10	-32.7	***	-10.1		-44.108	***
(Age/10)-squared	-7.4	***	-8.7	***	-9.600	***
Observations	5450705		2746959		1593528	
R-squared	0.0004		0.0001		0.0033	

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Note: For clarity, coefficients on dummy variables for the other quarters are not shown. Quarters –25 to +25 were included in the regression.

Table 9: Estimated coefficients for relative quarters –12 to 12, where mortgage was acquired in quarter 0, for mortgage adopters only. Dependent variable is **credit card utilization (percent)**.

Variable	Full Sample		Pre-crisis		Post-crisis	
Mortgage -12 quarters	-0.162		0.003		0.373	*
Mortgage -11 quarters	-0.361	***	-0.216		-0.148	
Mortgage -10 quarters	-0.387	***	-0.058		-0.232	
Mortgage -9 quarters	-0.692	***	-0.461	***	-0.523	***
Mortgage -8 quarters	-0.307	***	-0.048		0.064	
Mortgage -7 quarters	-0.579	***	-0.387	***	-0.432	***
Mortgage -6 quarters	-0.577	***	-0.374	***	-0.234	
Mortgage -5 quarters	-0.757	***	-0.506	***	-0.739	***
Mortgage -4 quarters	-0.488	***	-0.273	*	-0.233	
Mortgage -3 quarters	-0.781	***	-0.645	***	-0.399	***
Mortgage -2 quarters	-1.099	***	-0.538	***	-1.352	***
Mortgage -1 quarters	-1.483	***	-0.667	***	-2.223	***
Mortgage acquisition	0.641	***	-0.213		2.492	***
Mortgage +1 quarters	1.161	***	0.683	***	2.283	***
Mortgage +2 quarters	1.200	***	1.437	***	1.279	***
Mortgage +3 quarters	0.451	***	0.557	***	0.637	***
Mortgage +4 quarters	0.299	***	0.433	***	0.522	***
Mortgage +5 quarters	0.086		0.134		0.232	
Mortgage +6 quarters	0.100		0.260	**	0.139	
Mortgage +7 quarters	-0.031		0.082		0.147	
Mortgage +8 quarters	0.175	*	0.258	*	0.096	
Mortgage +9 quarters	-0.073		0.002		0.043	
Mortgage +10 quarters	0.014		0.105		0.048	
Mortgage +11 quarters	0.183	*	0.384	***	0.015	
Mortgage +12 quarters	0.033		0.058		0.074	
Age/10	-0.068	***	-0.074	***	-0.042	*
(Age/10)-squared	0.020	***	0.018	*	0.016	
Observations	4287081		2176546		1302939	
R-squared	0.0007		0.0004		0.0023	

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Note: For clarity, coefficients on dummy variables for the other quarters are not shown. Quarters –25 to +25 were included in the regression.

Table 10: Short-term impact of mortgage acquisition on utilization (percentage points)

	I		II		III	
Intercept	11.057	***	8.352	***	8.591	***
	(0.650)		(0.690)		(0.687)	
Post-crisis	-		4.502	***	5.166	***
			(0.172)		(0.185)	
Risk score	-		-		4.015	***
					(0.139)	
Risk score squared	-		-		0.614	***
					(0.122)	
*Risk score*post-crisis*	-		-		-6.118	***
					(0.276)	
Age	-3.209	***	-2.736	***	-2.814	***
	(0.301)		(0.315)		(0.315)	
Age squared	0.174	***	0.137	***	0.117	***
	(0.032)		(0.033)		(0.033)	
Observations	114610		106813		106746	
R-squared	0.0070		0.0137		0.0225	

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax. Risk score is divided by 100 and age by 10 to scale coefficients.

Table 11: Long-term impact of mortgage acquisition on utilization (percentage points)

| **Variable**	I		II		III	
Intercept	0.144		-2.336	***	-2.248	***
	(0.814)		(0.865)		(0.864)	
Post-crisis	-		3.384	***	3.687	***
			(0.213)		(0.234)	
Risk score	-		-		1.724	***
					(0.172)	
Risk score squared	-		-		1.804	***
					(0.149)	
*Risk score*post-crisis*	-		-		-2.005	***
					(0.348)	
Age	-2.246	***	-1.761	***	-2.094	***
	(0.377)		(0.395)		(0.396)	
Age squared	0.236	***	0.193	***	0.200	***
	(0.040)		(0.042)		(0.042)	
Observations	96567		88920		88845	
R-squared	0.0004		0.0032		0.0052	

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax. Risk score is divided by 100 and age by 10 to scale coefficients.

Table 12: Long-term impact of mortgage acquisition and average utilization (percentage points) on near-acquisition utilization change (percentage points)

| Variable	I		II	
Intercept	11.078	***	9.668	***
	(0.729)		(0.736)	
Average utilization	-0.080	***	-0.037	***
	(0.003)		(0.004)	
Post-crisis	-1.089	***	0.262	
	(0.277)		(0.412)	
Risk score	-		2.470	***
			(0.304)	
Risk score squared	-		0.539	***
			(0.173)	
*Risk score * post-crisis*	-		-1.570	***
			(0.526)	
*Average utilization * post-crisis*	0.122	***	0.086	***
	(0.006)		(0.007)	
*Risk score * average utilization*	-		0.013	**
			(0.006)	
*Risk score * average utilization * post-crisis*	-		-0.033	***
			(0.009)	
Age	-2.346	***	-2.553	***
	(0.328)		(0.329)	
Age squared	0.094	***	0.099	***
	(0.035)		(0.035)	
Observations	88765		88732	
R-squared	0.0211		0.0242	

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax. Risk score is divided by 100 and age by 10 to scale coefficients.

