CREDIT SUPPLY AND ITS IMPACT ON SMALL BUSINESSES DURING THE GREAT RECESSION

AN EMPIRICAL STUDY OF LOW AND HIGH INCOME COUNTIES IN THE US

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Abstract:

The purpose of this paper is to investigate the economic effects that the reduction of credit that followed the Great Recession had on small businesses. We find that the supply of bank credit to small businesses in times of crisis does not discriminate against businesses in low income regions, but rather that the economic effects are the same through a nation-wide perspective. We identify credit supply shocks on a county level, through a comprehensive data collection covering the years before, during and after the Great Recession of 2008, using a similar methodology as Greenstone et. al (2020). What we find is that there is a significant difference between low and high income counties in regard to loan origination, but not in regard to employment, establishment, and payroll growth as a result of the credit shock that followed the financial crisis of 2007-2009.

Keywords:

Small business loans, Credit supply, Great Recession, Inequality

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1 Introduction

There is a clear difference in the types of firms that people from low and high income regions work for. According to a report published by the International Labor Organization (Kok and Berrios (2019)), approximately 85% of people from low and lower middle income regions are either self-employed or work for firms with 2 to 9 employees. In the group of people belonging to upper middle and high income regions, the picture looks completely different. For these groups, only about 35% of people are self-employed or work in firms with 2 to 9 employees, whilst the remaining 65% work for medium and large sized firms with 10 to 49 and more than 50 employees, respectively.

Newly formed and small enterprises are inherently more dependent on bank loans to grow and finance their operations, according to Hancock et al. (2007) (see also Berger and Udell (1998)). Hence, considering the structure of the labor market, a reduction in the supply of credit to small businesses could potentially have an adversely larger impact on employment and overall welfare in lower income regions, than it would in high income regions. Following the Great Recession of 2007 to 2009, the supply of credit indeed decreased internationally. However, the decrease did not affect all firms equally; small firms were especially negatively impacted, with significant increases in job destruction (Fort et al. (2013)).

A potential explanation for this dynamic can be deduced by combining works by Hancock and Wilcox (1998) and Ergungor (2010). Ergungor (2010) found that people in low and moderate income areas are more dependent on credit from smaller banks. Further, Hancock and Wilcox (1998) looked at data between 1989 and 1992, and found that small banks reduced their loan portfolios by more than large banks, following a reduction in the banks' capital. Hence, following the financial crisis, when the capital for all banks decreased, this leads to a larger reduction in lending by small banks and thus in the capital received by lower income regions.

Whilst credit, or rather the reduction of credit, poses as a risk factor for small firms when entering a financial downturn, it, that is credit, has also been discussed as being one of the main instruments that can be used to combat financially unstable times (see e.g. Bernhardtson and Billborn (2010)). This became evident when the Federal Reserve, the Federal Deposit Insurance Corporation, the Office of the Comptroller of the Currency, and the Office of Thrift Supervision, in November of 2008 published the Interagency Statement on Meeting the Needs of Creditworthy Borrowers in an attempt to make capital more available.

This paper investigates the differences in how regions with varying income levels in the US were affected, in terms of employment, establishment, and payroll growth, in small businesses that the credit supply shocks of the 2007 to 2010 financial crisis effectively triggered. The data will be divided into quartiles based on median household income in order to try and find differences between income groups. Further, the paper intends to discuss, in regards to what is discovered, what an increase in the wealth of different

income groups of society would have. With previous research in mind, our main hypothesis is that the negative consequences that follow a financial crisis are more prominent to small businesses in regions with lower income.

As in Greenstone et al. (2020), our method is dependent on successfully isolating credit supply factors from demand factors, based on the overall decrease in small business lending. The procedure through which this is done (described more thoroughly below) looks at banks' pre-crisis market shares on a county-level and their overall change in lending on a national-level. Within-state differences in the county market shares of banks mean that we can compare how different counties, with different amounts of bank branches, were impacted by the banks' reduction in lending on a national-level. The predicted credit supply shocks found are then used in regressions to find the impact that these shocks had on different economic factors.

