

# Uncertainty and Consumer Credit Decisions

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## *Abstract*

*This paper shows that the effects of uncertainty on consumer credit decisions can be large, especially in the period around a financial crisis. These effects also vary considerably by borrower credit-risk. Among high credit-risk borrowers, increased uncertainty is associated with an increase in credit card balances, but a decrease in the size of their credit card lines. In contrast, low credit-risk borrowers reduce their balances in response to increased uncertainty, but benefit from an increase in their borrowing capacity. This evidence suggests that economic and policy-related uncertainty could independently affect economic activity, in part by shaping financial constraints across the business cycle for some kinds of borrowers.*

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## Introduction

Uncertainty abounds, affecting household and firm decision making. The recent British vote to leave the European Union created substantial uncertainty about future regulatory and economic policy in Britain and the European Union, potentially weighing on economic growth in those countries. The Fed tapering has also ignited a debate about the optimal time to reverse the expansionary measures adopted in the aftermath of the crisis due to the uncertain effects on the recovery path. This idea that fluctuations in uncertainty might drive economic outcomes has long been appreciated: Criticisms of the New Deal activism during the Great Depression mainly centered around the harmful effects of policy uncertainty on business investment (Shlaes (2008)).<sup>2</sup>

That is, well known arguments observe that economic uncertainty can increase the real option value of delaying difficult to reverse investment and hiring decisions. Uncertainty can also increase the precautionary saving motive among consumers, and these delays also impacts the economy. In addition, uncertainty can also operate through credit markets. Higher microeconomic uncertainty can affect collateral values and increase credit spreads, limiting the supply of credit to entrepreneurs and consumers (Christiano, Motto and Rostagno (2014). The mostly aggregate evidence is suggestive of these hypothesized effects.<sup>3</sup>

However, far less is known about the effects of uncertainty on households'

<sup>2</sup> The head of DuPont chemicals observed in 1938: "...there is uncertainty about the future burden of taxation, the cost of labor, the spending policies of the Government, the legal restrictions applicable to industry—all matters affecting computations of profit and loss. It is this uncertainty rather than any deep-seated antagonism to governmental policies that explains the momentary paralysis of industry. It is that which causes some people to question whether the recuperative powers of industry will work as effectively to bring recovery from the current depression as they have heretofore." – excerpted from Akerlof and Shiller (2009), pg. 72.

<sup>3</sup> The mostly aggregate evidence is suggestive of these hypothesized effects. The contemporary aggregate VAR evidence in Bloom (2009) and Caldera et. al (2016) show for example that volatility shocks might be associated with significant declines in output and employment. Bloom, Baker and Davis (2015) provide further evidence, showing that firms most exposed to the public sector might be most sensitive to political uncertainty, while Kelly, Pastor and Veronesi (2015) show that political uncertainty also affects asset prices.

behavior, and whether heightened uncertainty—usually associated with financial crises and their aftermaths—might directly affect consumer credit decisions. This is of enormous economic importance since the stock of consumer credit in the US economy is around 4 trillion dollars as of 2015. There are however at least two challenges to estimate the effects of uncertainty on households' behavior. First, uncertainty is usually measured in the aggregate. Indexes such as the VIX, which are useful to characterize the economy-wide response during turbulent times, do not provide enough micro variation to pin down the households' response. Second, uncertainty usually spikes in response to negative shocks, for instance, policy-related uncertainty usually increases after a period of weak economic activity, as governments experiment with new policies. Thus, disentangling the effect of uncertainty from the direct response to the negative shocks is difficult.

This paper develops a number of empirical tests to help overcome these challenges and provides evidence that households' consumption and borrowing decisions are indeed significantly impacted by changes in uncertainty. We first use a proprietary dataset that spans the period before the crisis (2002-2006), the 2007-2009 financial crisis, and up through 2015—a period of remarkable quiescent and unprecedented monetary and regulatory uncertainty. The dataset contains information on major credit card debt decisions and a rich set of observables such credit scores, age and zip code of residence.

We then exploit the spatial granularity available in the consumer credit data, constructing new measures of *microeconomic* uncertainty—uncertainty specific to counties and even finer geographic units. These measures are constructed to be free of aggregate first moment shocks and can allow us to more easily identify the causal impact of uncertainty on spending and debt decisions, especially when conditioning on the rich set of individual-level observables available in the data. Specifically, for each public firm, we identify the idiosyncratic component in daily excess returns by taking the residuals of standard factor regressions. We

then compute the daily industry portfolio residual returns by weighting the daily residual returns by the firms' size relative to those in the same 4 digit sectoral industrial classification code (NAIC) code, and compute the quarterly sector-specific standard deviation of these daily idiosyncratic returns. This produces a sector specific index of volatility. Finally, we draw upon the quarterly sectoral employment data to create an employment weighted index of economic volatility by county: the sector specific index of volatility is weighted by the county's employment share in that sector with a one-year lag.<sup>4</sup> Intuitively, this measure captures the uncertainty resulting from unemployment risk due to uncertain prospects of the local firms.

There is evidence that uncertainty can drive consumer credit outcomes, but there is significant heterogeneity in the response to uncertainty across individuals. For less credit-worthy borrowers, increased microeconomic uncertainty is associated with a significant increase in credit card balances, and a decline in the size of credit lines: Their credit utilization increases. In contrast, while more credit-worthy borrowers decrease credit card balances when uncertainty increases, their access to credit actually improves, when measured in terms of the size of credit card lines and the number of cards. While this pattern holds even in the 2002-2006 sample period, the effects of uncertainty are especially large during the financial crisis and its aftermath (2007-2013).

The previous tests are motivated by the idea that an increase in the uncertainty about future income prospects affect borrowing decision, however, we can complement these results by providing evidence that other sources of uncertainty, such as the risk of an increase in interest rates, also play a direct role in shaping consumer credit decisions. We build on Di Maggio et. al (2015) to exploit the plausibly exogenous timing of exposure to interest rate risk in adjustable rate

<sup>4</sup> The use of a one-year lag in the employment share is to mitigate the potential contemporaneous endogenous response of employment to uncertainty.

mortgages (ARMs) to identify the impact of uncertainty on consumer behavior. In these ARMs, the mortgage interest rate is fixed for the first 5 years, but then adjusts to prevailing short-term interest rate after this period. Thus, after the reset date, borrowers' monthly payments are determined in accordance to the changes in the three-months Treasury rates or LIBOR rate. As a result, we can take advantage of the variation in the timing of exposure to interest rate across individuals, which is predetermined some five years prior, by comparing individuals with the same type of contract and similar characteristics, who experience the rate reset at different point in time.

We find evidence that monetary policy uncertainty has a powerful impact on spending decisions as exposure to interest rate risk nears. A one standard deviation increase in the monetary policy uncertainty index developed by Baker, Bloom and Davis (2016) is associated with a 1.1 percent drop in credit card balances two months prior to the date of the interest rate reset; a 2.3 percent decline one month prior to the reset; and a 1.3 percent drop one month after reset. These reductions in balances are also more pronounced among the low credit-risk borrowers, and they are robust to most plausible controls. Interestingly, we also show that these results do not hold when we perform a similar analysis with a measure of uncertainty about fiscal policy, which highlights that the source of concern for the borrowers is indeed a potential contraction in the monetary policy measures.

Taken together, the evidence in this paper suggests that economic uncertainty might significantly affect consumption and consumer credit decisions. And that the increase in economic and policy-related uncertainty commonly observed during financial crises and their aftermath could independently impede consumption, and economic activity more generally. The heterogeneity across credit-risk types also suggests uncertainty could drive financial constraints across the business cycle for some kinds of borrowers. In section 2 of the paper we

discuss the empirical framework and data; Section 3 presents the main results and Section 4 concludes.

## **II. Empirical Framework and Data**

### *II.A Empirical Framework*

We study the impact of uncertainty on consumer debt decisions. Because mortgages, and to a lesser extent other forms of consumer credit such as credit cards, are long-term obligations that are difficult to abrogate, well known arguments suggests that the real-option value of waiting to enter into these types of contracts might be higher during periods of increased economic uncertainty.<sup>8</sup> For example, when stock market volatility is high, households, especially those with a higher fraction of their wealth denominated in stocks, might face greater uncertainty about the present value of their expected net-worth. And rather than committing to a contract requiring a series of payments extending far into the future, these households might find it optimal to reduce or altogether postpone these commitments until uncertainty abates.

The effects of uncertainty on debt decisions might also vary across individuals. For individuals with limited access to external finance, increased uncertainty about future cash flow might induce these borrowers to reduce their utilization of existing credit card lines as a hedge against the increased risk of negative income shocks. However, borrowers with plentiful sources of external finance might evince less precautionary behavior in response to increased uncertainty. Of course, access to external finance might endogenously reflect a borrower's risk aversion and past use of credit. In this case, credit worthy borrowers with access

<sup>8</sup> In the specific case of real estate, well known models also observe that aggregate uncertainty about the future value of real estate can also make it optimal for potential buyers to delay purchase or develop unused land (Titman (1985)).

to external finance might be even more sensitive to uncertainty, lowering their utilization rates when uncertainty spikes.

To be sure, uncertainty can also shape the supply of credit. Lenders might be unwilling to enter into longer term debt contracts with some types of borrowers during periods of increased uncertainty. Lenders for example might discount the present value of consumer wealth at a higher rate during times of increased uncertainty. Lenders might also ration credit more sharply during periods of increased uncertainty, limiting access to less credit worthy borrowers while increasing credit access to those perceived to be more able to repay amid increased uncertainty (Ramcharan et al., 2014).

Although economic theory posits that uncertainty might play a large role in shaping consumer debt and spending decisions, credibly identifying this relationship is difficult. This reflects the fact that second moment shocks to economic processes often coincide with first moment shocks, rendering it difficult to disentangle the effects of uncertainty on behavior from a first moment shock that might also independently shape debt decisions. For example, uncertainty might rise during recessions because a decline in economic activity might lead to a decline in information production; recessions independently affect spending decisions (Van Nieuwerburgh and Veldkamp (2006), Fajgelbaum, Schaal, Taschereau-Dumouchel (2013)). A number of other mechanisms can also generate endogenous countercyclical fluctuations in uncertainty over the business cycle (see Benhabib, Lu and Wang (2016); Ludvigson, Ma and Ng (2016); and the discussion in Kozeniauskas, Orlik and Veldkamp (2016)). While the mechanisms vary, a common theme in these theoretical arguments is that any empirical relationship between uncertainty and consumer debt decisions can easily be spurious.

To help address these challenges, we turn to detailed microeconomic data on consumer debt decisions from a one percent random sample of the NY Fed's

Equifax Consumer Credit Panel (CCP). With these data we can measure with relative precision the impact of uncertainty shocks on individual debt decisions over time, holding constant a number of important characteristics such as the individual's level of risk aversion and other potentially time invariant preferences, along with credit access indicators and age. Because of this level of detail, we can control for a myriad of aggregate and local economic conditions—first moment shocks—that might covary with uncertainty.

The spatial granularity available in the data also allows us to develop more relevant measures of uncertainty based on the individual's location. That is, beyond studying the impact of *macro* uncertainty on behavior, we can also construct measures of *micro* uncertainty—uncertainty specific to counties and even finer geographic units. These measures are likely free of aggregate first moment shocks and can allow us to more easily identify the causal impact of uncertainty on spending and debt decisions. The individual level data also allow us to trace out heterogeneous responses to uncertainty shocks, again helping us make progress in understanding the underlying mechanisms that might drive an individual's response to uncertainty.

Data from Black Box Logic merged with Equifax (BBL) provides more direct causal evidence of the impact of uncertainty on consumer behavior. The BBL dataset consists of borrowers with adjustable rate mortgages (ARMs) originated between 2005 and 2007. These contracts have a fixed interest rate for the first 5 years. After this initial 5 year period, borrowers become directly exposed to interest rate risk: The ARM resets to the prevailing short term interest rate index on the first month of the 6th year, and then continues to adjust either every 6 months or every 12 months thereafter.

We can use this data generating process to study the response of the individual's monthly credit card balances to uncertainty in the period around the interest rate reset (Di Maggio et. al (2016)). And because the variation in the

exposure to interest rate across individuals is predetermined some five years prior, these responses are likely to reflect the causal impact of uncertainty on spending behavior. This identification strategy—the focus on the change in interest rate exposure—also suggests very specific sources of uncertainty and first moment controls. Monetary policy uncertainty for example is likely to be most relevant for consumer decision making when interest rate exposure is imminent; conversely, health care uncertainty should be largely irrelevant for spending decisions in this context. We next describe the various datasets before turning to these specific tests.

## *II.B Data*

### *Credit Decisions: NY Federal Reserve's Equifax Consumer Credit Panel and Black Box Logic*

We draw a two percent sample from the New York Federal Reserve's Equifax Consumer Credit Panel (Equifax). This is a balanced panel of about 220,000 individuals, and includes comprehensive quarterly information on key dimensions of debt usage: mortgage and home equity credit lines, automotive, and credit card balances, as well as credit limits from 2002-2013. The panel also includes information on age; census tract of the primary residence; and the Equifax Risk Score --an important credit scoring index commonly used in credit decisions; higher values suggest less risk credit risk. In what follows, we primarily use data on mortgage and home equity credit lines—mortgage credit—and on credit card balances and lines—consumer credit.