Table 13: Short-term impact of mortgage acquisition on utilization (percentage points), with income and down payment measures

Variable	I		II		III		IV		V	
Intercept	1.485		1.745		13.553	***	1.967		-1.097	
	(2.511)		(2.516)		(4.129)		(1.777)		(3.755)	
Post-crisis	2.246	***	2.023	***	1.290	*	3.037	***	3.062	***
	(0.651)		(0.664)		(0.710)		(0.520)		(0.513)	
Risk score	1.950	***	1.970	***	2.350	***	2.577	***	2.715	***
	(0.693)		(0.693)		(0.715)		(0.564)		(0.567)	
Risk score squared	1.028	*	1.031	*	1.288	**	1.262	***	1.303	***
	(0.579)		(0.579)		(0.598)		(0.436)		(0.436)	
Risk score*post-crisis	-2.979	***	-2.961	***	-2.692	***	-4.926	***	-4.697	***
	(0.988)		(0.988)		(1.022)		(0.729)		(0.730)	
Down payment/(1000*income)	-		-5.104	*	-		-		-	
			(3.005)							
log (income)	-		-		-0.468		-		-	
					(0.414)					
log (down payment)	-		-		-0.687	***	-		-1.336	***
					(0.195)				(0.180)	
log (appraisal amount)	-		-		-		-		1.189	***
									(0.353)	
Down payment/appraisal amount	-		-		-		-8.629	***	-	
							(1.256)			
Age	0.746		0.744		0.545		1.110		1.230	
	(1.165)		(1.165)		(1.205)		(0.812)		(0.817)	
Age squared	-0.169		-0.167		-0.154		-0.174	**	-0.192	**
	(0.123)		(0.123)		(0.128)		(0.085)		(0.086)	
Observations	6633		6633		6161		13620		13620	
R-squared	0.0047		0.0051		0.0076		0.0126		0.0135	

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax. Risk score is divided by 100 and age by 10 to scale coefficients.

Table 14: Long-term impact of mortgage acquisition on utilization (percentage points), with income and down payment measures

Variable	I		II		III		IV		V	
Intercept	2.551		2.325		23.072	***	-1.122		10.979	**
	(3.045)		(3.051)		(5.070)		(2.228)		(4.724)	
Post-crisis	-0.465		-0.275		-1.293		-0.245		-0.474	
	(0.786)		(0.801)		(0.860)		(0.638)		(0.631)	
Risk score	-1.134		-1.166		-0.370		-1.073		-0.764	
	(0.817)		(0.818)		(0.846)		(0.662)		(0.666)	
Risk score squared	0.190		0.186		0.683		1.094	**	1.167	**
	(0.684)		(0.684)		(0.704)		(0.534)		(0.534)	
*Risk score*post-crisis*	1.690		1.688		2.405	*	1.674	*	1.800	**
	(1.192)		(1.192)		(1.241)		(0.900)		(0.902)	
*Down payment/(1000*income)*	-		4.548		-		-		-	
			(3.622)							
log (income)	-		-		-2.179	***	-		-	
					(0.501)					
log (down payment)	-		-		-0.232		-		-0.116	
					(0.237)				(0.224)	
log (appraisal amount)	-		-		-		-		-0.918	**
									(0.441)	
Down payment/appraisal amount	-		-		-		0.021		-	
							(1.549)			
Age	-2.330	*	-2.328	*	-2.292		-1.329		-0.918	
	(1.398)		(1.398)		(1.450)		(1.014)		(1.019)	
Age squared	0.259	*	0.258	*	0.246		0.179	*	0.134	
	(0.146)		(0.146)		(0.152)		(0.106)		(0.106)	
Observations	6357		6357		5892		12145		12145	
R-squared	0.0010		0.0012		0.0058		0.0017		0.0026	

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax. Risk score is divided by 100 and age by 10 to scale coefficients.