Our results indicate a couple of things. First, for all quartiles, the credit shocks of 2008 and 2009 both had significant effects on loan origination. For the 2008 credit shock, the impact of a one standard deviation decrease in lending was 12.18 percentage points higher for below median counties than it was for above median counties. This indicates that small firms in low income regions were hit harder by the credit shock than small firms in high income regions. Secondly, when looking at the economic effects in terms of employment, establishment, and payroll growth, the general pattern is that there are no significant differences between counties with different levels of income. Only for the 2009 credit shock, when evaluating establishment growth, could we find a statistically significant difference between above and below median counties. Here, establishment growth in above median counties was affected with 0.36 percentage points more for every one standard deviation decrease in lending, compared to below median counties. Overall, our results suggest that the economic impacts that the credit shocks of the financial crisis had were similar across all income groups of society.

2 Related Literature

Most closely, our paper is related to Greenstone et al. (2020). Greenstone et al. examines the effects that the credit market shock of the Great Recession had on small businesses, and especially how this contributed to the employment losses that the crisis had. The paper finds that the credit market shock only had a small impact on small establishment employment. Our paper intends to add to the results found by Greenstone et al. by looking at how different subgroups of community were impacted. More specifically, our paper will apply the same methodology, but look at counties with different levels of household income, in order to try and find differences between these income groups. In addition to this, following the lead of Ebrahimian and Mansouri (2021), we intend to perform the analysis on payroll data to try and find statistically significant results for small businesses in areas where Greenstone et al. (2020) did not.

Further, it has been shown by Kroszner et al. (2007) that firms in sectors that are highly dependent on credit, in the form of bank loans, experience less growth, than firms in less credit-dependent sectors, following a financial crisis. This result suggests that small firms should be hit harder by credit contraction than large firms, which in effect, considering the relationship between income and firm structure, would mean a larger negative impact on low income regions. Moreover, Duygan-Bump et al. (2015) found that workers in small firms, in industries more dependent on credit, were more likely to become unemployed during the Great Recession and the 1990 to 1991 recession. Here it can be further argued that small firms were adversely hit by the reduction in credit supply. Our paper intends to strengthen these theses and build on the findings made by Kroszner et al. (2007) and Duygan-Bump et al. (2015) by looking at how the establishment, employment and payroll growth in different income regions of the US differed over the course of the financial crisis.

Moreover, a significant factor to this research is the relationships between banks and borrowers. Berger and Udell (1995b) show that larger, more complex banks reduce the supply of small business lending, although other institutions may replace those loans. Furthermore, Berger and Udell (1995a) finds that small firms with longer banking relationships pay lower interest rates and are less likely to pledge collateral than those without any relationships. These results in themselves are consistent with other theoretical arguments stating that relationship lending is effective in generating valuable, significant information regarding the quality of borrowers. Generally speaking, small firms are more dependent on banks and are more likely to have the type of asymmetric information problems that a bank-borrower relationship may resolve. In addition to the findings of Berger and Udell, Petersen and Rajan (1994) claim that the long term relationships have little effect on the quality and price of the loans, but rather impacts availability. Additionally, Petersen and Rajan (1994) find that small firms may voluntarily choose to concentrate their borrowing so as to improve the availability of financing. This thesis will contribute to this line of literature in the sense that we will connect the borrowing behaviour between small businesses and banks to our findings regarding loan origination.

Finally, a permeable theme that is discussed in all of the above mentioned papers is inequality, and especially how finance relates to inequality. Cihak and Sahay (2020) has found that the financial system can play a key role in reducing inequality. Specifically, it was found that an expansion of financial services to low income regions can complement fiscal policy in increasing welfare. Moreover, Clarke et al. (2006) empirically show that overall financial development improves growth, whilst also reducing inequality. This result, in itself, suggests that negative financial development, as during the Great Recession, should increase inequality. Our paper will contribute to this space by empirically looking at how different income regions, were impacted by the financial crisis of 2007.