Table 1 reports basic summary statistics for some of the individual variables, observed in 2008 Q1 from the Equifax and Black Box Logic (BBL) panel. The Equifax panel is more representative of the general credit-using population, and contains information on non-homeowners and homeowners alike. The average

credit card limit in Equifax is around \$13,500 while the average credit card balance is a little less than half that number. The average utilization rate, the ratio of balances to limits, is around 70 percent. The average age, around 48, is higher than the US average; and the typical risk score is just under 700—well above the traditional subprime cutoff of 660 for mortgage credit.

Unlike Equifax, Black Box Logic contains a richer set of data but for homeowners with prime credit. Vantage scores—similar to but distinct from Equifax Risk Scores—are significantly higher, with the average around 740. The mean credit card limit and balance are also much higher than the more general population surveyed in Equifax, but utilization rates are much lower. Mortgage balances are also much higher among the BBL ARM sample. Unlike Equifax, BBL also contains mortgage contract loan terms. These loans were contracted during 2005-2007 and the mean interest rate is around 5.8 percent, with LTV ratios averaging 77 percent.

The panel in Figure 1 plots the median outcomes for these variables over the crisis and post crisis sample period (2008 Q1-2013Q4) among the set of individuals with positive balances for both the more general Equifax dataset and the BBL data. There are differences across the two samples, likely reflecting the different economic circumstances of the median individual across the two datasets ((Di Maggio et. al (2016)). In both datasets for example, utilization rates decline sharply with the crisis, but this rate recovers after the recession in the Equifax data, but it continues to decline in the BBL dataset, potentially due to the mortgage debt overhang after the housing crisis.

#### *Uncertainty*

The VIX—the implied volatility of the S&P 500 stock market index--along with the policy-related economic uncertainty index developed by Baker, Bloom and Davis (2016) (BBD Index) are two standard measures of aggregate financial and policy-related uncertainty used in the literature. The BBD Index is built on

components that quantify newspaper coverage of policy-related economic uncertainty; reflects the number of federal tax code provisions set to expire in future years; and finally uses disagreement among economic forecasters as a proxy for uncertainty.<sup>9</sup>

In some specifications, we also use a related index from [policyuncertainty.com](http://policyuncertainty.com) based on categories of economic policy uncertainty pulled solely from newspapers. The subcategories include: monetary policy; taxes; health care; national security; entitlement programs; regulation; financial regulation; trade policy; and sovereign debt crises. As Figure 2 shows, the three series are positively correlated at the quarterly level, but they do seem to measure somewhat different aspects of uncertainty.<sup>10</sup> The BBD index for example increased sharply in the second half of 2011 and part of 2012, while financial volatility, the VIX, remained very low during this period.

To illustrate the potential relationship between uncertainty and credit decisions, we use the Equifax dataset to compute the fraction of individuals that obtain a first mortgage in each quarter from 2008-2013. Figure 3 plots the partial correlation between this fraction and the VIX over the 24 quarters, after controlling for first moment shocks through the average daily change in the S&P 500 computed over the quarter. Increased uncertainty is associated with a significant decline in the use of mortgage credit. Individual-level regressions in Table 1 of the Internet Appendix (Table IA1) also suggest a negative relationship between aggregate uncertainty and the use of mortgage credit at the extensive margin.

However, because countercyclical movements in aggregate uncertainty makes it difficult to interpret the relationship in Figure 3, we develop a time varying

<sup>9</sup> More details can be found at [policyuncertainty.com](http://policyuncertainty.com)

<sup>10</sup> The correlation coefficient for the VIX and the BBD index (EPU Index ) is 0.32 (0.38). The correlation coefficient for the BBD and EPU indices is 0.5.

county-level measure of economic uncertainty that is likely free of aggregate credit market and other first moment shocks—henceforth referred to as *micro* uncertainty. For each public firm, we first remove the systematic component in daily excess returns by regressing excess stock returns on a standard three factor model: returns of the S&P 500 index, the book to market ratio, and relative market capitalization (Fama and French (1992)). The residuals from these regressions are unlikely to include aggregate first moment shocks, such as time-varying shocks to financing constraints, but instead likely reflect firm-level idiosyncratic shocks.<sup>11</sup>

In the second step, we compute the daily industry portfolio residual returns by weighting the daily residual returns of firms by their relative size among firms in the same 4 digit sectoral industrial classification code (NAIC) code—the firm’s relative market capitalization.

In the third step, we calculate the quarterly sector-specific standard deviation of these daily idiosyncratic returns ((Gilchrist, Sim, & Zakrajšek, 2014)). This produces a sector specific index of volatility. The final step draws upon the quarterly sectoral employment data from the Quarterly Census of Employment and Wages (QCEW), which lists employment in each county by the 4 digit NAIC. In this step, we use the QCEW data to create an employment weighted index of economic volatility by county: the 4 digit NAIC sector specific index of volatility is weighted by the county’s employment share in that sector with a one-year lag. The use of a one-year lag in the employment share is to mitigate the potential contemporaneous endogenous response of employment to uncertainty.

<sup>11</sup> The literature on firm financial constraints is large, and offers a diverse range of approaches to measuring financial constraints. See for example Faulkender and Petersen (2006); Farre, Mensa and Ljungqvist (2014); Fazzari, Hubbard and Petersen (1988); Hoshi, Kashyap and Scharfstein (1991); Kaplan and Zingales (1997); Whited and Wu (2006). Generally the relative size of a firm is one common proxy for its ability to access external finance (Hadlock and Pierce (2010)).

Along with this second moment index, we also construct the first moment analog: The weighted mean idiosyncratic stock returns at the county level—henceforth referred to as micro returns. For each sector, we compute the sectoral daily weighted residual returns by weighting each firm’s residual returns by its relative market capitalization within the sector at a daily frequency. We then take the average of the sectorial returns over a quarter to obtain the quarterly mean residual returns for the sector. As before, we then map these sector level weighted idiosyncratic returns into the local economy by weighting the sectoral returns by the lagged employment shares at the county level. We can thus study the impact of local or micro uncertainty on debt decisions, after controlling for first moment local shocks.

The resulting time-varying county-level index of uncertainty is likely to be a more powerful measure of the uncertainty relevant for a household than the VIX. There is now for example substantial evidence of home bias in portfolio holdings, as individuals, and even professional money managers tend to disproportionately weight geographically proximate companies in their portfolios ((DeMarzo, Kaniel, & Kremer, 2004), (Hong, Kubik, & Stein, 2005), (Grinblatt & Keloharju, 2001), Pool, Stoffman and Yonker (2015)). Therefore, if a household’s equity holdings are weighted towards geographically proximate, then aggregate stock market volatility is likely to be a relatively less informative measure of uncertainty in the presence of this portfolio home bias.

Beyond the portfolio channel, the micro uncertainty index is also likely to measure far better uncertainty about future labor income when compared with aggregate financial market volatility. Equally important, because the micro uncertainty measure is derived from daily idiosyncratic returns, it is unlikely to contain aggregate shocks that shape mortgage credit conditions and general credit supply, especially when compared to the VIX, which often reflects first moment shocks to financial markets.

Figure 4 compares the aggregate VIX and the micro uncertainty index. It plots the time variation in the micro index at different points in its distribution—the 10<sup>th</sup>, 50<sup>th</sup> and 90<sup>th</sup> percentiles in each quarter—along with the VIX. While the 2008-2009 crisis is associated with a significant increase in uncertainty and a concomitant spike in the VIX, county-quarter observations at the 10<sup>th</sup> percentile of the local index experienced a far smaller increase in the index. The 90<sup>th</sup>-10<sup>th</sup> percentile spread in the micro index also increased by a factor of three, suggesting that because of differences in their employment structures, some counties were far more exposed to the crisis and fluctuations in economic uncertainty than others.

The simple correlations in the Table 2 also reveal more of this heterogeneity. Movements in the VIX are correlated positively with all three series, especially during the crisis period. But restricting the sample to the post 2009 period, movements in the micro uncertainty index at the 10<sup>th</sup> percentile are actually negatively correlated with the VIX and the BBD index. That is, for some counties, the micro uncertainty index does not mirror mechanically aggregate uncertainty, but likely contains information about uncertainty relevant for the local area. Also, Table IA2 shows that the variation in micro uncertainty is not mechanically related to local first moment shocks like the unemployment rate or other indicators of economic activity in the county. We next use this heterogeneity in the micro uncertainty index to understand the impact of uncertainty on credit decisions.

### **III. Main Results**

Table 3 examines the impact of micro uncertainty on consumer debt decisions. The sample period, 2002Q1-2015Q4, encompasses the financial crisis and its immediate aftermath. All specifications control for individual-level observables such as age, and the Equifax Risk score (with one-year lag), along with individual

fixed effects and year-by-quarter fixed effects. We also control for local weighted returns at the county-level—the first moment analog to the 4-digit NAIC based micro uncertainty index.

In column 1 of Table 3, the dependent variable is the log of the individual's credit card balance in the quarter. We also control for the individual's debt capacity using the log of the credit line in that quarter as a regressor. The coefficient on the micro uncertainty variable is negative but not statistically different from zero. The coefficient itself suggests that a one standard deviation increase in uncertainty is association with a 1 percent drop in credit card balances.

But a number of well known arguments observe that the individual-level response to uncertainty is likely to vary significantly by credit risk, and this heterogeneity could mask the effects of uncertainty on consumer debt decisions. Individuals with high Risk scores are generally viewed as more creditworthy, and these individuals generally obtain credit more cheaply, and are far less likely to face credit rationing from lenders. If anything, when lenders contract credit supply in response to economic shocks, they often do so selectively by disproportionately rationing riskier borrowers. Thus, for high Risk score borrowers, changes in the use of credit is more likely to reflect the decisions of these borrowers—changes in demand—rather than the effects of uncertainty operating through the actions of lenders.

Reputation effects are also likely to make these borrowers even more sensitive to uncertainty (Chatterjee et.al, 2007). Because high Risk score borrowers enjoy less rationing and cheaper credit access on account of their score, any increase in uncertainty that raises the likelihood of default or non-payment would be especially costly for these borrowers, as default or non-payment would lower their Risk score and substantially raise the cost of credit for these borrowers. Therefore, even if lenders made credit more easily available to these borrowers during periods of increased uncertainty, reputational concerns would make it more

attractive for these borrowers to limit their use of credit until uncertainty diminishes.

In addition, high Risk score borrowers might have earned their reputation for creditworthiness on account of their higher levels of risk aversion compared to other types of borrowers, and this increased risk aversion would again make these borrowers especially sensitive to uncertainty. Finally, high Risk Score borrowers are also more likely to own financial assets, and we would expect these consumers to be most sensitive to any financial market based measure of uncertainty. Taken together, these arguments suggest that if our results reflect the effects of uncertainty on consumer behavior, then the impact of uncertainty on consumer credit decisions should differ significantly by Risk Score.

To measure these potential differences, we create an indicator variable that equals one if a borrower's Risk score is above the median (732) and zero otherwise. We then interact this variable with both the micro uncertainty measure, as well as the local weighted returns variable; all variables are linearly included in the specifications as well. The interaction terms measure whether the impact of uncertainty differs across borrowers with "high" or above median Risk scores. As before, we control linearly for the log of age and the previous year's risk score and employ individual-level fixed effects and cluster standard errors at the state-level.

Column 2 reveals dramatic differences in the response to uncertainty between high and low risk borrowers. For borrowers below the median Risk score, a one standard deviation increase in micro uncertainty is associated with a 4.8 percent increase in credit card balances. However, a similar increase in uncertainty suggests a 5.5 percent drop in credit card balances for above median Risk Score borrowers. That is, while low risk borrowers respond to increased uncertainty by reducing their credit card balances, higher risk borrowers appear to do the opposite.

The results in columns 3-5 suggest that these differences are not driven mechanically by differences in the supply of credit across the two groups. If anything, these results suggest that low risk borrowers appear to benefit from an increase in credit access when uncertainty increases. The dependent variable in column 3 is the log of the credit limit. In this case, for the below median Risk score borrower—high risk borrowers—increased uncertainty is associated with a decline in the size of the credit limit, reflecting both perhaps lenders reducing their exposure to these borrowers and consolidation on the part of these borrowers themselves: A one standard deviation increase in micro uncertainty is associated with a 8.2 percent drop in credit lines. However, for low risk borrowers—those above the median Risk score—such an increase in uncertainty is associated with a 4.7 percent increase in the size of credit lines.

Column 4 uses the log of the number of credit cards as the dependent variable. In this case, while the micro uncertainty coefficient is different across the two groups, it is not statistically significant. However, the impact of micro uncertainty on credit card enquiries initiated by consumers is different across the two groups. While these enquiries decline among the High Risk types, it increases among Low Risk borrowers when micro uncertainty increases.

The financial crisis and the period afterward saw unprecedented experimentation in monetary policy and large scale regulatory changes to the financial system, including regulations that govern consumer credit. It was thus a period of extraordinary uncertainty. Therefore, while the baseline evidence suggests that uncertainty might help drive consumer credit decisions, we use this empirical framework to study the impact of the extraordinary increase in uncertainty during the financial crisis in driving credit decisions.

In Table 4, the sample period is 2007Q1-2013Q4. Compared to the full sample, Column 1 reveals even bigger differences in the response to uncertainty between high and low risk borrowers during the financial crisis. For borrowers below the

median Risk score, a one standard deviation increase in micro uncertainty is associated with a 6.7 percent increase in credit card balances. However, a similar increase in uncertainty suggests a 7.7 percent drop in credit card balances for above median Risk Score borrowers. That is, while low risk borrowers respond to increased uncertainty by reducing their credit card expenditures, higher risk borrowers appear to do the opposite.