Figure 1a: Mortgage holding by individual's age, 18- to 95-year-olds
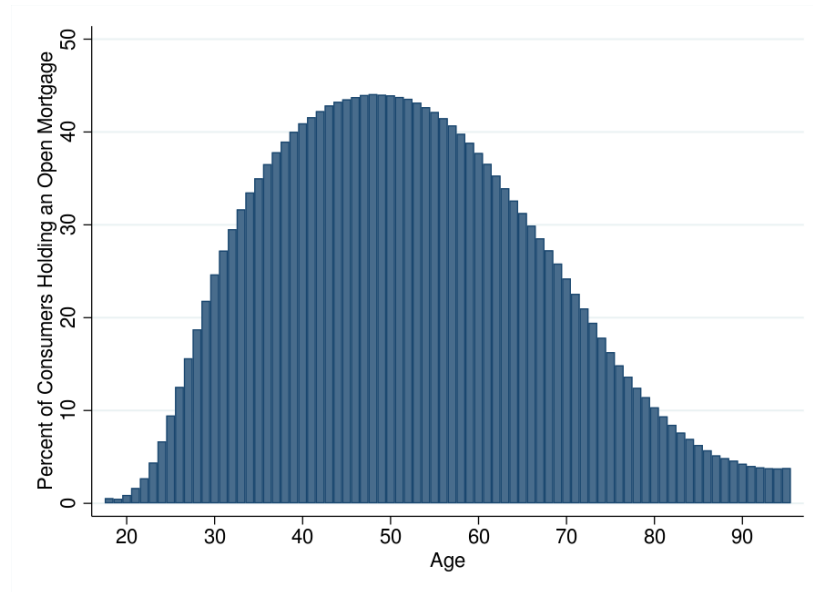
Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Figure 1b: Mortgage acquisitions by age
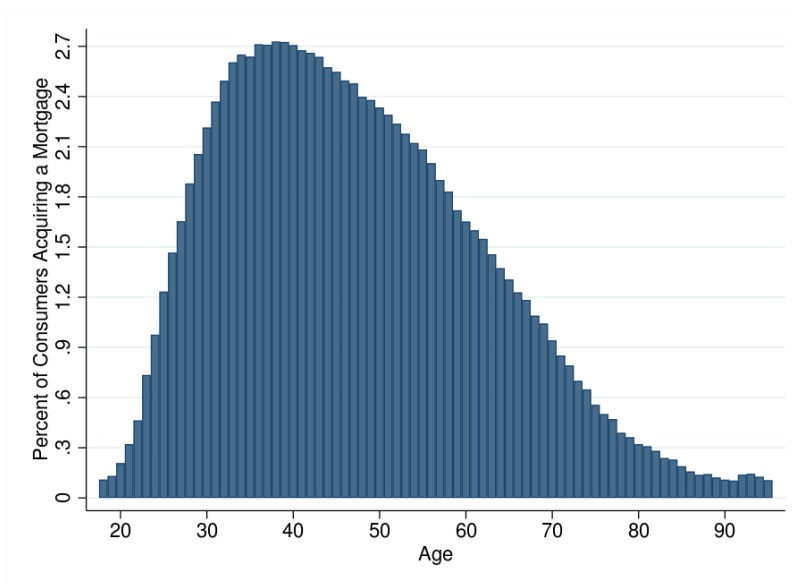
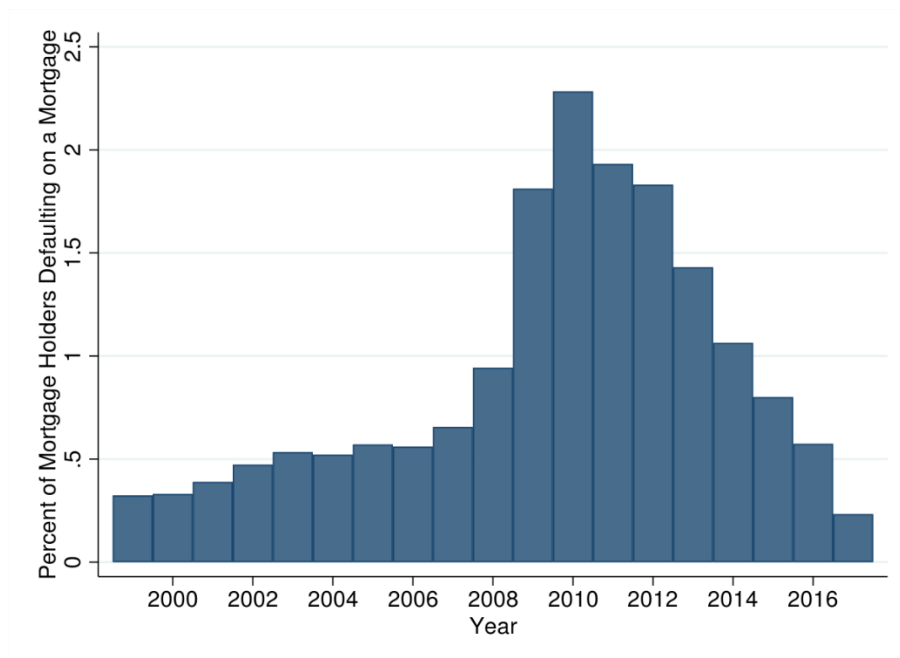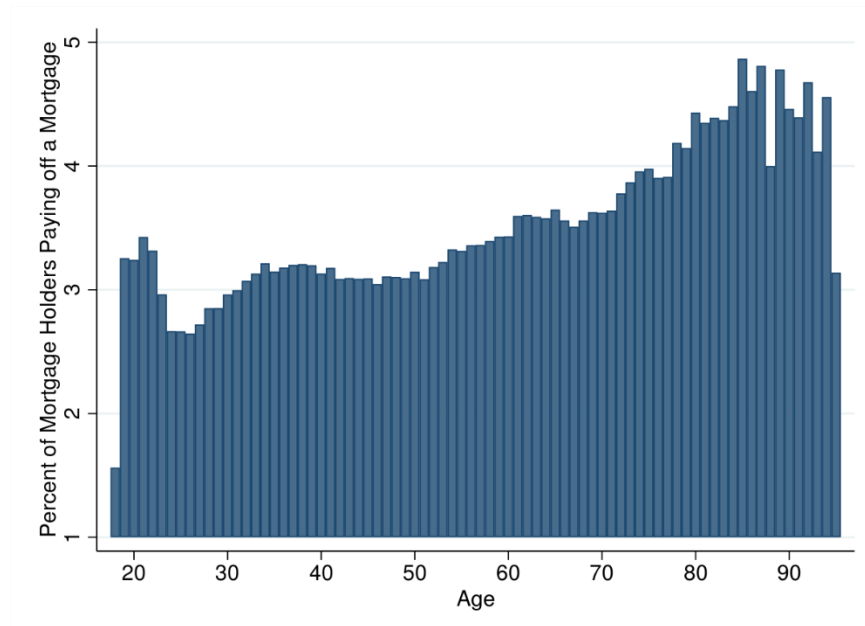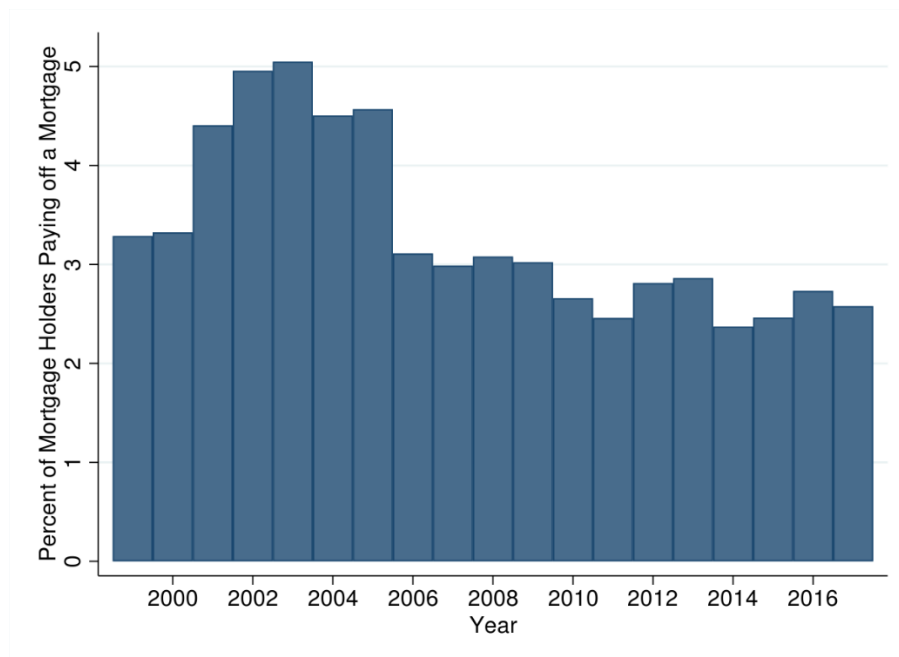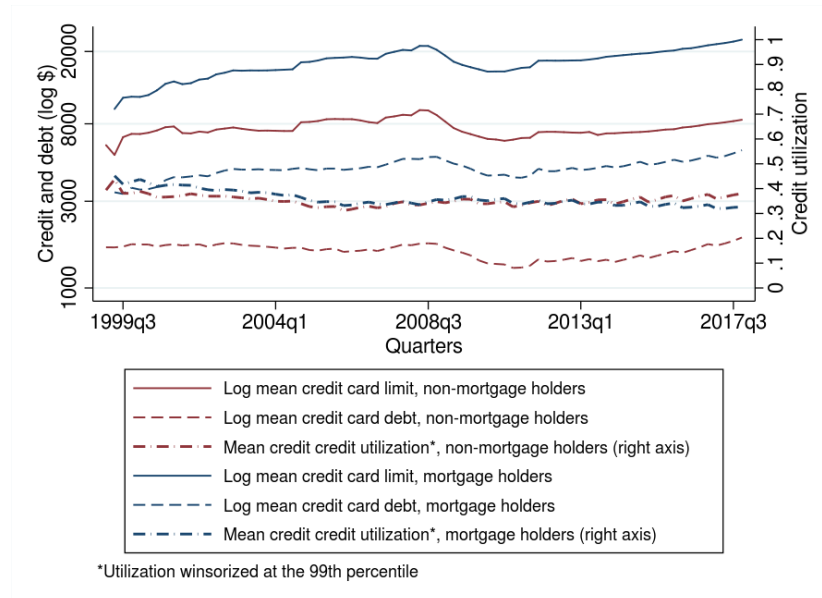*Source:* Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Figure 