3 Data Sources

The analysis conducted in this paper, as in Greenstone et al. (2020), has been based on data covering the period 1997 to 2010, available from several public data sources. The main elements of the analysis can be divided into three parts: county characteristics, credit market effects, and economic effects. The following section goes through the data sets used to generate results for each of the three parts. For the county characteristics, a summary of the statistics are presented.

3.1 County Characteristics

In Tables 11, 12, 13, and 14, complete summaries of the county characteristics are presented for the bottom, 2nd, 3rd, and top quartile counties respectively. In Table 10, Table 1 has been extended with the standard deviations.

Data on employment growth, wage growth, construction share, and manufacturing share have been gathered from the Quarterly Census on Employment and Wages (QCEW), published by the U.S. Bureau of Labor Statistics. The QCEW publishes, on a quarterly basis, counts of employment and wages and covers more than 95% of jobs in the U.S. In Table 1, a summary of the county characteristics for the entire sample and for the quartiles is presented. In terms of employment growth, it becomes evident that there is a upwards sloping trend - top quartile counties, with 9% growth, had a higher growth in employment than 3rd quartile counties, with 4.1% growth. However, when looking at the wage growth in the quartiles, an opposite trend can be detected. Here, bottom quartile counties had the highest growth, whilst top quartile counties had the lowest - 15.2% in the bottom quartile and 14.2% in the top quartile. For the construction share of GDP, it was highest in the top quartile counties and lowest in the bottom quartile counties. There is a difference of 4 percentage units between the two, with the 2nd and 3rd quartiles in between. The manufacturing share of GDP was highest in the 3rd quartile with 18.4% and shows no direct pattern between the quartiles.

Secondly, data on per capita income, poverty rates, population and population density are from the United States Census Bureau. ln(Per capita income) shows the pattern that was expected. It was highest in the top quartile with 10.896 and lowest in the bottom quartile with 10.303. For the poverty rate we can also see that it shows the expected pattern - it was highest in the bottom quartile with a value of 22.677, and lowest in the top quartile with a value of 9.465. The population and population density were highest in the top quartile and lowest in the bottom quartile. Hence, more people live in communities with higher median household income and are less dispersed.

Thirdly, the home price appreciation was calculated using home prices from Zillow. For bottom quartile counties, the change in home prices was 49.5% - the highest amount for all of the quartiles. The 2nd and 3rd quartiles had price appreciations of 42.4% and 37% respectively. The top quartile counties experienced the lowest appreciation with an increase of 36.5%.

Summary of County Characteristics					
Quartiles	All	Bottom	2nd	3rd	Top
	(1)	(2)	(3)	(4)	(5)
Employment Growth	0.042	0.010	0.026	0.041	0.090
Wage Growth	0.146	0.152	0.146	0.146	0.142
ln(Per capita income)	10.583	10.303	10.499	10.635	10.896
Debt-to-income ratio	1.574	1.194	1.418	1.545	1.920
ln(Population)	10.260	9.465	9.832	10.429	11.342
ln(Population density)	-10.976	-11.770	-11.464	-10.867	-9.770
Poverty rate	15.413	22.677	16.306	13.195	9.465
Change in home prices	0.374	0.495	0.424	0.370	0.365
Change in bank lending	0.051	0.006	0.022	0.014	0.163
Construction share of GDP	0.651	0.046	0.061	0.067	0.086
Manufacturing share of GDP	0.169	0.167	0.169	0.184	0.156

Notes: Data on employment growth, wage growth, construction share, and manufacturing share from the QCEW. Data on per capita income, poverty rates, population and population density are from the United States Census Bureau. Home price data from Zillow. Standard deviations in brackets. Standard errors in parenthesis. Quartiles based on median household income.