As before, the results in columns 3-5 suggest that these differences are not driven mechanically by differences in the supply of credit across the two groups. If anything, these results suggest that low risk borrowers appear to benefit from an increase in credit access when uncertainty increases. The dependent variable in column 3 is the log of the credit limit. In this case, for the below median Risk score borrower—high risk borrowers—increased uncertainty is associated with a decline in the size of the credit limit, reflecting both perhaps lenders reducing their exposure to these borrowers and consolidation on the part of these borrowers themselves: A one standard deviation increase in micro uncertainty is associated with a 10.45 percent drop in credit lines. However, for low risk borrowers—those above the median Risk score—such an increase in uncertainty is associated with a 4.02 percent increase in the size of credit lines.

Column 4 uses the log of the number of credit cards as the dependent variable. Among high risk borrowers, a one standard deviation increase in uncertainty is associated with a 1.1 percent decline in the number of active cards. But among the above median Risk score individuals, the implied impact suggests a 0.8 percent increase in the number of cards. Increased uncertainty is also associated with a decrease in the number of credit applications among the high risk borrowers, but an increase among the low risk borrowers. Therefore, while increased uncertainty appears to be associated with an increase in spending and a decline in consumer debt capacity among the less credit worthy borrowers—an increase in credit utilization—the exact opposite appears to be the case for low risk borrowers.

as the period encompasses the financial crisis, To gauge the extent to which these results might generalize, Table 4 focuses on the relatively quiet 2002Q1-2006Q4 period. The effects of uncertainty on credit decisions remain statistically significant, but the economic magnitudes are much smaller. From column 1 for example, a one standard deviation increase in the micro index is associated with a 4.7 percent increase in credit card balances among the high risk group—an effect about 2 percentage points less than that observed during the 2007-2013 period.

Similarly, in the 2002-2006 sample, we also see a decline in balances among the high Risk score individuals, but this effect is about 4 percentage points less than the 2007-2013 sample. The remaining columns of Table 4 also suggests far smaller effects of uncertainty on credit decisions during the 2002-2006 period. For example, in column 2, a one standard deviation increase in the micro uncertainty index suggests a 4.3 percent decline the size of these lines—6 percentage points less than in 2007-2013; and the implied increase in credit lines among the high Risk score borrowers is about half that of the crisis sample. Taken together, these results suggest that while uncertainty features in consumer credit decisions, its effects might be especially strong during a financial crisis and its aftermath.

However, while we have controlled for a number of potential first moment shocks at the county level, these results could still reflect the fact that the micro uncertainty measure observed at the county level might be systematically related to aggregate first moment shocks or aggregate uncertainty itself. In Table IA3, we interact the “Low Risk Borrower” indicator variable with a veritable kitchen sink of aggregate variables: GDP growth, the 3 month and 10 year Treasury rates; the VIX, the BBD and EPU indices, along with their various subcomponents. Throughout, our main results remain unchanged: Increased micro uncertainty is associated with increased credit utilization and relatively less credit access among riskier borrowers.

Because the micro uncertainty measure is derived from financial market volatility, differences across individuals in their exposure to equity and financial markets can further identify the impact of uncertainty on consumer credit decisions. This approach is motivated by the fact that for individuals whose net worth is mainly comprised of financial assets, increased financial volatility or political uncertainty will likely have a bigger impact on their net worth. And as uncertainty over their own net worth increases, standard arguments observe that these individuals would then be more likely to postpone entering into longer-term debt contracts like mortgages and other credit arrangements. In contrast, for individuals whose net worth contains relatively little financial assets, their credit decisions might be less sensitive to economic uncertainty, as measured by the fluctuations in price of financial.

Unfortunately, while the Equifax panel includes rich information on liabilities, it contains no data on assets. We can however construct indirect tests of this hypothesis by matching zip code level tax data from the IRS to the location of the individual in the Equifax panel. For each zip code, the IRS reports the number of income tax returns, total income from salaries and wages; and importantly, total income from ordinary dividends and net capital gains. Using this data, we can compute the ratio of dividends and net capital gains to total adjusted income.

In cases where individuals have little exposure to financial markets, this ratio is likely to be close to zero in those zip codes. While in zip codes where individuals have larger financial portfolios, we would expect this ratio to be larger. We use the 2005 tax year version of this dataset. There is substantial variation in this ratio across zip codes. For the median zip code in the sample, capital gains and ordinary dividends account for about five percent of adjusted gross income. But in the top decile, this ratio more than doubles, while in the bottom decile of zip codes, the ratio of net capital gains and ordinary dividends to adjusted gross income is about 1.5 percent.

Moreover, to help overcome the absence of assets data in Equifax and measure better an individual's potential exposure to uncertainty, we match the tax data to both zip code and age. There is considerable evidence that exposure to equity markets fluctuates over the life cycle. Agents gradually accumulate assets early in their life cycle, increase their exposure to equity markets mid-life, and then gradually dissave and shift their portfolios towards less risky assets during and nearing retirement. Individuals in mid-life then would likely be maximally exposed to equity market based measures of uncertainty. And if our results reflect the impact of financial market uncertainty on debt decisions, then we would expect that individuals in their 40s and 50s who live in an above median zip code should evince the greatest sensitivity to equity market uncertainty.

To implement this test, we create indicator variables for whether an individual lives in a zip code with an above median ratio of capital gains and dividend income to adjusted gross income. We then interact this indicator with the uncertainty and weighted returns indices. Because this tax ratio might proxy for income differences, we also create an analogous indicator for whether an individual lives in a zip code with an above median income, and create interaction terms based on this variable as well. We then estimate separately this specification by age categories.

The estimates from these specifications are in Table 5. They suggest that exposure to financial markets might be another key channel through which this source of uncertainty might affect credit decisions. In particular, we focus on the log of credit card balances, where we continue to control for borrowing capacity and the other baseline controls in Table 3, column 2. An increase in micro uncertainty is associated with a significant decline in credit card balances among individuals in their 50s—those likely to be at the peak of their exposure to financial markets—as well as among individuals in their 70s—those most likely to be retired and dependent on financial markets for their income. During the

period 2002-2006, these results vanish (Table 6), suggesting again that the effects on uncertainty on credit decisions might be especially powerful during a financial crisis and its aftermath.

### **III. Identification through Mortgage Contract Design**

The accretion of evidence suggests that economic and policy-related uncertainty likely impact a range of consumer debt decisions. This basic result appears robust to a range of plausible controls, and the impact of uncertainty appears most pronounced among those populations likely to be most susceptible to our measure of uncertainty: high risk borrowers, or those most exposed to financial markets. However, while the micro uncertainty measure is likely free of aggregate first and second moment shocks, its variation is non-random and we cannot be certain whether these results reflect uncertainty, related county-level first moment shocks or some other unobserved feature of decision making. Even if these results reflect the causal impact of uncertainty, it possible that they might be specific to the form of uncertainty used in the analysis, and may not generalize easily to other uncertainty measures.

To address these concerns, we turn to the exogenous timing of the interest rate resets in a large panel of adjustable rate mortgage (ARMs) contracts to isolate better the causal impact of economic uncertainty on individual spending decisions (DiMaggio et. al (2016)). Specifically, our sample consists of borrowers with adjustable rate mortgages (ARMs) originated between 2005 and 2007. These contracts have a fixed interest rate for the first 5 years. After this initial 5 year period, borrowers become directly exposed to interest rate risk: The ARM adjusts to the prevailing short term interest rate index on the first month of the 6th year, and then continues to adjust either every 6 months or every 12 months thereafter.

The design of these adjustable rate mortgage contracts help to causally identify the role of uncertainty. First, because the decision to obtain a mortgage in our sample precedes current spending and credit decisions by some five years, it is unlikely that the home buying decision along with the choice of mortgage contract is systematically made in anticipation of the current economic environment and prevailing levels of economic uncertainty. Second, because the precise timing of an individual's exposure to interest rate risk in these ARMs is contractually predetermined, current uncertainty shocks and credit and spending decisions are unlikely to determine the timing of this exposure. That is, borrowers in our sample do not systematically time or select their exposure to interest rate risk in anticipation of near-term uncertainty or other economic and policy shocks.

We can therefore exploit the plausibly exogenous variation in the timing of an individual's exposure to interest rate risk within a difference-in-difference framework in order to identify the impact of uncertainty on credit decisions. In particular, let  $S_t$  denote some time varying vector of uncertainty in month  $t$ , and let  $y_{it}$  denote individual  $i$ 's credit card balance in month  $t$ . The indicator  $R_{it+0}$  equals one if individual  $i$ 's first interest rate reset--the beginning of the individual's exposure to interest rate risk--occurs on that specific date  $t$ ; similarly,  $R_{it+1}$  equals one in the month after the first reset and zero otherwise and  $R_{it-1}$  is an indicator for the month just before the reset.

We then estimate the following difference-in-difference specification:

$$y_{it} = \sum_{j=-\tau}^{\tau} \alpha_j S_t R_{it+j} + \sum_{j=-\tau}^{\tau} \beta_j R_{it+j} + X_{it} \Phi + \eta_t + \theta_i + \varepsilon_{it}$$

The vector  $X_{it}$  contains time-varying individual level observables such as the interest rate on the loan, as well as the log of monthly mortgage payments and the

log of credit card limits—the individual’s maximum borrowing capacity. Individual-level time invariant characteristics are absorbed in the individual fixed effect  $\theta_i$  and aggregate shocks are linearly captured in year by month fixed effects  $\eta_t$ ; note that  $\eta_t$  absorbs the linear impact of  $S_t$ .

The parameters  $\alpha_j$  measure the response of the individual's monthly credit card balances to uncertainty in the period  $\tau$  months before and after the interest rate reset. We would expect that as direct exposure to interest rate risk nears—the reset date approaches—borrowers’ spending decisions are likely to become increasingly sensitive to some forms of uncertainty. For example, an increase in monetary policy uncertainty in the months before the reset increases the variance of the distribution of possible interest rate resets, and thus the variance of future possible monthly payments and disposable income. Given this increase in the variability of future disposable income, we are likely to observe an increase in precautionary savings and a concomitant decline in credit card balances until the uncertainty is resolved.

The exact timing of these responses likely depends on the extent to which individuals anticipate the reset date, pay attention to uncertainty, and can adjust easily their consumption plans. Mortgage servicers are required to send notices to borrowers about the future reset of interest rates 2 to 8 months in advance, and so borrowers are likely to be aware of the reset beforehand and are faced with the uncertainty of future interest rate changes until the reset occurs. In addition, if individuals perceive uncertainty shocks to dissipate rapidly with time, affecting the distribution of short-term rates only in the very near term, then it can be optimal to ignore uncertainty until very close to the reset date.<sup>12</sup> Likewise,

<sup>12</sup> For the various measures of uncertainty, Table IA4 reports the results from a series of 6th order autoregressive models using monthly data. For some types of uncertainty, there is evidence of persistence, but this is limited to the two month horizon. That is, while some types of uncertainty might be forecastable, these simple AR(6) models suggest that this forecastability might be limited, at least beyond the two month horizon.

liquidity constraints or habit persistence could also delay any consumption response to the uncertainty shocks as the reset date nears.

That said, given the plausibly exogenous variation in the timing of the reset across individuals, estimates of  $\alpha_j$  likely reflect the causal response of credit usage to uncertainty. But heterogeneity across uncertainty measures also adds to the credibility to our approach. If indeed our results reflect the effects of higher uncertainty and a resulting increase in the variance of future disposable income outcome, then monetary policy uncertainty should have the most powerful effect on consumption decisions in the period around first exposure to interest rate risk. In contrast, when  $S_t$  measures uncertainty related to policies less likely to affect directly short-term interest rates such as health care, estimates of  $\alpha_j$  should be economically and statistically insignificant.

The results from estimating equation 1 are in Table 7. In keeping with the idea that monetary policy uncertainty should have the largest impact on behavior around the reset date, column 1 uses the Baker, Bloom and Davis (2016) monthly monetary policy uncertainty index (MPU). This index is derived from newspaper mentions of monetary policy topics—Federal Reserve; quantitative easing etc.—and uncertainty words. The difference-in-difference framework focuses on the 6 months around the reset.

Column 1 suggests that an increase in monetary policy uncertainty is associated with a significant decline in credit card balances beginning two months before the reset date, and continuing up to two months afterwards; the effects however peak in the month just before the reset, and the economic magnitudes are large. A one standard deviation increase in the MPU index is associated with a 1.1 percent drop in balances two months prior to the reset; a 2.3 percent decline one month prior; and a 1.3 percent drop one month after reset. Effects are also detectable up

to two months afterwards, where a standard deviation increase in MPU suggests a 1.3 percent drop in credit card balances.

Rather than reflecting the direct effects of monetary policy uncertainty, the results in column 1 could be driven by actual movements in the interest rate that coincide with movements in the MPU index. In column 2, we include analogous interaction terms for the mean 3-month Treasury rate. The MPU results are unchanged. As a further robustness check, column 3 includes interaction terms with the 10-year Treasury rate. If anything, the estimated impact of uncertainty appears somewhat larger after controlling for the 10-year rate. Mean interest rate movements do not appear to drive the MPU results and columns 4 and 5 next control for realized interest rate volatility using the monthly standard deviation of the three-month Treasury computed daily (column 4) and the 10 year Treasury (column 5). The evidence continues to strongly suggest that increased MPU around the reset date, especially the month before the reset, tends to have a large negative impact on credit card balances.