2a: Mortgage holding by year, 1999–2017
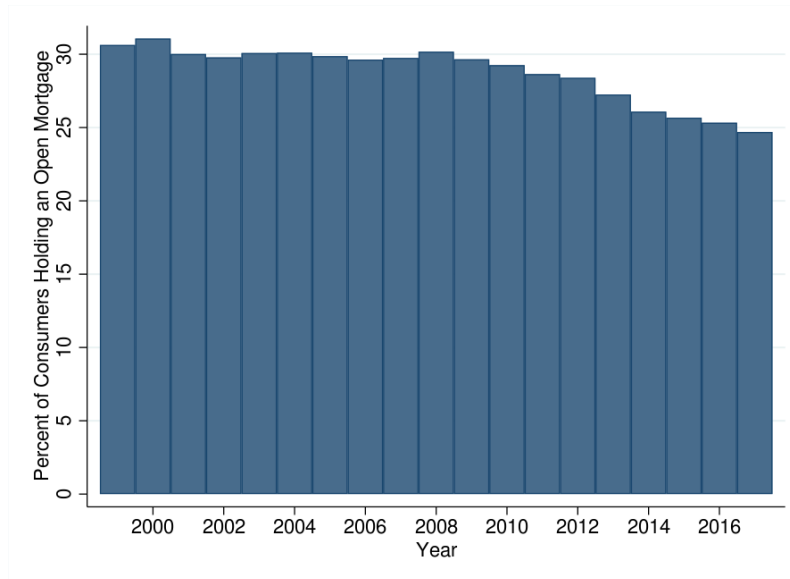
Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Figure 2b: Mortgage acquisitions by year, 1999–2017
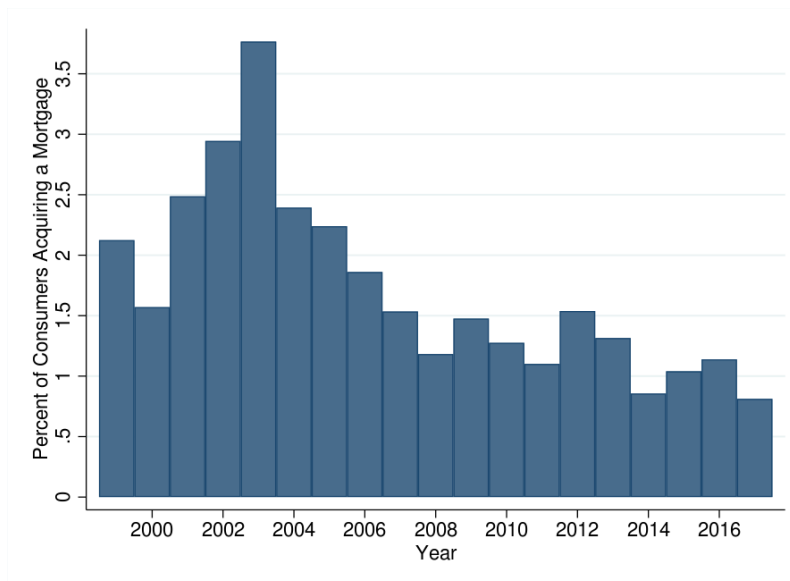
Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Figure 3a: Mortgage defaults by age, as a percentage of mortgage holders