Table 1

3.2 Credit Market Effects

The credit market effects have been estimated using county-level market data from the Community Reinvestment Act (CRA) published by the Federal Financial Institutions Examination Council (FFIEC). The CRA was enacted in 1977 and intended to encourage banks, and other financial institutions, to meet credit needs in the counties in which they have operations. Contained in the dataset is information on loans to small businesses; the total loan amount and the number of loans, by bank, county, and year.

According to the CRA, banks over a certain asset threshold are subject to data collection and required to report. The asset threshold was $1.033 billion in 2007 and $1.098 billion in 2010. It has been estimated by Greenstone et al. (2020) that the CRA-eligible financial institutions are responsible for approximately 86% of all loans with a loan amount below $1 million. There are two official definitions of small business lending, one is based on the loan amount and the other on the characteristics of the borrowing firm. If the loan amount is below $1 million or if the borrowing firm has less than $1 million in revenue, the loan is to be considered a small business loan. Here, we have had to include loans that has gone to firms with less than 20 employees, in order to conduct our analysis using the Quarterly Workforce Indicators (QWI) data set.

As discussed by Bernanke et al. (1991), Greenstone et al. (2020) and Ebrahimian and Mansouri (2021), in order to study banks' lending over time, account has to be taken to mergers and acquisitions. In the procedure to handle this issue, if two banks merge, or one bank acquires another bank, in a later time period, their respective lending in previous periods are added together to form the merged entity. Here, call reports from the Federal Deposit Insurance Corporation (FDIC) are used to assemble banks on a holding company level. We follow the procedure used by Greenstone et al. (2020) in this process.

Worth mentioning here is the work by Berger et al. (1998), which examines the effect that mergers and acquisitions have on lending to small businesses. The paper finds that there is an reduction in lending to small businesses by the new entity. However, this reduction is counteracted by other banks in the area. Building on these findings, we assume in this paper that M&A-activity in itself does not have an impact on the lending to small businesses.

3.3 Economic Effects

To analyze the effects that credit market shocks have on employment and establishments, the dataset from QCEW, mentioned above, was used together with a dataset from County Business Patterns (CBP) published by the United States Census Bureau. As in Greenstone et al. (2020), a new dataset was formed containing the averages of the values of the variables in the respective datasets.

Further, the Quarterly Workforce Indicators (QWI) data set, gathered from the United States Census Bureau, was used to conduct an analysis of the effects that the estimated credit supply shocks would have on payroll in the different income groups. From the QWI it is possible to filter out small businesses. Based on the categories used, we have chosen to only look at firms with less than 20 employees. This is somewhat in line with the definition made by Kok and Berrios (2019).

4 Method and Specification of Regression

To examine the effect that a credit supply shock would have on establishment and employment growth, a number of steps have to be performed before this analysis can be conducted. The main steps of the method in this paper, based on the research conducted by Greenstone et al. (2020), can be divided into three parts:

1. Determine the credit supply shocks for different years
2. Show that the modeled supply shocks are predictive of actual loan origination
3. Perform regressions with the shocks to determine economic effects

Below, these three steps are, in turn, described in closer detail.

4.1 Credit Supply Shock

As mentioned in Section 1, our method is dependent on successfully isolating credit supply factors from demand factors, based on the overall decrease in small business lending. As in Greenstone et al. (2020), the procedure through which this is done looks at banks' pre-crisis market shares on a county-level and their overall change in lending on a national-level. Within-state differences in the county market shares of banks mean that we can compare how different counties, with different amounts of bank branches, were impacted by the banks' reduction in lending on a national-level.