More so than other types of uncertainty, we have seen that the MPU index is significantly related to interest rate movements. But measures of economic and policy uncertainty can be highly correlated, and these results could reflect more general economic uncertainty rather than monetary policy uncertainty. For example, the correlation between the MPU measure and the VIX is 0.43, as equity market volatility can also be highly sensitive to monetary policy uncertainty. And both the VIX and the MPU index are likely proxies for the monetary policy uncertainty.

Nevertheless, despite the potential for multicollinearity, column 1 of Table 8 adds the VIX and the related reset-timing interaction terms to the baseline specification (column 1, Table 7). The coefficient on the VIX is negative and statistically significant in the months immediately around the reset. In the month of reset for example, a one standard deviation increase in the VIX is associated

with a 4 percent decline in credit card balances. The impact of the MPU is generally negative. We next consider a range of categorical policy-related uncertainty measures. Column 2 uses the broad monthly fiscal uncertainty measure computed by Baker, Bloom and Davis (2016), while column 3 employs the financial regulation uncertainty index gleaned from newspapers.

The general fiscal policy uncertainty index in column 2 enters with a small negative sign, while the financial regulation index (column 3) has positive sign. The MPU variable is however little changed. The remaining columns of Table 8 uses a range of indices measuring different facets of policy uncertainty. As the source of uncertainty becomes less relevant for the distribution of near term short run interest rates—health policy for example—the estimates of  $\alpha_j$  decline in economic and statistical significance. The impact of monetary policy uncertainty remains broadly stable across these various specifications.

Using the 5-year ARM contract design helps facilitate causal inference, as the identification strategy exploits the plausibly exogenous timing of the reset, and is arguably robust to the nonrandom selection into specific types of mortgage contracts. But the specific nature of the contract itself might make it difficult to generalize these results. Individuals that select into ARMs might for example also have a different consumption profile. To assess this argument, we combine the 5 year ARM sample with borrowers holding 10 year ARMs. The latter borrowers also elected to use longer-term ARMs to finance their home purchases, and we can use this sample as a control group to help gauge the robustness of these results. From the final column of Table 9A, the impact of MPU index remains unchanged.

Column 2 of Table 9A returns to the baseline specification (column 1 of Table 7) but instead of credit card balances, it uses the log of retail balances—Macy’s and other store credit cards. We control for the log of the retail card limit. As with

credit card balances, there is evidence that these balances become more sensitive to uncertainty in the six months around the reset date. From column 3, an increase in uncertainty is also associated with a decrease in the probability of buying a car in the month of the reset; the coefficient is however positive three months prior.

Table 9B aggregates the data to the quarterly level and considers additional robustness tests. Instead of monetary policy uncertainty, column 1 uses the quarterly micro uncertainty index. There is evidence that this source of uncertainty might also be relevant for credit decisions as interest rate exposure nears. The point estimate suggests that a one standard deviation increase in the micro uncertainty measure is associated with a 4.8 percent decline in credit card balances in the quarter before reset. Column 2 includes the MPU index, aggregated up to the quarterly level along with the micro uncertainty measure. The main results are little changed. Finally, disagreement in CPI forecasts among professional forecasters is another common measure of monetary policy uncertainty. This data is available quarterly, and column 3 suggests that increased disagreement might be associated with a less spending in the period around the reset.

The more general Equifax results indicate that low credit-risk borrowers tend to disproportionately curtail spending in response to increased uncertainty, perhaps in part to protect their valuable credit scores. Table 10 examines this hypothesis within the context of the Black Box Logic data. Column 1 estimates the baseline difference-in-difference specification (column 1 of Table 7) for above median Vantage score borrowers; column 2 of Table 10 repeats the exercise for the below median subsample. As before, the credit card usage of borrowers with above median credit risk scores appear significantly more sensitive to uncertainty than those with below median scores. If anything, in the months after reset, the below median subsample actually evinces a positive response to uncertainty. A related exercise estimates separately the baseline specification for borrowers with above

median loan to value ratios (column 3) and below median leverage ratios (4). Large interest rate resets will likely have a bigger impact on the balance sheet of more leveraged borrowers, and there is some evidence that the credit card balances of this group might be more sensitive to interest rate uncertainty.

#### **IV. Conclusion**

Financial crises are associated with a collapse in consumption and economic activity. There is now substantial evidence that much of this collapse stems from both a decline in demand as consumers adjust to balance sheet shocks, as well as a decline the availability of credit, as financial institutions also react to balance sheet impairments and funding disruptions. But crises are also associated with a substantial increase in economic and policy uncertainty. And consistent with models of decision making under uncertainty, there is growing aggregate evidence that uncertainty might also explain some of the collapse in consumption and output after these events.

This paper has used a large comprehensive individual level dataset of debt and credit decisions to understand the role of economic uncertainty in shaping these decisions. We find evidence that an increase in either economic or policy uncertainty is associated with a decline in the use of mortgage credit, and to a lesser extent automotive credit. These effects are largest for individuals most likely to be exposed financial markets—those living in zip codes where capital gains and dividend income are larger relative to earnings. Among these individuals, the effects are largest among those in their 40s and 50s—those with the largest share of their portfolio in financial assets.

While the evidence is suggestive that individuals might delay entering into these long lived and difficult to reverse debt contracts, there is also evidence that increased financial volatility is associated with a decline in credit card limits. That

is, providers of credit lines might pre-emptively curtail credit availability when economic uncertainty increases and the net worth of individuals fluctuate. Interestingly, an increase in policy uncertainty is associated with an increase in these limits.

## V. Tables and Figures

### Tables

TABLE 1. SUMMARY STATISTICS

NY Federal Reserve Equifax Panel, 2007-2013.

|                             | Age   | Equifax Risk Score | First Mortgage Total Balance | Credit Card Limit | Credit Card Balance | Utilization Rate:<br>Balance/Limit |
|-----------------------------|-------|--------------------|------------------------------|-------------------|---------------------|------------------------------------|
| Mean                        | 47.6  | 696.6              | 187653.8                     | 16738.1           | 6195.4              | 0.71                               |
| Median                      | 48    | 724                | 133434                       | 12500             | 3042                | 0.88                               |
| 25 <sup>th</sup> percentile | 35    | 620                | 75867                        | 5000              | 1016                | 0.45                               |
| 75 <sup>th</sup> percentile | 59    | 789                | 228074                       | 21990             | 7563                | 1.00                               |
| min                         | 18    | 284                | 55                           | 1                 | 3                   | 0.00                               |
| max                         | 80    | 841                | 8938310                      | 817704            | 239832              | 1.00                               |
| Std Deviation               | 15.78 | 108.64             | 217628.64                    | 20653.21          | 10700.26            | 0.34                               |

Black Box Logic, 2005-2013

|                             | Vantage Risk Score | Credit Card Balance | Credit Card Limit | Utilization Rate:<br>Balance/Limit | Loan to Value Ratio, Origin | Interest Rate, Origin | Mortgage, Origin |
|-----------------------------|--------------------|---------------------|-------------------|------------------------------------|-----------------------------|-----------------------|------------------|
| Mean                        | 736.87             | 11280.41            | 34027.33          | 0.35                               | 77.09                       | 5.85                  | 362291.74        |
| Median                      | 719.00             | 5096.00             | 24700.00          | 0.27                               | 80.00                       | 6.38                  | 293000.00        |
| 25 <sup>th</sup> percentile | 690.00             | 799.00              | 10080.00          | 0.07                               | 75.00                       | 5.75                  | 186918.42        |
| 75 <sup>th</sup> percentile | 754.00             | 14573.00            | 47273.00          | 0.59                               | 80.00                       | 6.88                  | 467461.67        |
| min                         | 658.00             | 0.00                | 0.00              | 0.00                               | 5.00                        | 0.00                  | 10000.00         |
| max                         | 9999.00            | 912240.00           | 1005712.00        | 2.47                               | 148.53                      | 14.00                 | 8196501.00       |
| Std Deviation               | 356.67             | 18053.91            | 34742.87          | 0.32                               | 10.05                       | 2.13                  | 271928.36        |

TABLE 2. MICRO AND AGGREGATE UNCERTAINTY, CORRELATIONS

| correlation, 2002-2013                            |   |   |   |       |              |
|---|---|---|---|-------|--------------|
|   | Micro Uncertainty,<br>10 <sup>th</sup> percentile | Micro Uncertainty, 50 <sup>th</sup><br>percentile | Micro Uncertainty, 90 <sup>th</sup><br>percentile | VIX   | BBD<br>Index |
| Micro Uncertainty,<br>10 <sup>th</sup> percentile | 1.00  | 0.96  | 0.76  | 0.71  | 0.08         |
| Micro Uncertainty,<br>50 <sup>th</sup> percentile | 0.96  | 1.00  | 0.84  | 0.75  | 0.17         |
| Micro Uncertainty,<br>90 <sup>th</sup> percentile | 0.76  | 0.84  | 1   | 0.61  | 0.14         |
| VIX   | 0.71  | 0.75  | 0.61  | 1.00  | 0.54         |
| BBD Index   | 0.08  | 0.17  | 0.14  | 0.54  | 1.00         |
| correlation, post 2009                            |   |   |   |       |              |
|   | Micro Uncertainty,<br>10 <sup>th</sup> percentile | Micro Uncertainty, 50 <sup>th</sup><br>percentile | Micro Uncertainty, 90 <sup>th</sup><br>percentile | VIX   | BBD<br>Index |
| Micro Uncertainty,<br>10 <sup>th</sup> percentile | 1.00  | 0.37  | 0.24  | -0.15 | -0.42        |
| Micro Uncertainty,<br>50 <sup>th</sup> percentile | 0.37  | 1.00  | 0.92  | 0.42  | 0.44         |
| Micro Uncertainty,<br>90 <sup>th</sup> percentile | 0.24  | 0.92  | 1.00  | 0.23  | 0.42         |
| VIX   | -0.15   | 0.42  | 0.23  | 1.00  | 0.71         |
| BBD Index   | -0.42   | 0.44  | 0.42  | 0.71  | 1.00         |

All correlations in the table are significant at the 5 percent level or better.

TABLE 3. MICRO-UNCERTAINTY AND CONSUMER CREDIT DECISIONS, 2002Q1-2015Q4

|  | (1)                       | (2)                       | (3)                    | (4)                     | (5)                               |
|--|---------------------------|---------------------------|------------------------|-------------------------|-----------------------------------|
|  | Credit Card Balances, log | Credit Card Balances, log | Credit Card Limit, log | No of Credit Cards, log | No. of Credit Card Enquiries, log |
| Local weighted returns                   | -14.4**                   | 10.1                      | -48.6***               | -6.39                   | 5.53                              |
|  | (5.50)                    | (6.24)                    | (13.1)                 | (3.86)                  | (4.93)                            |
| Micro Uncertainty                        | -1.72                     | 8.17***                   | -13.9***               | 0.22                    | -3.68**                           |
|  | (2.25)                    | (2.74)                    | (1.65)                 | (1.02)                  | (1.63)                            |
| Local weighted returns*Low Risk Borrower |                           | -41.9***                  | 86.5***                | 16.0***                 | -7.23*                            |
|  |                           | (6.05)                    | (13.3)                 | (4.92)                  | (3.98)                            |
| Micro Uncertainty*Low Risk Borrower      |                           | -17.4***                  | 14.7***                | -1.28                   | 12.4***                           |
|  |                           | (1.52)                    | (1.95)                 | (0.82)                  | (1.18)                            |
| Credit Card Limit, log                   | 0.083***                  | 0.084***                  |                        |                         |                                   |
|  | (0.0037)                  | (0.0037)                  |                        |                         |                                   |
| Observations                             | 5792722                   | 5792722                   | 7486031                | 7486031                 | 7486031                           |
| R-squared                                | 0.583                     | 0.584                     | 0.435                  | 0.525                   | 0.359                             |

This table examines the impact of Micro Uncertainty on a range of consumer credit outcomes. All regressions include the individual's average Risk score the previous year; and age (log); unemployment rate in the county; change in house prices at the zip code level; individual fixed effects and year-by-quarter fixed effects. Standard errors are clustered at the state-level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. "Low Risk Borrower" equals 0 for borrowers with below median Risk Scores and 1 otherwise. This variable also enters linearly. The full table is available in a supplementary online appendix. The sample period is 2007 Q1-2013 Q4.