Figure 3b: Mortgage defaults by year, as a percentage of mortgage holders

Figure 4a: Mortgage payoffs by age, as a percentage of mortgage holders

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

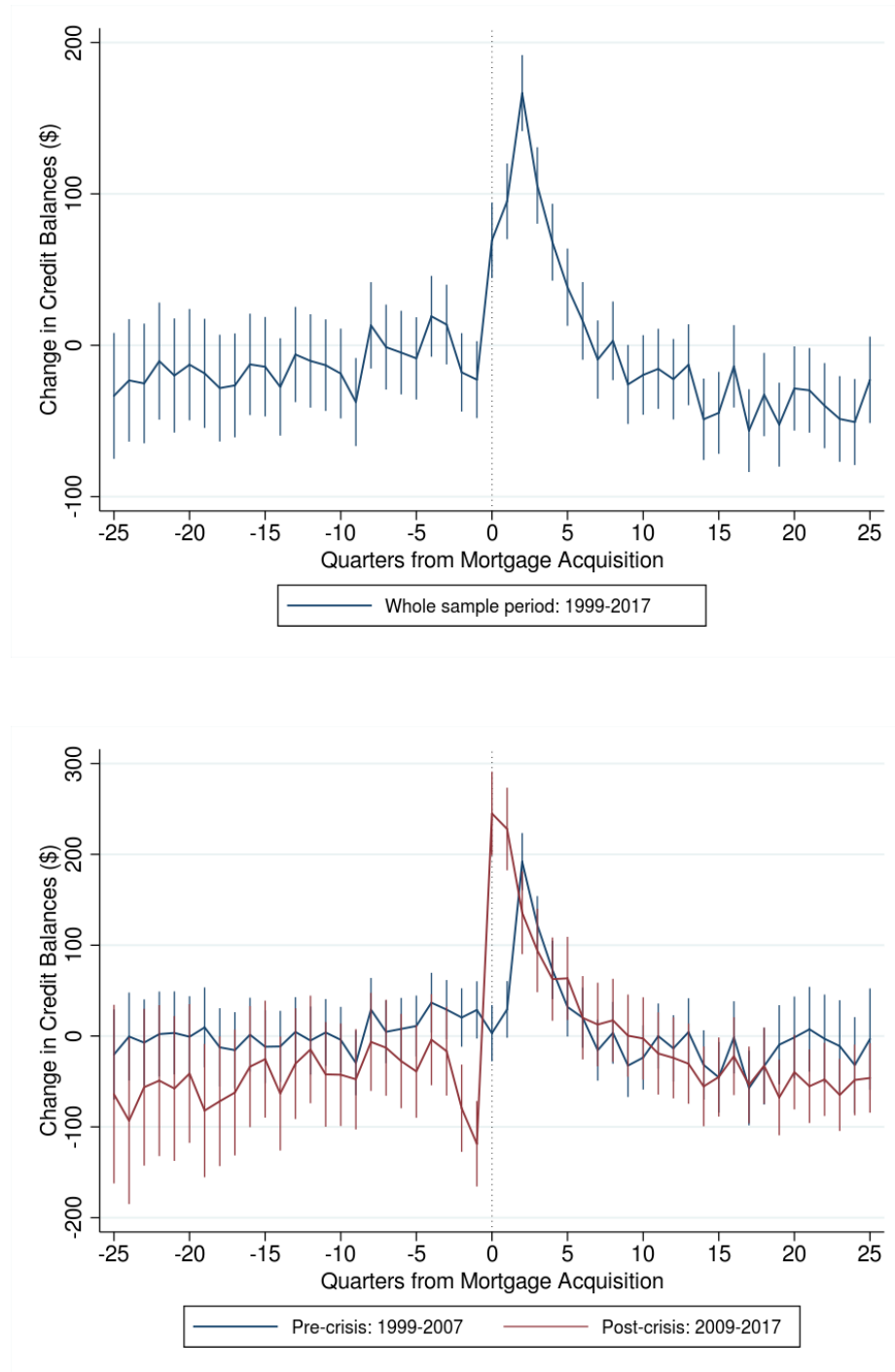Figure 4b: Mortgage payoffs by year, as a percentage of mortgage holders

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Figure 5: Average limit, balances and utilization by mortgage holding status, by quarter

*Utilization winsorized at the 99th percentile

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Note: The labels were mapped to the actually amount rather than the logged value.

Figure 6: Average debt and utilization over time and mortgage acquisition, normalized quarters
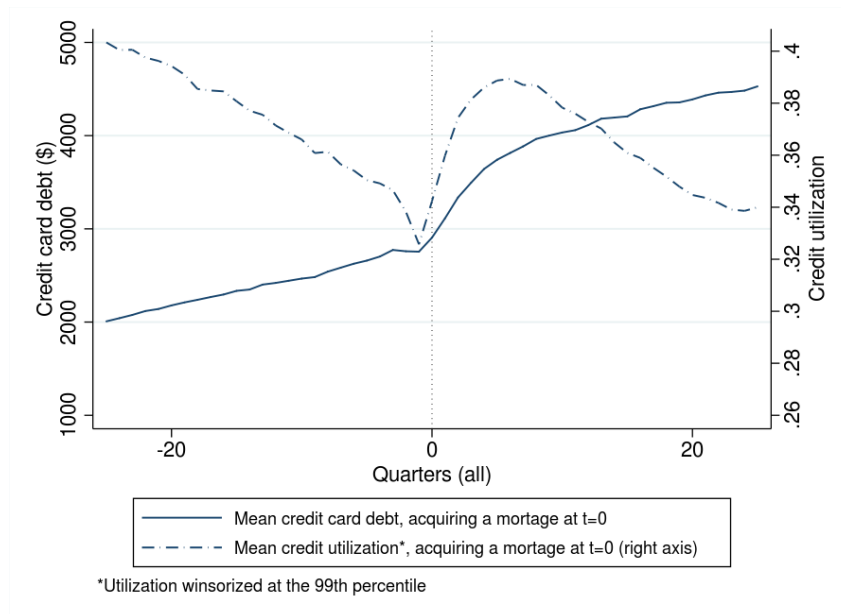
*Utilization winsorized at the 99th percentile

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Figure 6a: Average debt and utilization over time and mortgage acquisition, **before the financial crisis (1999–2007)**

*Utilization winsorized at the 99th percentile
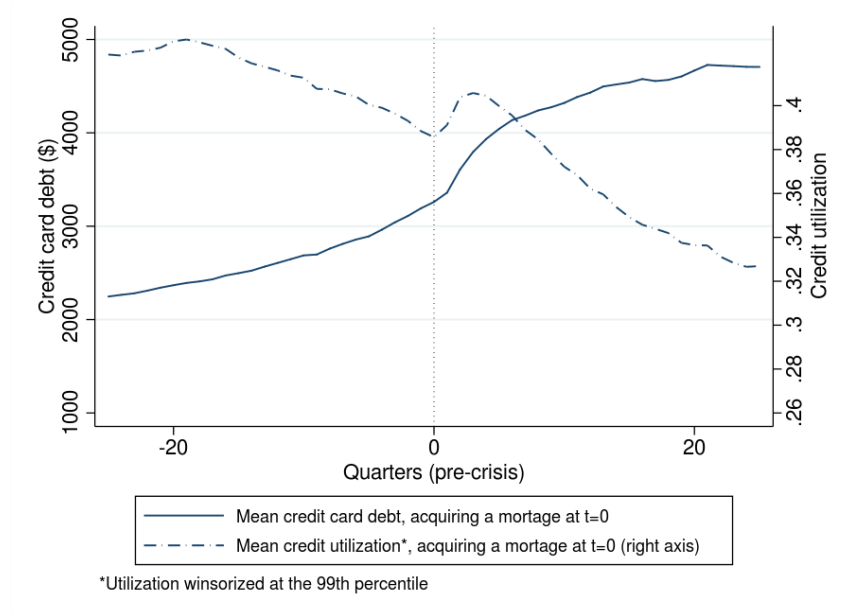
Figure 6b: Average debt and utilization over time and mortgage acquisition, **after the financial crisis (2009–2017)**
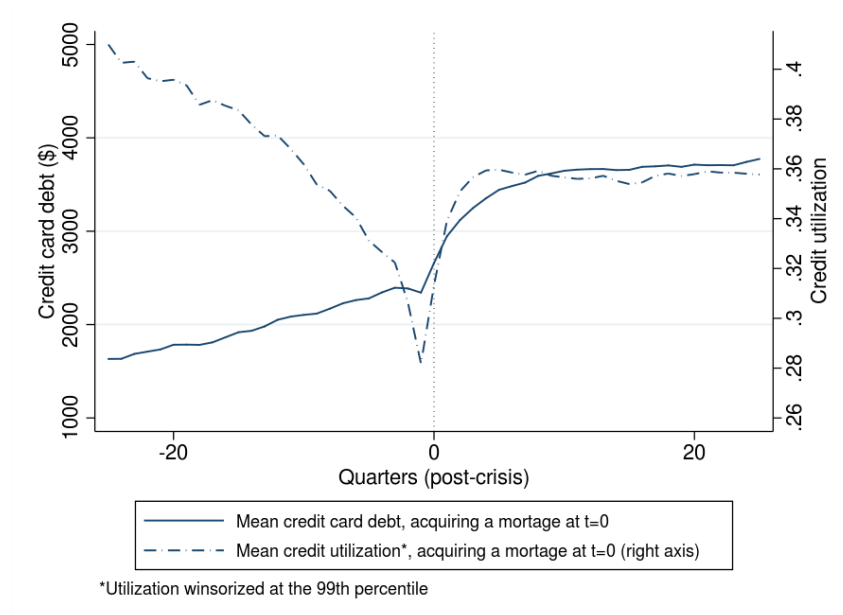
*Utilization winsorized at the 99th percentile

Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Figure 7: Average risk score of mortgage acquirers and non-acquirers in each quarter
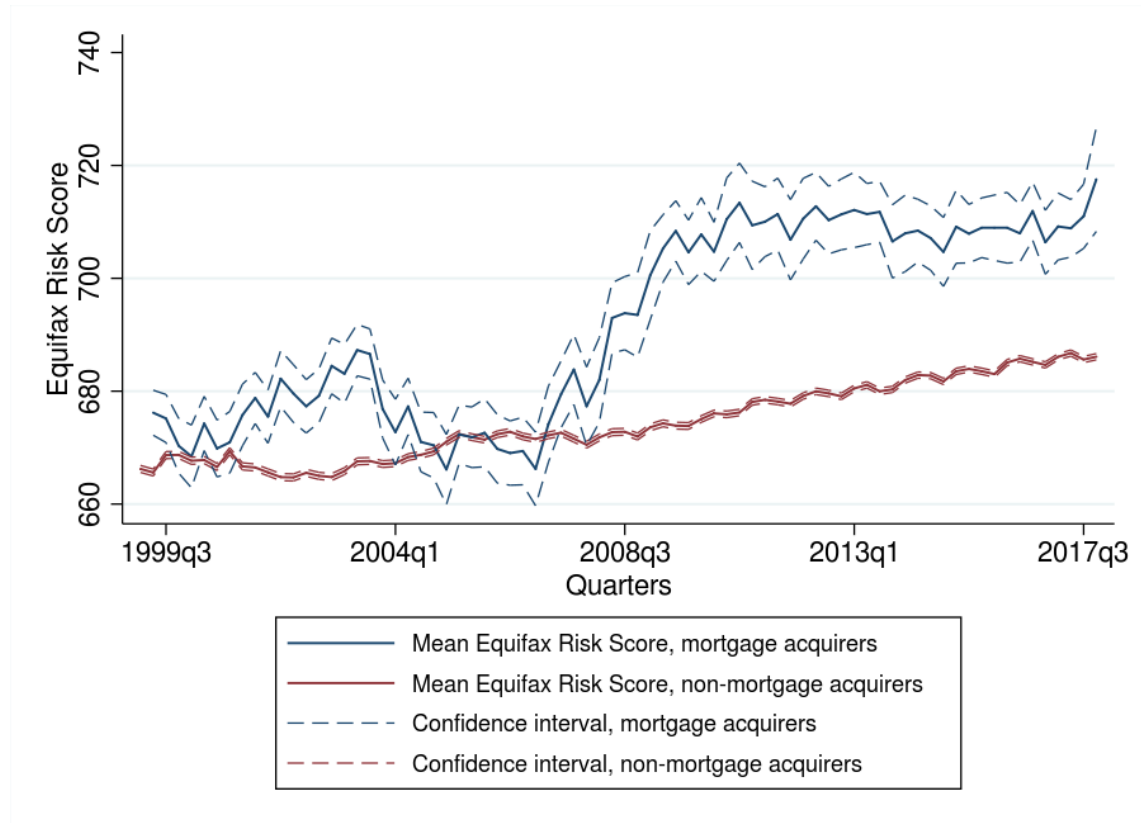
Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Figure 8: Estimated coefficients of indicators for the number of quarters since (or before) mortgage acquisition. Dependent variable is quarterly change in **credit card balances**. Vertical bars show confidence intervals around the estimated coefficients.