In broad terms, to estimate the credit supply shock, the change in lending by a bank i in a county j can be divided into a three component formula:

$$\Delta(\ln(C_{ij})) = s_i + d_i + \epsilon_{i,j} \tag{1}$$

where s_i and d_j are supply and demand shocks respectively, and $\epsilon_{i,j}$ constitutes the error term. The dependent variable in Equation 1 is the percentage change in small business lending by bank i in county j, C referring to credit.

This modified version of the shift-share approach is based on the observation (made by Greenstone et al. (2020)) that, since banks have separate divisions in separate counties, the supply and demand effects can be separated from one another. This is done by looking at the difference between the national change in lending and the change in lending on a county level.

For each bank, the estimated supply factors s_i are used to find the total county-level credit supply shock. To do so, the banks' county-level market shares are used to weight the estimated supply factors. These are then summarized for all banks in a given county to get the total credit supply shock in that county. The approach can be summarized as:

$$S_j = \sum_i s_i \times m_{i,j} \tag{2}$$

where S_j is the total credit supply shock in county j, s_i is the credit supply shock for bank i (as estimated using Equation 1), and $m_{i,j}$ is the market share for bank i in county j. The S_j's are calculated for each county and pair of years, beginning in 1997.

Having calculated the credit supply factors for each county and year, the next step to enable our contributing factor is to divide the counties into different groups based on median household income. For each year, all counties are divided into quartiles based on the median per capita household income.

Here, it is important to mention that some counties changed between income quartiles in between years. However, for the most part, counties tended to remain in the same income quartile over the entire time-period (i.e. 1997 to 2010). Since the analysis is conducted on a yearly basis, if a county changes between quartiles this will be automatically accounted for in the results.

4.2 Loan Origination

Having divided the counties into quartiles based on median household income and estimated the credit supply shocks, it is now time to analyze each of these groups and the effect that the shocks have. The first step, as in Greenstone et al. (2020), is to divide each of these groups into three smaller groups once again. However, this time the division is based on the predicted credit supply shock in the counties. Thus, each of the four income quartiles are divided into three smaller groups: lower, middle, and upper. The following equation was the first step in analyzing the different groups:

$$\ln(L_{jt}) = \alpha_{sy} + \bar{\beta}_t \bar{X}_{j,t} + \beta_t^{DtI} X_{jt} + \delta_{t,L} \mathbb{1}\{j, L\} + \delta_{t,M} \mathbb{1}\{j, M\} + \delta_{t,U} \mathbb{1}\{j, U\} + \epsilon_{j,t} \tag{3}$$

The dependent variable in the above equation L_{jt} is loan origination in county j and year t. The indicator function $\mathbb{1}\{j, k\}$ takes on the value 1 if county j belongs to the predicted lending shock group k, and zero if it does not - it functions as a dummy variable. $\epsilon_{j,t}$ is the random error term in county j at time t. The variables of interest are the variables $\delta_{t,k}$, where $k = L, M, U$. These variables show the loan origination at time t in a county with a predicted lending shock of k.

Equation 3 accounts for state-by-year fixed effects through the α_{sy} variable. The variables ln(Per capita income), ln(Population), ln(Population density), construction share of GDP and manufacturing share of GDP were added as control variables and can be seen through the vector $\bar{\beta}$. Finally, debt-to-income is further added as one last control variable, here through β^{DtI}. The reason for adding the control variables is to try to remove endogeneity from the model.

To further analyze the effect that the credit supply shocks had on loan origination, the following regressions were run for the four median household income quartiles.