TABLE 4. MICRO-UNCERTAINTY AND CONSUMER CREDIT DECISIONS, 2007Q1-2013Q4

|  | (1)                       | (2)                       | (3)                    | (4)                     | (5)                               |
|--|---------------------------|---------------------------|------------------------|-------------------------|-----------------------------------|
|  | Credit Card Balances, log | Credit Card Balances, log | Credit Card Limit, log | No of Credit Cards, log | No. of Credit Card Enquiries, log |
| Local weighted returns                   | -9.55*                    | -9.62*                    | -20.7                  | -5.95*                  | 4.73                              |
|  | (4.86)                    | (5.52)                    | (12.6)                 | (3.43)                  | (5.70)                            |
| Micro Uncertainty                        | -3.23                     | 10.1***                   | -15.6***               | -1.67**                 | -4.20*                            |
|  | (2.28)                    | (3.38)                    | (2.55)                 | (0.81)                  | (2.49)                            |
| Local weighted returns*Low Risk Borrower |                           | 1.03                      | 28.7**                 | 9.13***                 | 5.26                              |
|  |                           | (6.36)                    | (12.2)                 | (3.29)                  | (3.68)                            |
| Micro Uncertainty*Low Risk Borrower      |                           | -22.9***                  | 21.6***                | 2.93***                 | 12.8***                           |
|  |                           | (1.76)                    | (2.77)                 | (1.01)                  | (1.62)                            |
| Credit Card Limit, log                   | 0.044***                  | 0.044***                  |                        |                         |                                   |
|  | (0.0033)                  | (0.0033)                  |                        |                         |                                   |
| Observations                             | 3115407                   | 3115407                   | 4156597                | 4156597                 | 4156597                           |
| R-squared                                | 0.685                     | 0.685                     | 0.555                  | 0.674                   | 0.437                             |

This table examines the impact of Micro Uncertainty on a range of consumer credit outcomes. All regressions include the individual's average Risk score the previous year; and age (log); unemployment rate in the county; change in house prices at the zip code level; individual fixed effects and year-by-quarter fixed effects. Standard errors are clustered at the state-level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. "Low Risk Borrower" equals 0 for borrowers with below median Risk Scores and 1 otherwise. This variable also enters linearly. The full table is available in a supplementary online appendix. The sample period is 2007 Q1-2013 Q4.

TABLE 5. MICRO-UNCERTAINTY AND CONSUMER CREDIT DECISIONS, 2002Q1-2006Q4

|  | (1)                       | (2)                    | (3)                     | (4)                               |
|--|---------------------------|------------------------|-------------------------|-----------------------------------|
|  | Credit Card Balances, log | Credit Card Limit, log | No of Credit Cards, log | No. of Credit Card Enquiries, log |
| Local weighted returns                   | 30.0***                   | -32.5***               | 18.4***                 | 3.41                              |
|  | (8.97)                    | (6.85)                 | (3.24)                  | (4.70)                            |
| Micro Uncertainty                        | 13.1***                   | -12.1***               | 5.45***                 | -2.15                             |
|  | (2.22)                    | (2.71)                 | (1.16)                  | (2.45)                            |
| Local weighted returns*Low Risk Borrower | -70.3***                  | 40.5***                | -35.5***                | -25.7***                          |
|  | (7.76)                    | (8.59)                 | (2.52)                  | (4.98)                            |
| Micro Uncertainty*Low Risk Borrower      | -22.5***                  | 18.7***                | -9.05***                | 4.24**                            |
|  | (1.66)                    | (3.01)                 | (0.69)                  | (1.82)                            |
| Credit Card Limit, log                   | 0.079***                  |                        |                         |                                   |
|  | (0.0035)                  |                        |                         |                                   |
| Observations                             | 2467549                   | 3041806                | 3041806                 | 3041806                           |
| R-squared                                | 0.671                     | 0.577                  | 0.756                   | 0.467                             |

This table examines the impact of Micro Uncertainty on a range of consumer credit outcomes. All regressions include the individual's average Risk score the previous year; and age (log); unemployment rate in the county; change in house prices at the zip code level; individual fixed effects and year-by-quarter fixed effects. Standard errors are clustered at the state-level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. "Low Risk Borrower" equals 0 for borrowers with below median Risk Scores and 1 otherwise. This variable also enters linearly. The full table is available in a supplementary online appendix. The sample period is 2002 Q1-2006 Q4.

TABLE 6. MICRO UNCERTAINTY AND FINANCIAL MARKET EXPOSURE, 2007Q1-2013Q4.

|   | (1)     | (2)     | (3)     | (4)      | (5)     | (6)     |
|---|---------|---------|---------|----------|---------|---------|
|   | Age 20s | Age 30s | Age 40s | Age 50s  | Age 60s | Age 70s |
| Local weighted returns                            | -26.7   | -21.9   | -36.5*  | -7.85    | -14.1   | -24.1   |
|   | (50.6)  | (22.3)  | (21.1)  | (22.1)   | (26.1)  | (35.9)  |
| Micro Uncertainty                                 | -2.79   | -3.83   | -0.83   | -2.14    | 4.13    | 12.1    |
|   | (9.93)  | (3.45)  | (5.68)  | (5.09)   | (5.26)  | (8.96)  |
| Local weighted returns* Financial Market Exposure | -8.64   | -20.6   | -3.43   | -9.10    | -6.93   | 7.03    |
|   | (20.4)  | (15.8)  | (12.7)  | (9.95)   | (11.7)  | (24.9)  |
| Micro Uncertainty* Financial market exposure      | -3.92   | 2.50    | -2.35   | -5.16*** | -2.18   | -6.77*  |
|   | (3.11)  | (2.07)  | (1.48)  | (1.42)   | (2.00)  | (3.88)  |
| Local weighted returns* High Income               | 44.6    | 5.66    | 41.0*   | -8.25    | 8.14    | 26.0    |
|   | (55.4)  | (21.4)  | (23.9)  | (18.3)   | (24.8)  | (37.8)  |
| Micro Uncertainty* High Income                    | -3.89   | -4.29   | -2.69   | 1.04     | -5.15   | -8.10   |
|   | (6.92)  | (2.87)  | (3.71)  | (3.65)   | (3.65)  | (6.81)  |
| Observations                                      | 125368  | 526154  | 682378  | 719988   | 537947  | 320106  |
| R-squared   | 0.646   | 0.650   | 0.688   | 0.704    | 0.730   | 0.758   |

The dependent variable is the log of credit card balances. All regressions include the individual's average Risk score the previous year; and age (log); unemployment rate in the county; change in house prices at the zip code level; individual fixed effects and year-by-quarter fixed effects. "Financial Market Exposure" equals one if an individual lives in a zip code with an above median ratio of capital gains and dividend income to adjusted gross income and zero otherwise. "High Income" equals one if an individual lives in a zip code with an above median adjusted gross income and zero otherwise. Both these variables enter linearly as well. The regressions also control for the log of the credit line in quarter. The sample period is 2007Q1 through 2013 Q4. The basic regression is estimated separately for individuals in different age cohorts.

TABLE 7. MICRO UNCERTAINTY AND FINANCIAL MARKET EXPOSURE, 2002Q1-2006Q4.

|   | (1)      | (2)     | (3)     | (4)     | (5)     | (6)     |
|---|----------|---------|---------|---------|---------|---------|
|   | Age 20s  | Age 30s | Age 40s | Age 50s | Age 60s | Age 70s |
| Local weighted returns                            | 91.6     | -92.2** | -37.2   | 56.8*   | 3.32    | 53.3    |
|   | (59.3)   | (42.2)  | (35.6)  | (32.1)  | (43.6)  | (52.1)  |
| Micro Uncertainty                                 | -14.8**  | -3.59   | 13.7**  | -3.53   | 18.9*** | 12.9    |
|   | (7.35)   | (6.81)  | (5.53)  | (5.05)  | (6.96)  | (8.67)  |
| Local weighted returns* Financial Market Exposure | -74.6*** | -3.90   | -2.26   | -9.53   | -14.5   | 16.2    |
|   | (25.0)   | (15.4)  | (17.3)  | (16.1)  | (21.3)  | (31.8)  |
| Micro Uncertainty* Financial market exposure      | 0.99     | -2.96   | 0.77    | -1.07   | 0.92    | 3.71    |
|   | (2.05)   | (1.86)  | (2.16)  | (1.85)  | (3.30)  | (4.43)  |
| Local weighted returns* High Income               | -72.3    | 75.0*   | 54.4    | -50.3** | 1.71    | -91.2   |
|   | (54.6)   | (43.5)  | (34.2)  | (24.9)  | (39.9)  | (58.5)  |
| Micro Uncertainty* High Income                    | 9.73     | 4.17    | -11.5** | 2.05    | -6.95   | -6.66   |
|   | (5.88)   | (5.39)  | (5.24)  | (4.40)  | (5.19)  | (10.1)  |
| Observations                                      | 302997   | 477711  | 577174  | 496891  | 300103  | 207712  |
| R-squared   | 0.599    | 0.626   | 0.663   | 0.696   | 0.721   | 0.740   |

The dependent variable is the log of credit card balances. All regressions include the individual's average Risk score the previous year; and age (log); unemployment rate in the county; change in house prices at the zip code level; individual fixed effects and year-by-quarter fixed effects. "Financial Market Exposure" equals one if an individual lives in a zip code with an above median ratio of capital gains and dividend income to adjusted gross income and zero otherwise. "High Income" equals one if an individual lives in a zipcode with an above median adjusted gross income and zero otherwise. Both these variables enter linearly as well. The regressions also control for the log of the credit line in quarter. The sample period is 2007Q1 through 2013 Q4. The basic regression is estimated separately for individuals in different age cohorts.

TABLE 8. UNCERTAINTY AND ADJUSTABLE RATE MORTGAGE INTEREST RATE RESETS

| VARIABLES  | (1)                        | (2)   | (3)  | (4)   | (5)  |
|--|----------------------------|---|--|---|--|
|  | monetary policy            | monetary policy & short-term interest rates | monetary policy & long-term interest rates | monetary policy & interest rate volatility (3month) | monetary policy & interest rate volatility (10 year) |
| Before Reset                                       |                            |   |  |   |  |
| Monetary policy uncertainty, 1 month before reset  | -0.000484***<br>(0.000148) | -0.000475***<br>(0.000155)                  | -0.000575***<br>(0.000177)                 | -0.000470***<br>(0.000149)                          | -0.000491***<br>(0.000147)                           |
| Monetary policy uncertainty, 2 months before reset | -0.000233*<br>(0.000129)   | -0.000209<br>(0.000134)                     | -0.000357**<br>(0.000143)                  | -0.000193<br>(0.000128)                             | -0.000237*<br>(0.000138)                             |
| Monetary policy uncertainty, 3 months before reset | -0.000112<br>(8.15e-05)    | -0.000127<br>(8.11e-05)                     | -0.000275***<br>(8.47e-05)                 | -5.29e-05<br>(9.96e-05)                             | -0.000135<br>(0.000104)                              |
| Monetary policy uncertainty, 4 months before reset | 0.000120<br>(0.000135)     | 0.000117<br>(0.000112)                      | -7.61e-05<br>(0.000130)                    | 0.000144<br>(0.000138)                              | 0.000239<br>(0.000178)                               |
| Monetary policy uncertainty, 5 months before reset | 4.09e-05<br>(0.000102)     | 5.13e-05<br>(9.28e-05)                      | -0.000137<br>(8.74e-05)                    | 3.41e-05<br>(0.000137)                              | 6.04e-05<br>(0.000124)                               |
| Monetary policy uncertainty, 6 months before reset | -3.15e-05<br>(0.000169)    | -6.84e-05<br>(0.000137)                     | -0.000256*<br>(0.000152)                   | 3.46e-05<br>(0.000193)                              | 1.01e-05<br>(0.000196)                               |
| Month of Reset                                     |                            |   |  |   |  |
| Monetary policy uncertainty, month of reset        | -0.000267*<br>(0.000143)   | -0.000258*<br>(0.000144)                    | -0.000368**<br>(0.000176)                  | -0.000331**<br>(0.000134)                           | -0.000234*<br>(0.000134)                             |
| After Reset  |                            |   |  |   |  |
| Monetary policy uncertainty, 1 months after reset  | 9.49e-05<br>(0.000121)     | 0.000118<br>(0.000120)                      | 1.78e-05<br>(0.000150)                     | 4.52e-05<br>(0.000124)                              | 0.000124<br>(0.000121)                               |
| Monetary policy uncertainty, 2 months after reset  | -0.000279**<br>(0.000127)  | -0.000247*<br>(0.000136)                    | -0.000356**<br>(0.000142)                  | -0.000272**<br>(0.000134)                           | -0.000306**<br>(0.000129)                            |
| Monetary policy uncertainty, 3 months after reset  | -0.000179<br>(0.000133)    | -0.000178<br>(0.000142)                     | -0.000272**<br>(0.000123)                  | -0.000191<br>(0.000139)                             | -0.000167<br>(0.000125)                              |
| Monetary policy uncertainty, 4 months after reset  | 9.58e-07<br>(0.000127)     | 1.07e-05<br>(0.000132)                      | -6.39e-05<br>(0.000116)                    | 6.75e-06<br>(0.000119)                              | -1.43e-05<br>(0.000120)                              |
| Monetary policy uncertainty, 5 months after reset  | 0.000219<br>(0.000203)     | 0.000234<br>(0.000204)                      | 0.000113<br>(0.000176)                     | 0.000283<br>(0.000222)                              | 0.000235<br>(0.000203)                               |
| Monetary policy uncertainty, 6 months after reset  | 0.000291<br>(0.000180)     | 0.000293<br>(0.000184)                      | 0.000151<br>(0.000212)                     | 0.000321*<br>(0.000169)                             | 0.000262<br>(0.000176)                               |
| Observations                                       | 2,329,821                  | 2,329,821                                   | 2,329,821                                  | 2,329,821   | 2,329,821  |

|           |       |       |       |       |       |
|-----------|-------|-------|-------|-------|-------|
| R-squared | 0.667 | 0.667 | 0.667 | 0.667 | 0.667 |
|-----------|-------|-------|-------|-------|-------|

The dependent variable is the log of monthly credit card balances. All specifications control for the current mortgage interest rate; the current monthly mortgage interest payment (logs) and the log of the individual's credit card limit; state fixed effects and year-by-month fixed effects. Column 2 interacts the mean three month Treasury rate with the reset indicators; column 3 interacts the mean 10 year Treasury rate with the reset indicators; columns 4 and 5 include respectively interaction terms with the standard deviation of the 3 month and 10 year Treasury rate (computed over the trading days in the month) and the reset indicators. Standard errors are clustered at the state level.