Figure 9: Estimated coefficients of indicators for the number of quarters since (or before) mortgage acquisition. Dependent variable is quarterly change in **credit card limits**. Vertical bars show confidence intervals around the estimated coefficients.
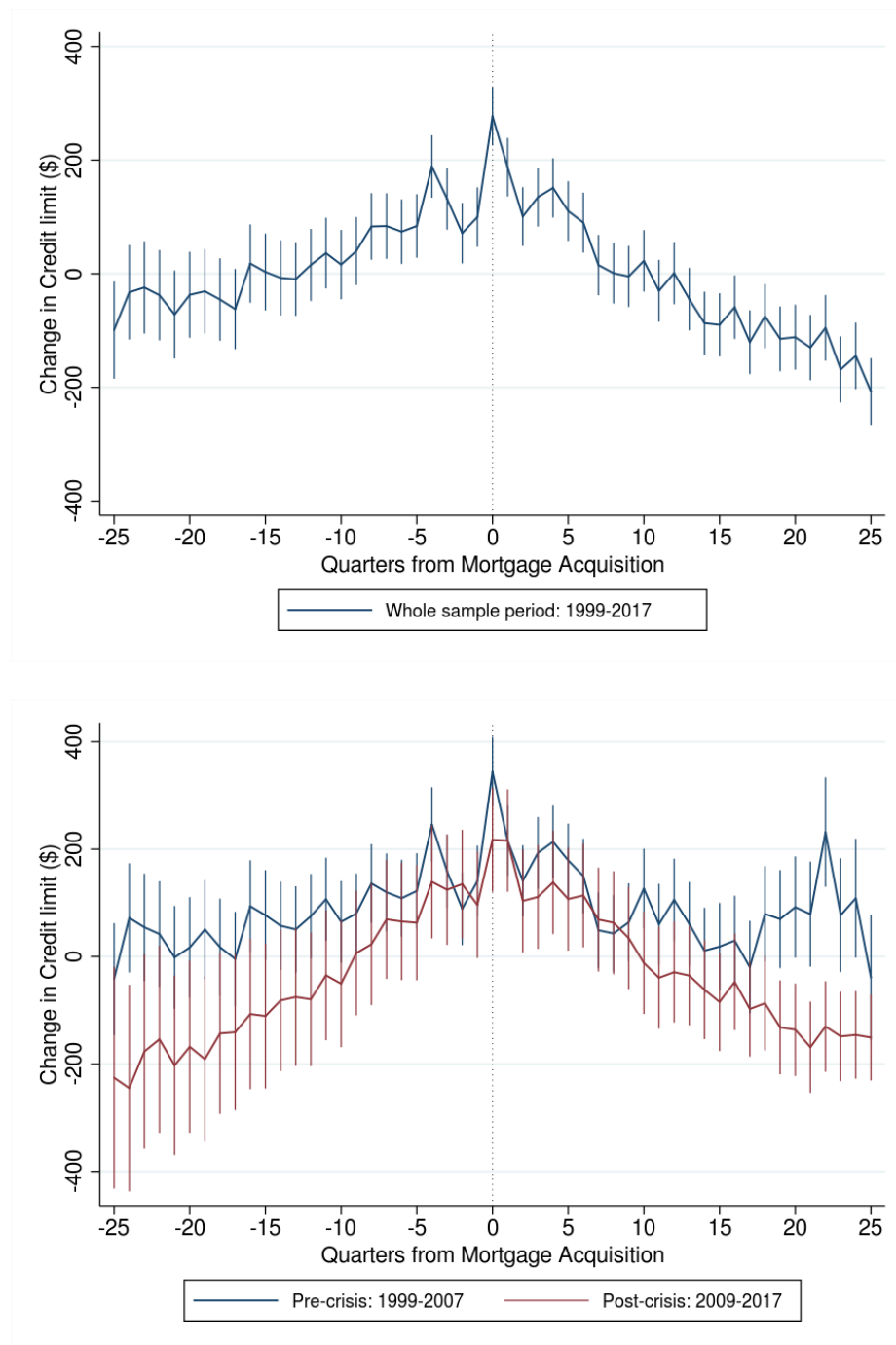
Source: Authors' calculations from data based on New York Fed Consumer Credit Panel/Equifax.