$$\ln(L_{jt}) = \alpha_{sy} + \theta_{8,8}(\mathbb{1}\{08\}S_{j,08}) + \theta_{8,9}(\mathbb{1}\{09\}S_{j,08}) + \theta_{8,10}(\mathbb{1}\{10\}S_{j,08}) + \\ + \theta_{9,9}(\mathbb{1}\{09\}S_{j,09}) + \theta_{9,10}(\mathbb{1}\{10\}S_{j,09}) \quad (4)$$

$$\ln(L_{jt}) = \alpha_{sy} + \bar{\beta}_t \bar{X}_{j,t} + \theta_{8,8}(\mathbb{1}\{08\}S_{j,08}) + \theta_{8,9}(\mathbb{1}\{09\}S_{j,08}) + \theta_{8,10}(\mathbb{1}\{10\}S_{j,08}) + \\ + \theta_{9,9}(\mathbb{1}\{09\}S_{j,09}) + \theta_{9,10}(\mathbb{1}\{10\}S_{j,09}) \quad (5)$$

$$\ln(L_{jt}) = \alpha_{sy} + \bar{\beta}_t \bar{X}_{j,t} + \beta_t^{DtI} X_{jt} + \theta_{8,8}(\mathbb{1}\{08\}S_{j,08}) + \theta_{8,9}(\mathbb{1}\{09\}S_{j,08}) + \\ + \theta_{8,10}(\mathbb{1}\{10\}S_{j,08}) + \theta_{9,9}(\mathbb{1}\{09\}S_{j,09}) + \theta_{9,10}(\mathbb{1}\{10\}S_{j,09}) \quad (6)$$

The dependent variable in Equations 4, 5, and 6 is L_{jt} and represents loan origination in county j and year t. Next, $S_{j,\tau}$ is the predicted lending shock in county j and year τ, where τ takes on the values 2008 and 2009. The indicator function $\mathbb{1}\{t\}$ takes on the value 1 for year t and 0 otherwise - it is a dummy variable for year. The difference between the three Equations lies in the control variables used. In Equation 4, account is taken to state-by-year fixed effects. In Equation 5, the variables ln(Per capita income), ln(Population), ln(Population density), construction share of GDP and manufacturing share of GDP are added as control variables. Finally, in Equation 6, debt-to-income is further added as a control variable.

$\theta_{p,q}$, with $p = 8, 9$ and $q = 8, 9, 10$, are measures of how loan origination in year q was impacted by a credit supply shock in year p in relation to loan origination in the years before the shock. These are the interesting variables and will be analyzed between the different income quartiles further below. The θ's are interaction variables between the predicted credit supply shocks and dummy variables for the years - 2008 with 2008, 2009, and 2010, and for 2009 with 2009 and 2010. The cumulative effects of the credit supply shocks are presented as the sum of the shocks for the respective years:

$$\text{Cumulative effect for 2008} = \theta_{8,8} + \theta_{8,9} + \theta_{8,10} \tag{7}$$

$$\text{Cumulative effect of 2009} = \theta_{9,9} + \theta_{9,10} \tag{8}$$

Further, to increase the chances of finding statistical significance between the income groups, another regression has been added. This regression uses several interaction terms comprised of one, binary, variable that indicates whether a county is above or below median based on median household income and one continuous variable. The binary variable is interacted with all of the terms included in the regression shown in equation 6.

$$\begin{aligned}\ln(L_{jt}) = \alpha_{sy} + \bar{\beta}_t \bar{X}_{j,t} + \beta_t^{DtI} X_{j,t} + \theta_{8,8}(\mathbb{1}\{08\}S_{j,08}) + \theta_{8,9}(\mathbb{1}\{09\}S_{j,08}) + \\ + \theta_{8,10}(\mathbb{1}\{10\}S_{j,08}) + \theta_{9,9}(\mathbb{1}\{09\}S_{j,09}) + \theta_{9,10}(\mathbb{1}\{10\}S_{j,09}) + \\ + \mathbb{1}\{high\} * \theta_{8,8} + \mathbb{1}\{high\} * \theta_{8,9} + \mathbb{1}\{high\} * \theta_{8,10} + \\ + \mathbb{1}\{high\} * \theta_{9,9} + \mathbb{1}\{high\} * \theta_{9,10} + \mathbb{1}\{high\} * \bar{\beta}_t + \mathbb{1}\{high\} * \beta_t^{DtI}\end{aligned} \tag{9}$$