TABLE 9. CREDIT CARD BALANCES AROUND THE MORTGAGE RESET DATE, OTHER ECONOMIC POLICY  
UNCERTAINTY CATEGORIES

|  | (1)                       | (2)                                   | (3)   | (4)   | (5)                                     | (6)   | (7)   |
|--|---------------------------|---------------------------------------|---|---|---|---|---|
| VARIABLES  | monetary<br>policy & VIX  | monetary<br>policy &<br>Fiscal Policy | monetary<br>policy &<br>Financial<br>Regulation | monetary<br>policy &<br>sovereign<br>crises | monetary<br>policy &<br>trade<br>policy | monetary<br>policy &<br>entitlement<br>policy | monetary<br>policy &<br>health care<br>policy |
| Before Reset   |                           |                                       |   |   |   |   |   |
| Monetary policy<br>uncertainty, 1 month<br>before reset  | -0.000351*<br>(0.000199)  | -0.000632***<br>(0.000180)            | -0.000401**<br>(0.000169)                       | -0.000434*<br>(0.000220)                    | -0.000469***<br>(0.000149)              | -0.000541***<br>(0.000175)                    | -0.000646***<br>(0.000159)                    |
| Monetary policy<br>uncertainty, 2 months<br>before reset | -0.000115<br>(0.000149)   | -0.000228<br>(0.000196)               | -0.000213*<br>(0.000123)                        | -0.000356**<br>(0.000167)                   | -0.000157<br>(0.000134)                 | -0.000234<br>(0.000194)                       | -0.000285*<br>(0.000163)                      |
| Monetary policy<br>uncertainty, 3 months<br>before reset | -7.93e-05<br>(9.37e-05)   | -0.000323*<br>(0.000163)              | -7.14e-05<br>(9.16e-05)                         | -0.000157<br>(9.61e-05)                     | -0.000117<br>(9.25e-05)                 | -0.000341**<br>(0.000156)                     | -0.000280*<br>(0.000143)                      |
| Monetary policy<br>uncertainty, 4 months<br>before reset | 0.000131<br>(0.000154)    | -0.000122<br>(0.000216)               | 0.000203<br>(0.000189)                          | 1.88e-05<br>(0.000139)                      | 0.000130<br>(0.000137)                  | -5.48e-05<br>(0.000197)                       | -2.59e-05<br>(0.000142)                       |
| Monetary policy<br>uncertainty, 5 months<br>before reset | -1.41e-05<br>(0.000123)   | 0.000269<br>(0.000206)                | 6.38e-05<br>(0.000129)                          | -0.000272**<br>(0.000103)                   | 6.56e-05<br>(0.000112)                  | 0.000150<br>(0.000211)                        | 0.000187<br>(0.000112)                        |
| Monetary policy<br>uncertainty, 6 months<br>before reset | -4.60e-05<br>(0.000196)   | -0.000218<br>(0.000280)               | -4.82e-05<br>(0.000149)                         | -0.000389**<br>(0.000162)                   | -5.18e-05<br>(0.000186)                 | -0.000284<br>(0.000271)                       | -6.43e-05<br>(0.000294)                       |
| Month of Reset   |                           |                                       |   |   |   |   |   |
| Monetary policy<br>uncertainty, month of<br>reset        | -2.79e-05<br>(0.000158)   | -0.000278<br>(0.000172)               | -0.000250<br>(0.000152)                         | -0.000372*<br>(0.000206)                    | -0.000186<br>(0.000131)                 | -0.000415**<br>(0.000195)                     | -0.000363**<br>(0.000175)                     |
| After Reset  |                           |                                       |   |   |   |   |   |
| Monetary policy<br>uncertainty, 1 months<br>after reset  | 0.000353***<br>(0.000132) | 0.000365<br>(0.000251)                | 0.000202<br>(0.000133)                          | -0.000434*<br>(0.000220)                    | 0.000198<br>(0.000119)                  | 0.000180<br>(0.000192)                        | 0.000256<br>(0.000192)                        |
| Monetary policy<br>uncertainty, 2 months<br>after reset  | -0.000261*<br>(0.000155)  | -4.65e-06<br>(0.000202)               | -0.000249**<br>(0.000120)                       | -0.000356**<br>(0.000167)                   | -0.000270*<br>(0.000136)                | 8.90e-05<br>(0.000195)                        | -0.000126<br>(0.000181)                       |
| Monetary policy<br>uncertainty, 3 months<br>after reset  | -0.000190<br>(0.000198)   | 0.000107<br>(0.000224)                | -0.000242<br>(0.000152)                         | -0.000157<br>(9.61e-05)                     | -0.000160<br>(0.000155)                 | 0.000196<br>(0.000209)                        | 9.61e-06<br>(0.000177)                        |

|   |                         |                        |                         |                           |                        |                        |                        |
|---|-------------------------|------------------------|-------------------------|---------------------------|------------------------|------------------------|------------------------|
| Monetary policy uncertainty, 4 months after reset | -1.53e-05<br>(0.000154) | 0.000173<br>(0.000187) | -7.88e-05<br>(0.000152) | 1.88e-05<br>(0.000139)    | 4.56e-05<br>(0.000136) | 8.85e-05<br>(0.000182) | 0.000132<br>(0.000176) |
| Monetary policy uncertainty, 5 months after reset | 0.000241<br>(0.000209)  | 0.000132<br>(0.000256) | 0.000259<br>(0.000207)  | -0.000272**<br>(0.000103) | 0.000196<br>(0.000235) | 0.000119<br>(0.000324) | 3.82e-05<br>(0.000199) |
| Monetary policy uncertainty, 6 months after reset | 0.000376<br>(0.000230)  | 0.000360<br>(0.000393) | 0.000256<br>(0.000243)  | -0.000389**<br>(0.000162) | 0.000304<br>(0.000239) | 0.000396<br>(0.000290) | 0.000393<br>(0.000336) |
| Observations                                      | 2,329,821               | 2,329,821              | 2,329,821               | 2,329,821                 | 2,329,821              | 2,329,821              | 2,329,821              |
| R-squared   | 0.667                   | 0.667                  | 0.667                   | 0.667                     | 0.667                  | 0.667                  | 0.667                  |

The dependent variable is the log of monthly credit card balances. All specifications control for the current mortgage interest rate; the current monthly mortgage interest payment (logs) and the log of the individual's credit card limit; state fixed effects and year-by-month fixed effects. Columns 2, 3, 4, 5, 6 and 7 interact the reset indicators with the following categorical uncertainty measures: fiscal policy; financial regulation; sovereign crises; trade policy; entitlement policy and health care policy. Standard errors are clustered at the state level.

TABLE 10A. CREDIT CARD BALANCES AROUND THE MORTGAGE RESET DATE, ROBUSTNESS TESTS I

|   | (1)                        | (2)                        | (3)                        |
|---|----------------------------|----------------------------|----------------------------|
| VARIABLES   | 5 and 10 Year<br>ARMs      | Retail Cards               | Auto Purchases             |
| Monetary policy uncertainty,<br>1 month before reset  | -0.000467***<br>(0.000143) | 2.98e-05<br>(0.000173)     | -1.21e-05<br>(1.65e-05)    |
| Monetary policy uncertainty,<br>2 months before reset | -0.000208*<br>(0.000117)   | -0.000342<br>(0.000216)    | -3.87e-06<br>(1.45e-05)    |
| Monetary policy uncertainty,<br>3 months before reset | -7.41e-05<br>(8.63e-05)    | -0.000182<br>(0.000180)    | 2.29e-05***<br>(8.02e-06)  |
| Monetary policy uncertainty,<br>4 months before reset | 0.000167<br>(0.000156)     | -0.000117<br>(0.000136)    | -3.89e-06<br>(1.18e-05)    |
| Monetary policy uncertainty,<br>5 months before reset | 8.68e-05<br>(0.000126)     | -0.000366***<br>(0.000107) | 1.42e-05<br>(1.15e-05)     |
| Monetary policy uncertainty,<br>6 months before reset | 1.03e-05<br>(0.000199)     | -0.000599***<br>(0.000119) | 9.88e-06<br>(1.15e-05)     |
| Monetary policy uncertainty,<br>month of reset        | -0.000248*<br>(0.000140)   | -0.000116<br>(0.000162)    | -3.72e-05***<br>(1.21e-05) |
| Monetary policy uncertainty,<br>1 months after reset  | 0.000127<br>(0.000119)     | 1.18e-05<br>(0.000183)     | 4.87e-06<br>(1.24e-05)     |
| Monetary policy uncertainty,<br>2 months after reset  | -0.000236*<br>(0.000124)   | -4.40e-05<br>(0.000217)    | 2.30e-05<br>(1.87e-05)     |
| Monetary policy uncertainty,<br>3 months after reset  | -0.000140<br>(0.000127)    | -0.000470**<br>(0.000199)  | 8.43e-06<br>(1.49e-05)     |
| Monetary policy uncertainty,<br>4 months after reset  | 4.09e-05<br>(0.000126)     | -0.000448<br>(0.000268)    | -5.54e-06<br>(1.29e-05)    |
| Monetary policy uncertainty,<br>5 months after reset  | 0.000267<br>(0.000198)     | -0.000302<br>(0.000189)    | -5.64e-06<br>(1.59e-05)    |
| Monetary policy uncertainty,<br>6 months after reset  | 0.000347*<br>(0.000185)    | -0.000133<br>(0.000200)    | 1.86e-05<br>(2.44e-05)     |
| Observations  | 3,809,141                  | 2,329,821                  | 2,329,821                  |
| R-squared   | 0.664                      | 0.667                      | 0.667                      |

TABLE 10B. CREDIT CARD BALANCES AROUND THE MORTGAGE RESET DATE, ROBUSTNESS TESTS II

|   | (1)                  | (2)   |  | (3)                 |
|---|----------------------|---|--|---------------------|
| VARIABLES                                     | Micro<br>Uncertainty | Micro Uncertainty<br>and Monetary<br>Policy |  | CPI<br>Disagreement |
| Micro uncertainty, 1 quarter<br>before reset  | -7.755**             | -7.767**                                    | CPI<br>Disagreement, 1<br>quarter before<br>reset  | -0.000644           |
|   | (3.626)              | (3.697)                                     |  | (0.000531)          |
| Micro uncertainty, 2 quarters<br>before reset | -2.120               | -1.159                                      | CPI<br>Disagreement, 2<br>quarters before<br>reset | -0.000339           |
|   | (2.520)              | (2.305)                                     |  | (0.000298)          |
| Micro uncertainty, quarter of<br>reset        | 7.071                | 6.820                                       | CPI<br>Disagreement,<br>quarter of reset           | -0.000169           |
|   | (4.127)              | (3.938)                                     |  | (0.000316)          |
| Micro uncertainty, 1 quarter<br>after reset   | -5.345               | -5.224                                      | CPI<br>Disagreement, 1<br>quarter after<br>reset   | -0.000111           |
|   | (3.318)              | (3.431)                                     |  | (0.000324)          |
| Micro uncertainty, 2 quarters<br>after reset  | -3.919               | -3.845                                      | CPI<br>Disagreement, 2<br>quarters after<br>reset  | -0.000440*          |
|   | (2.913)              | (2.967)                                     |  | (0.000244)          |
| Observations                                  | 770,000              | 770,000                                     |  | 831,042             |
| R-squared                                     | 0.707                | 0.707                                       |  | 0.704               |