Figure 10: Estimated coefficients of indicators for the number of quarters since (or before) mortgage acquisition. Dependent variable is quarterly change in **credit card utilization (percent)**. Vertical bars show confidence intervals around the estimated coefficients.
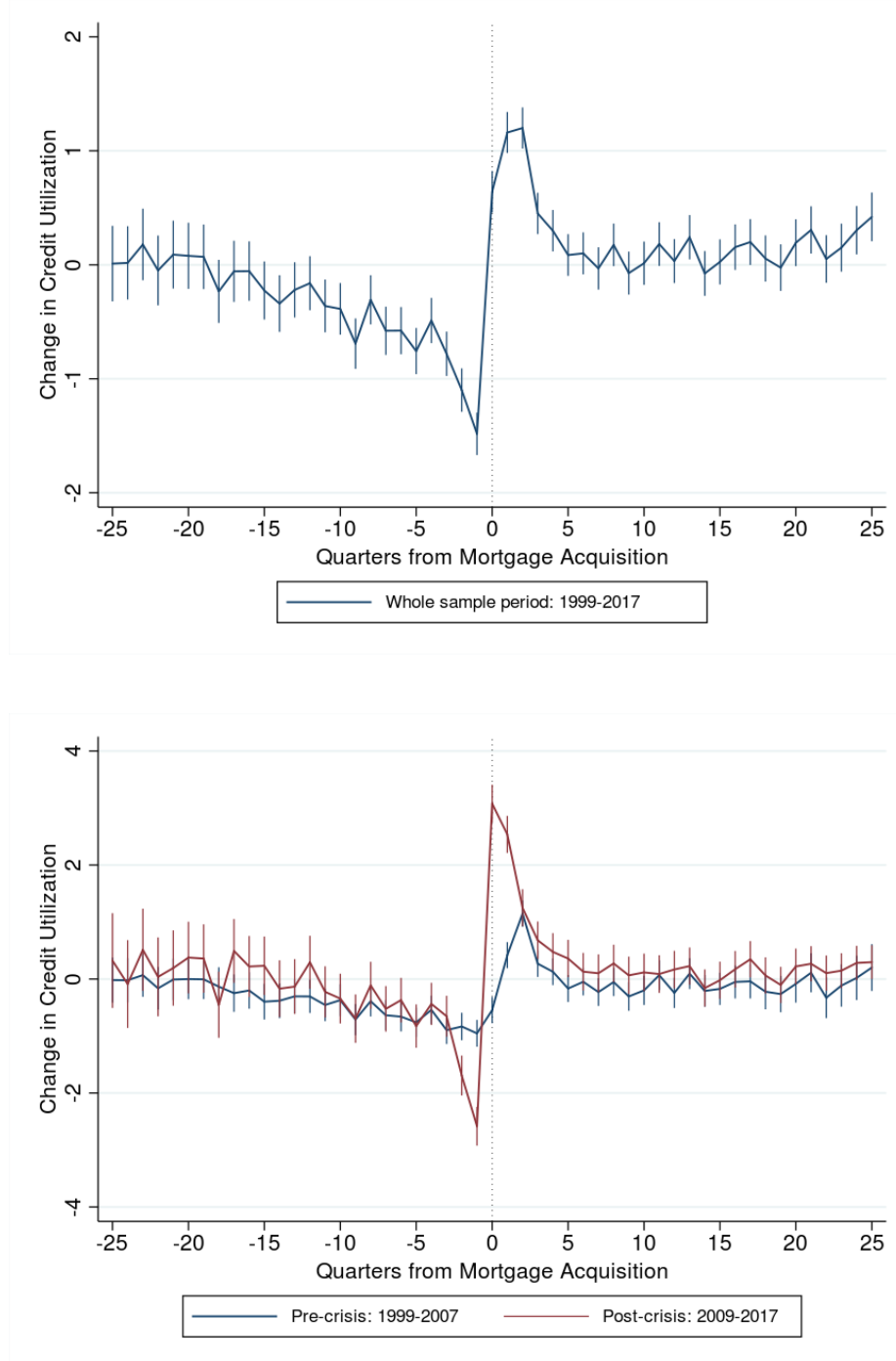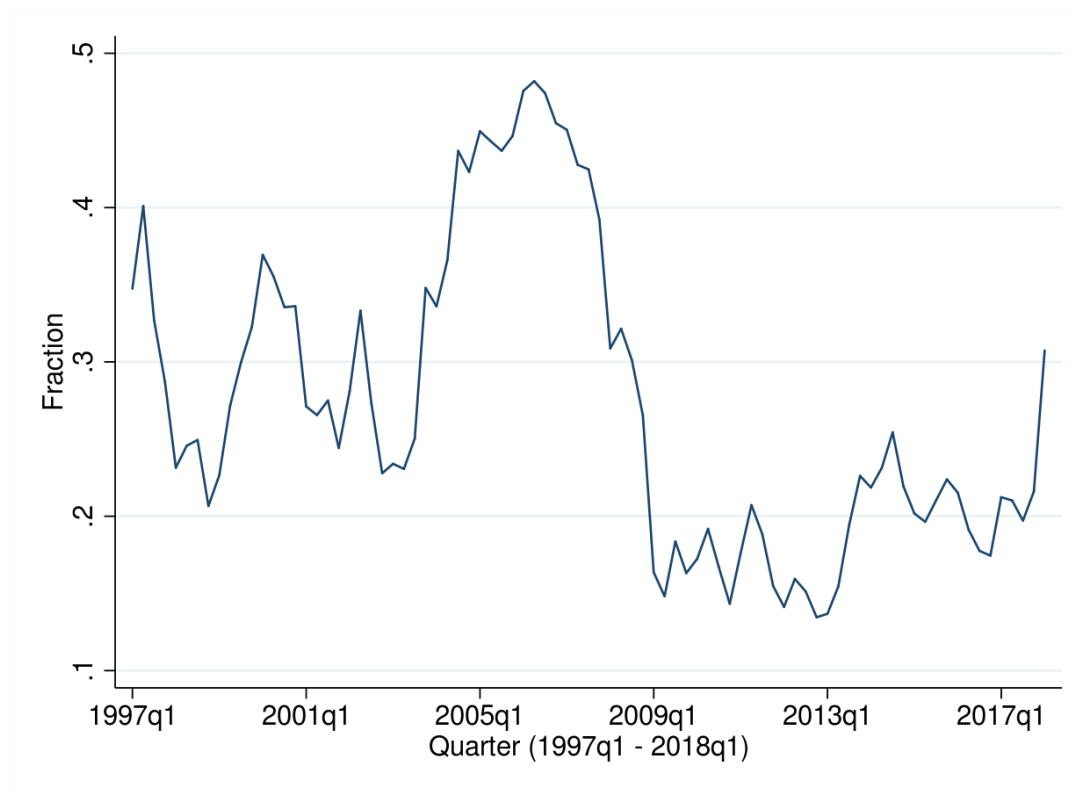
Figure 11: Predictive margins of change in utilization at different Equifax risk score levels, by pre- and post-crisis
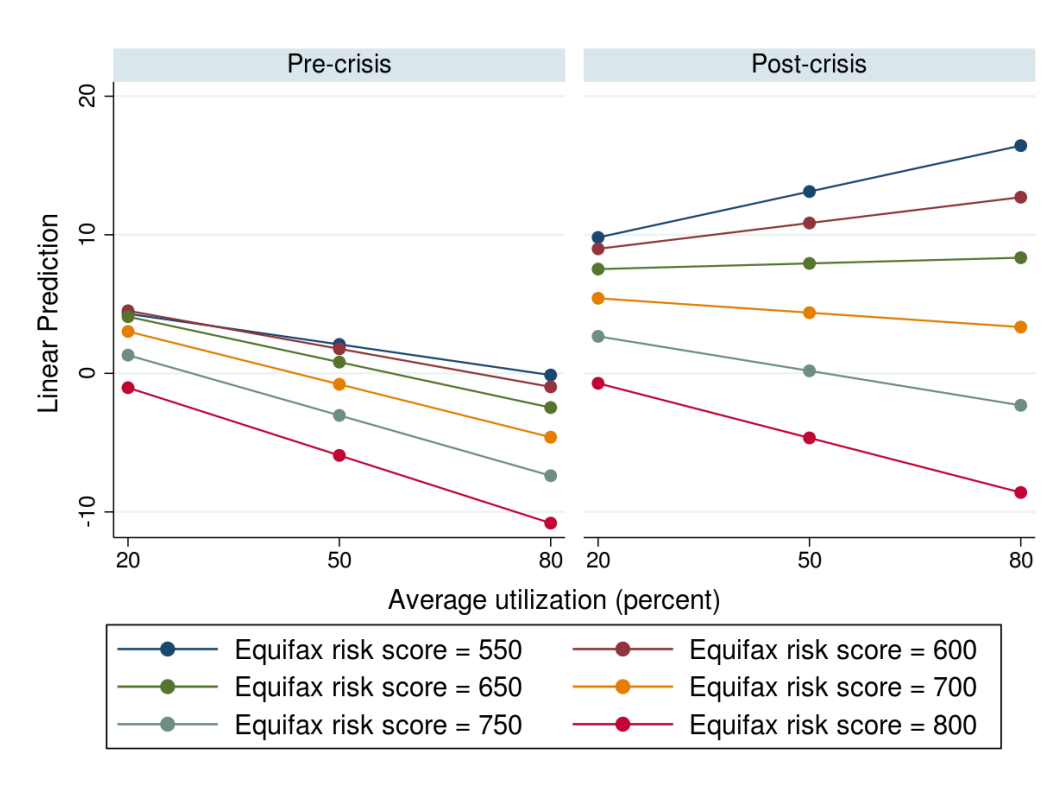
Figure 12: New HELOCs and HELOANs as a fraction of new mortgages

Note: The new HELOCs and HELOANs do not have to be for new mortgages.