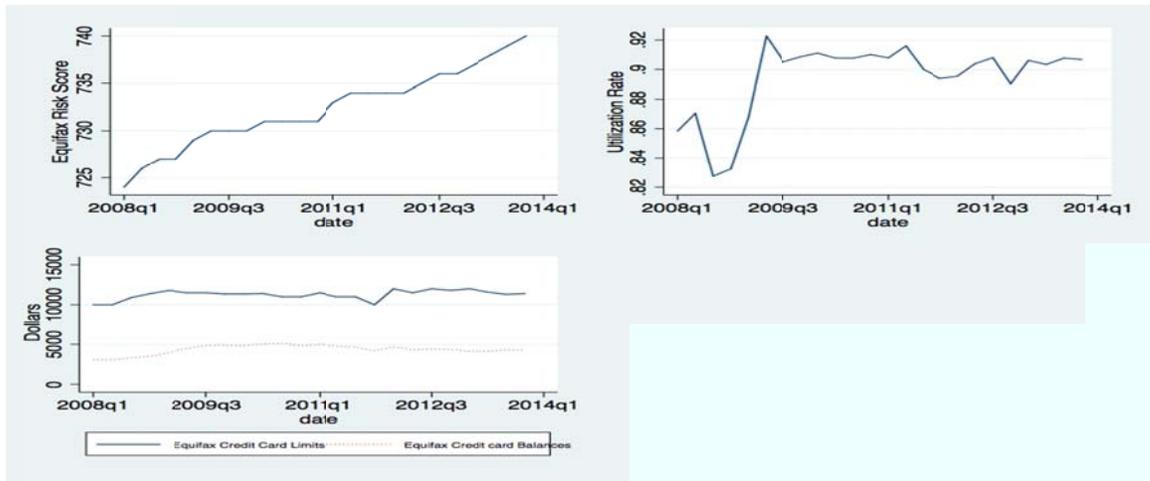
TABLE 11. CREDIT CARD BALANCES AROUND THE MORTGAGE RESET DATE, BORROWER HETEROGENEITY

| VARIABLES   | (1)<br>High Vantage<br>(Risk) Scores | (2)<br>Low Vantage<br>(Risk) Scores | (3)<br>High Loan to<br>Value | (4)<br>Low Loan to<br>Value |
|---|--------------------------------------|-------------------------------------|------------------------------|-----------------------------|
| Monetary policy uncertainty,<br>1 month before reset  | -0.000516**<br>(0.000193)            | -0.000431**<br>(0.000192)           | 0.000133<br>(0.000117)       | -0.000165<br>(0.000393)     |
| Monetary policy uncertainty,<br>2 months before reset | -0.000114<br>(0.000208)              | -0.000390<br>(0.000252)             | -0.000274*<br>(0.000142)     | -0.000337<br>(0.000279)     |
| Monetary policy uncertainty,<br>3 months before reset | -1.13e-05<br>(0.000146)              | -0.000220<br>(0.000216)             | -0.000128<br>(0.000190)      | -0.000111<br>(0.000355)     |
| Monetary policy uncertainty,<br>4 months before reset | 7.39e-05<br>(0.000111)               | 0.000185<br>(0.000222)              | 0.000118<br>(0.000140)       | -8.29e-05<br>(0.000311)     |
| Monetary policy uncertainty,<br>5 months before reset | 0.000237<br>(0.000159)               | -0.000117<br>(0.000163)             | 0.000191<br>(0.000202)       | 0.000630<br>(0.000406)      |
| Monetary policy uncertainty,<br>6 months before reset | 0.000121<br>(0.000256)               | -0.000166<br>(0.000135)             | 0.000171<br>(0.000163)       | 0.000677*<br>(0.000386)     |
| Monetary policy uncertainty,<br>month of reset        | -0.000357**<br>(0.000160)            | -0.000161<br>(0.000197)             | -0.000277<br>(0.000168)      | -0.00121***<br>(0.000284)   |
| Monetary policy uncertainty,<br>1 months after reset  | -0.000197<br>(0.000153)              | 0.000401**<br>(0.000158)            | -0.000277<br>(0.000168)      | -0.00121***<br>(0.000284)   |
| Monetary policy uncertainty,<br>2 months after reset  | -0.000625***<br>(0.000178)           | 5.61e-05<br>(0.000223)              | -0.000208<br>(0.000139)      | -0.000403<br>(0.000265)     |
| Monetary policy uncertainty,<br>3 months after reset  | -0.000233<br>(0.000171)              | -0.000131<br>(0.000191)             | -0.000177**<br>(8.61e-05)    | 0.000161<br>(0.000309)      |
| Monetary policy uncertainty,<br>4 months after reset  | 0.000113<br>(0.000220)               | -4.82e-05<br>(0.000206)             | 2.68e-05<br>(0.000105)       | 0.000507<br>(0.000331)      |
| Monetary policy uncertainty,<br>5 months after reset  | 0.000453<br>(0.000328)               | 4.59e-05<br>(0.000226)              | -2.29e-05<br>(9.54e-05)      | 0.000205<br>(0.000354)      |
| Monetary policy uncertainty,<br>6 months after reset  | 0.000102<br>(0.000137)               | 0.000594*<br>(0.000332)             | -7.31e-05<br>(0.000145)      | -2.39e-05<br>(0.000252)     |
| Observations  | 1,181,033                            | 1,128,771                           | 1,468,076                    | 861,745                     |
| R-squared   | 0.657                                | 0.677                               | 0.700                        | 0.703                       |

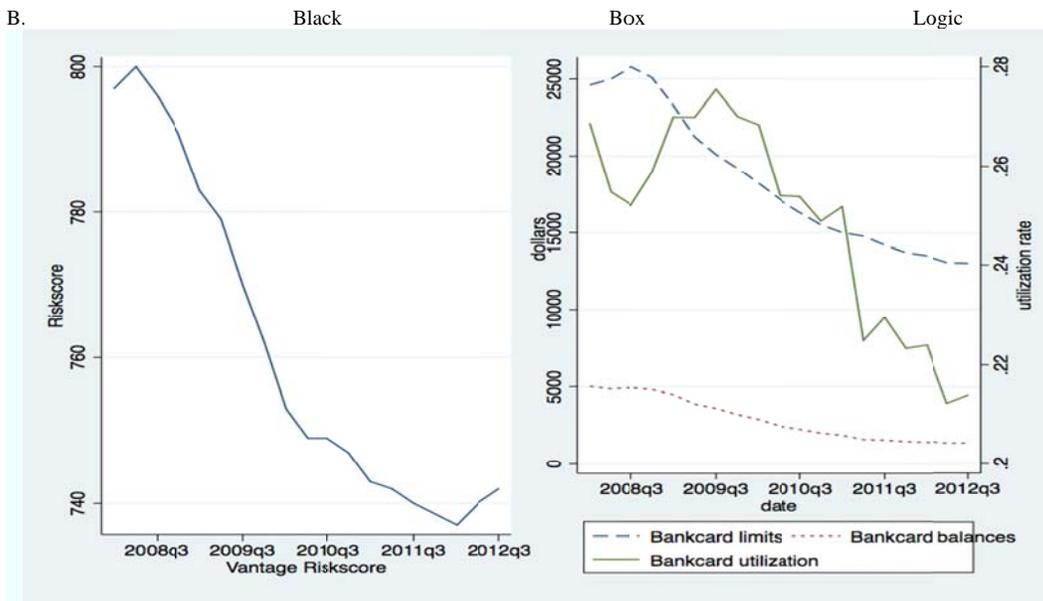
## Figures

FIGURE 1. CREDIT USAGE OVER TIME

### A. Equifax

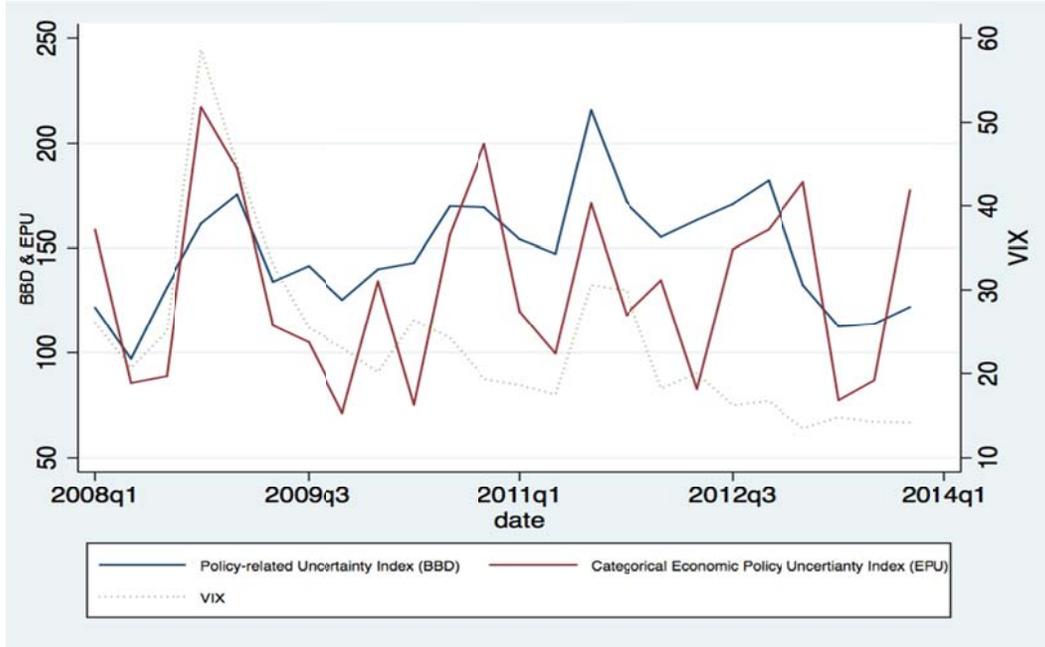


### B.



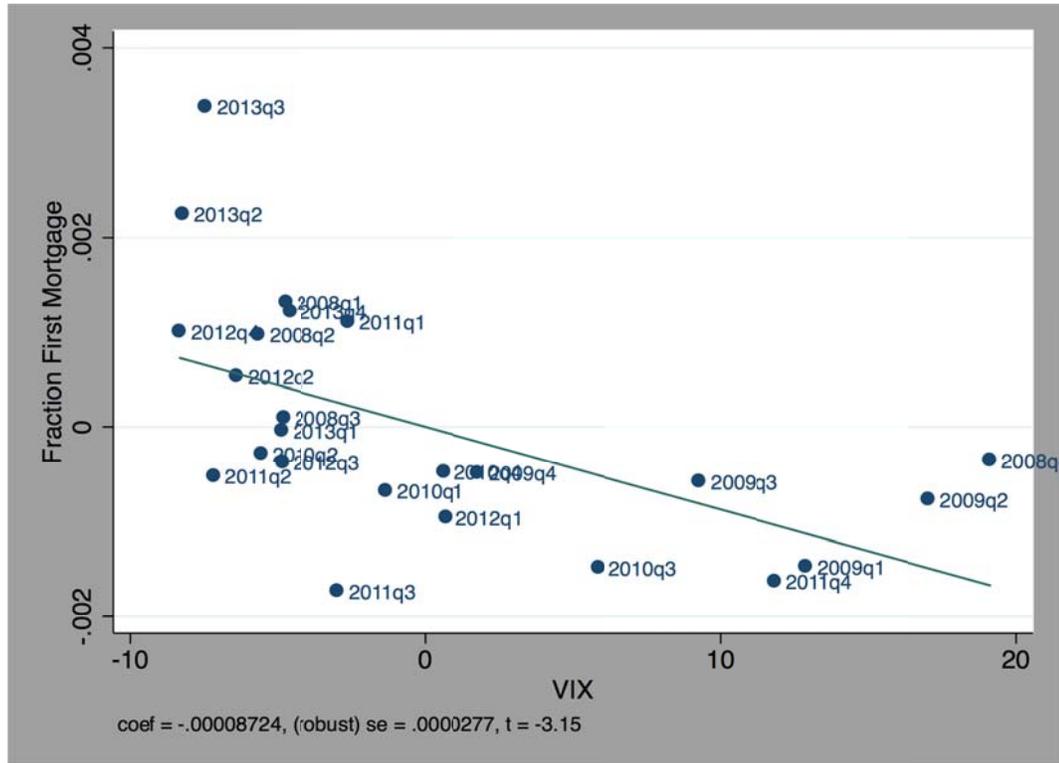
This figure reports the median (year-quarter) outcome of each variable for individuals in the Equifax panel (panel A) and Black Box Logic Panel (panel B)

FIGURE 2. AGGREGATE UNCERTAINTY



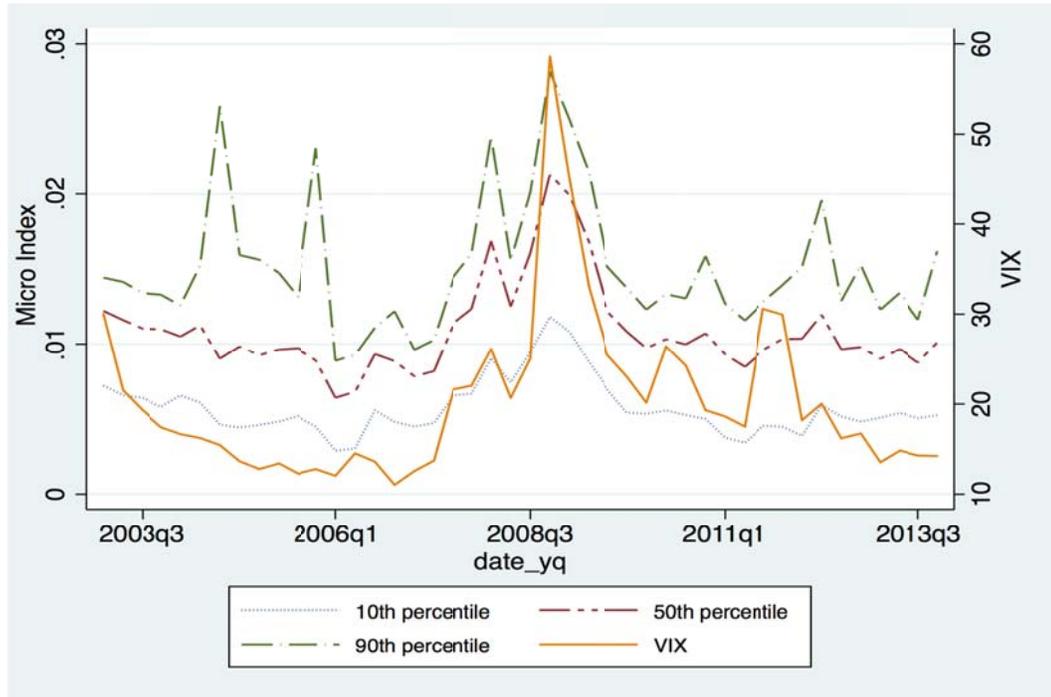
This figure plots the VIX along with the policy-related uncertainty index and the categorical economic policy uncertainty index; the latter two available at [policyuncertainty.com](http://policyuncertainty.com).

FIGURE 3. FRACTION OF FIRST MORTGAGES (EQUIFAX PANEL) AND THE VIX



This figure plots the scatter plot between the fraction of new mortgages individuals with new mortgages in each quarter in the Equifax Panel (2008-2013) and the VIX, after controlling for mean quarterly returns in the S&P 500 index.

FIGURE 4. MICRO UNCERTAINTY AND THE VIX



This figure plots the micro uncertainty index in each quarter for values at the 10<sup>th</sup>, 50<sup>th</sup> and 90<sup>th</sup> percentiles. It also plots the VIX.

## Internet Appendix

TABLE IA1 UNCERTAINTY: INDIVIDUAL-LEVEL EVIDENCE

|   | (1)                        | (2)                        | (3)                        |
|---|----------------------------|----------------------------|----------------------------|
|   | Home                       | Home                       | Home                       |
| VIX   | -0.000096***<br>(0.000022) |                            | -0.000089***<br>(0.000022) |
| Policy-related<br>Uncertainty (BBD<br>Index)) |                            | -0.000049***<br>(0.000040) | -0.000048***<br>(0.000040) |
| S&P 500 (change)                              | 0.28***<br>(0.054)         | 0.21***<br>(0.056)         | 0.054<br>(0.058)           |
| Average Risk Score<br>Previous Year           | 0.0022*<br>(0.0012)        | 0.0022*<br>(0.0012)        | 0.0022*<br>(0.0012)        |
| Age (Log)                                     | 0.045***<br>(0.0030)       | 0.044***<br>(0.0030)       | 0.030***<br>(0.0031)       |
| GDP growth                                    | -0.00024***<br>(0.000043)  | -0.00011***<br>(0.000027)  | -0.00024***<br>(0.000043)  |
| 3 month Treasury<br>yield                     | 0.0011***<br>(0.00039)     | 0.00068**<br>(0.00031)     | -0.000063<br>(0.00043)     |
| 10 year Treasury yield                        | 0.0013***<br>(0.00017)     | 0.00025<br>(0.00020)       | 0.00016<br>(0.00021)       |
| Observations                                  | 4895978                    | 4895978                    | 4895978                    |
| R-squared                                     | 0.054                      | 0.054                      | 0.054                      |

This table reports regressions from an individual level quarterly panel (2008-2013). “Home” is the probability that an individual obtains a first mortgage; Standard errors are clustered at the state level, and all regressions include individual fixed effects. “policy

TABLE IA2. DEPENDENT VARIABLE: MICRO UNCERTAINTY, 2002-2013.

|                                  | (1)                 | (2)                       | (3)                       | (4)                       | (5)                          | (6)                     |
|----------------------------------|---------------------|---------------------------|---------------------------|---------------------------|------------------------------|-------------------------|
| VARIABLES                        | first moment        | unemployment              | form of credit            | demographic controls      | demographic controls changes | county-fixed effects    |
| Local weighted returns           | 0.918***<br>(0.147) | 0.930***<br>(0.144)       | 0.930***<br>(0.144)       | 0.262*<br>(0.147)         | 0.263*<br>(0.147)            | 0.465***<br>(0.135)     |
| unemployment rate                |                     | 9.55e-05***<br>(2.50e-05) | 9.60e-05***<br>(2.50e-05) | 2.73e-05<br>(3.10e-05)    | 2.26e-05<br>(3.14e-05)       | -1.52e-05<br>(3.35e-05) |
| non-bank dependence              |                     |                           | 0.00114<br>(0.00109)      | -6.18e-06<br>(0.00107)    | 1.53e-05<br>(0.00109)        |                         |
| population, log                  |                     |                           |                           | 8.46e-05<br>(0.000611)    | -0.000159<br>(0.000617)      |                         |
| area, log                        |                     |                           |                           | -0.000227*<br>(0.000115)  | -0.000275**<br>(0.000107)    |                         |
| median income, log               |                     |                           |                           | -0.00162***<br>(0.000518) | -0.00237***<br>(0.000634)    |                         |
| African-American population, log |                     |                           |                           | -2.84e-05<br>(6.65e-05)   | 5.71e-06<br>(6.27e-05)       |                         |
| White Population, log            |                     |                           |                           | 0.00107*<br>(0.000561)    | 0.00135**<br>(0.000602)      |                         |
| poverty rate                     |                     |                           |                           | 2.64e-05<br>(1.74e-05)    | 7.09e-05**<br>(3.32e-05)     |                         |
| inequality                       |                     |                           |                           | -9.92e-05<br>(0.00177)    | -0.00140<br>(0.00273)        |                         |
| change in income, 2000-2008      |                     |                           |                           |                           | 0.00209**<br>(0.00102)       |                         |
| change in inequality, 2000-2008  |                     |                           |                           |                           | 0.00185<br>(0.00553)         |                         |

|  |        |        |        |        |            |        |
|--|--------|--------|--------|--------|------------|--------|
| change in African-American population, 2000-2008 |        |        |        |        | -0.000162* |        |
|  |        |        |        |        | (8.82e-05) |        |
| change in population                             |        |        |        |        | -0.000297  |        |
|  |        |        |        |        | (0.00142)  |        |
| change in poverty rate                           |        |        |        |        | -0.000997* |        |
|  |        |        |        |        | (0.000570) |        |
| Observations                                     | 66,841 | 66,841 | 66,841 | 66,841 | 66,841     | 66,841 |
| R-squared  | 0.044  | 0.046  | 0.047  | 0.347  | 0.349      | 0.574  |

The unit of observation is the county-quarter, observed from 2002-20013. Local weighted returns is the first moment analog of the micro uncertainty index: sectoral stock returns weighted by employment shares in the county. All regressions include year and quarter fixed effects, and standard errors are clustered at the state-level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

TABLE IA 3. MICRO UNCERTAINTY, AGGREGATE UNCERTAINTY AND CREDIT CARD BALANCES, 2007-2013

|   | (1)                       | (2)                       | (3)                       | (4)                       | (5)                       | (6)                       | (7)                       | (8)                       | (9)                       |
|---|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
|   | Credit Card Balances, log |
| BBD Index or sub-index                          | BBD Index                 | BBD News                  | BBD Government            | BBD CPI Inflation         | BBD Tax                   | Economic Policy           | Monetary Policy           | Fiscal Policy             | Tax Policy                |
| Local weighted returns                          | -15.1***<br>(5.49)        | -15.6***<br>(5.45)        | -25.2***<br>(5.82)        | -13.2**<br>(5.41)         | -14.6***<br>(5.42)        | -14.9***<br>(5.48)        | -20.0***<br>(5.87)        | -16.0***<br>(5.57)        | -15.8***<br>(5.54)        |
| Micro uncertainty                               | 9.15**<br>(3.48)          | 9.32***<br>(3.47)         | 9.65***<br>(3.54)         | 8.73**<br>(3.40)          | 10.7***<br>(3.56)         | 9.21**<br>(3.47)          | 9.93***<br>(3.52)         | 8.68**<br>(3.43)          | 9.00**<br>(3.46)          |
| Local weighted returns * Low risk borrower      | 10.7**<br>(4.44)          | 11.2**<br>(4.44)          | 27.3***<br>(5.42)         | 7.41*<br>(4.41)           | 9.97**<br>(4.48)          | 10.1**<br>(4.32)          | 18.6***<br>(4.94)         | 12.1***<br>(4.42)         | 11.7**<br>(4.54)          |
| Micro uncertainty * Low risk borrower           | -21.5***<br>(2.02)        | -21.8***<br>(2.02)        | -22.3***<br>(2.10)        | -20.8***<br>(1.95)        | -24.0***<br>(2.11)        | -21.6***<br>(2.01)        | -22.8***<br>(2.10)        | -20.7***<br>(1.96)        | -21.3***<br>(2.00)        |
| Three month treasury yields * Low risk borrower | -0.0083**<br>(0.0038)     | -0.0021<br>(0.0043)       | -0.027***<br>(0.0045)     | 0.0087**<br>(0.0041)      | 0.011***<br>(0.0039)      | -0.00032<br>(0.0044)      | -0.0044<br>(0.0043)       | -0.00056<br>(0.0044)      | -0.0029<br>(0.0043)       |
| Ten year yields * Low risk borrower             | -0.16***<br>(0.012)       | -0.15***<br>(0.011)       | -0.16***<br>(0.011)       | -0.15***<br>(0.0098)      | -0.17***<br>(0.011)       | -0.15***<br>(0.011)       | -0.16***<br>(0.011)       | -0.15***<br>(0.010)       | -0.16***<br>(0.011)       |
| GDP growth * Low risk borrower                  | 0.0020<br>(0.0016)        | 0.0047***<br>(0.0015)     | 0.0066***<br>(0.0015)     | 0.0025<br>(0.0015)        | 0.0024<br>(0.0015)        | 0.0055***<br>(0.0015)     | 0.0040**<br>(0.0015)      | 0.0058***<br>(0.0015)     | 0.0040**<br>(0.0016)      |
| BBD index or sub-index * Low risk borrower      | -0.013***<br>(0.0046)     | 0.012***<br>(0.0024)      | -0.065***<br>(0.0092)     | 0.011***<br>(0.0038)      | 0.022***<br>(0.0037)      | 0.014***<br>(0.0026)      | 0.012***<br>(0.0027)      | 0.015***<br>(0.0023)      | 0.0033<br>(0.0023)        |
| Observations                                    | 3115407                   | 3115407                   | 3115407                   | 3115407                   | 3115407                   | 3115407                   | 3115407                   | 3115407                   | 3115407                   |
| R-squared                                       | 0.685                     | 0.685                     | 0.685                     | 0.685                     | 0.685                     | 0.685                     | 0.685                     | 0.685                     | 0.685                     |

|   | (10)                      | (11)                      | (12)                      | (13)                      | (14)                      | (15)                      | (16)                      | (17)                             |
|---|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------------------------------|
|   | Credit Card Balances, log        |
| BBD Index or sub-index                          | Government Spending       | Healthcare                | National Security         | Entitlement Programs      | Regulation                | Financial Regulation      | Trade Policy              | Sovereign Debts, Currency Crisis |
| Local weighted returns                          | -14.4***<br>(5.38)        | -16.6***<br>(5.50)        | -14.6**<br>(5.56)         | -16.7***<br>(5.67)        | -14.7***<br>(5.47)        | -12.3**<br>(5.57)         | -15.6***<br>(5.48)        | -15.0***<br>(5.54)               |
| Micro uncertainty                               | 8.19**<br>(3.39)          | 8.24**<br>(3.38)          | 9.34***<br>(3.44)         | 8.72**<br>(3.42)          | 9.05**<br>(3.45)          | 9.68***<br>(3.44)         | 9.08**<br>(3.48)          | 9.03**<br>(3.45)                 |
| Local weighted returns * Low risk borrower      | 9.39**<br>(4.30)          | 12.8***<br>(4.44)         | 9.88**<br>(4.21)          | 13.1***<br>(4.62)         | 9.82**<br>(4.24)          | 5.88<br>(4.38)            | 11.3**<br>(4.41)          | 10.4**<br>(4.61)                 |
| Micro uncertainty * Low risk borrower           | -19.9***<br>(1.93)        | -20.0***<br>(1.92)        | -21.8***<br>(1.98)        | -20.8***<br>(1.96)        | -21.4***<br>(2.00)        | -22.4***<br>(2.02)        | -21.4***<br>(2.02)        | -21.3***<br>(2.02)               |
| Three month treasury yields * Low risk borrower | -0.00043<br>(0.0044)      | 0.0022<br>(0.0045)        | -0.0012<br>(0.0044)       | -0.0026<br>(0.0044)       | 0.0025<br>(0.0041)        | 0.00059<br>(0.0042)       | -0.0036<br>(0.0044)       | -0.0025<br>(0.0050)              |
| Ten year yields * Low risk borrower             | -0.15***<br>(0.010)       | -0.16***<br>(0.011)       | -0.15***<br>(0.011)       | -0.15***<br>(0.010)       | -0.16***<br>(0.011)       | -0.16***<br>(0.011)       | -0.16***<br>(0.011)       | -0.16***<br>(0.014)              |
| GDP growth * Low risk borrower                  | 0.0046***<br>(0.0015)     | 0.0055**<br>(0.0015)      | 0.0085**<br>(0.0015)      | 0.0045***<br>(0.0016)     | 0.0050**<br>(0.0015)      | 0.0037**<br>(0.0015)      | 0.0034*<br>(0.0015)       | 0.0034**<br>(0.0016)             |
| BBD index or sub-index * Low risk borrower      | 0.019***<br>(0.0021)      | 0.015***<br>(0.0022)      | 0.059***<br>(0.0057)      | 0.0073***<br>(0.0023)     | 0.012***<br>(0.0017)      | 0.012***<br>(0.0020)      | 0.0063<br>(0.0056)        | -0.0033<br>(0.0048)              |
| Observations                                    | 3115407                   | 3115407                   | 3115407                   | 3115407                   | 3115407                   | 3115407                   | 3115407                   | 3115407                          |
| R-squared                                       | 0.685                     | 0.685                     | 0.685                     | 0.685                     | 0.685                     | 0.685                     | 0.685                     | 0.685                            |

The dependent variable is the log of credit card balances, observed between 2007 Q1 and 2013 Q4. The other control variables included but suppressed are the same as in Table 3, column 2.

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