where $\mathbb{1}\{high\}$ is a the dummy variable indicating if a county is above or below median and the θ's are as in Equations 4, 5 and 6. The cumulative effects that the 2008 and 2009 credit supply shocks had on loan origination in the below median group are defined as in 7 and 8. The interaction effect, that is the difference between the below and above median groups, is defined as $\mathbb{1}\{high\} * \theta_{8,8} + \mathbb{1}\{high\} * \theta_{8,9} + \mathbb{1}\{high\} * \theta_{8,10}$ for the 2008 credit shock and as $\mathbb{1}\{high\} * \theta_{9,9} + \mathbb{1}\{high\} * \theta_{9,10}$ for the 2009 credit shock. These sums will show if we can find statistically significant results in the difference between the below and above median groups.

Finally, in terms of loan origination, one final regression has been run. The idea with this regression is to estimate how credit shocks would impact loan origination in non-crisis times. As in Greenstone et al. (2020), this regression incorporates credit shocks from 2000 until 2010 and estimates the value of the predicted credit shock for a year to be the same over the period. The estimating equation looks like:

$$\begin{aligned}\ln(L_{j,t}) = \alpha_{sy} + \bar{\beta}_t \bar{X}_{j,t} + \beta_t^{DtI} X_{j,t} + \theta_1 S_{j,t} + \theta_2 S_{j,t-1} + \theta_3(\mathbb{1}\{08\}S_{j,t}) + \\ + \theta_4(\mathbb{1}\{09\}S_{j,t-1}) + \theta_5(\mathbb{1}\{09\}S_{j,t}) + \theta_6(\mathbb{1}\{10\}S_{j,t-1})\end{aligned} \tag{10}$$

where L_{jt} represents loan origination in county j and year t. The $S_{j,t}$ are the predicted credit shocks and the θ's are, as in Equations 4, 5, and 6, the measures of how loan origination was impacted by the credit shocks. As can be seen in the equation, all control variables are included. The results reported below will be both the individual values of the θ's and the total and excess effects of each shock.

More specifically, as in Greenstone et al. (2020), for the 2008 shock, the total effect will be $\sum_{i=1,2,3,4} \theta_i$ and the excess effect $\theta_3 + \theta_4$. For the 2009 shock, the total effect will be $\sum_{i=1,2,5,6} \theta_i$ and the excess effect $\theta_5 + \theta_6$.

4.3 Economic Effects

Finally, to study the economic effects that follow by changes in the supply of credit, it is necessary to define growth in establishment, employment and payroll more clearly. Hence, as in Greenstone et al. (2020), establishment growth and employment growth between periods t and $t-1$ have been defined as:

$$\text{Establishment growth}_t = \frac{\text{New establishments}_t - \text{Closing establishments}_{t-1}}{(\text{Establishments}_t + \text{Establishments}_{t-1})\frac{1}{2}} \tag{11}$$

$$\text{Employment growth}_t = \frac{\text{NJNE}_t - \text{LJCE}_t + \text{JCE}_t - \text{JCE}_{t-1}}{(\text{Employment}_t + \text{Employment}_{t-1})\frac{1}{2}} \tag{12}$$

where NJNE_t stands for new jobs from new establishments in period t, LJCE_t stands for lost jobs from closing establishments in period t, and JCE_t stands for jobs in continuing establishments in period t. Further, payroll growth has been defined as in Ebrahimian and Mansouri (2021):

$$\text{Payroll growth}_t = \frac{\text{Payments to labor}_t - \text{Payments to labor}_{t-1}}{(\text{Payments to labor}_t + \text{Payments to labor}_{t-1})\frac{1}{2}} \tag{13}$$

For Equations 11, 12 and 13, the growth values were calculated using data from the QCEW and CBP for establishment and employment growth and data from QWI for the growth in payroll. The growth in establishment, employment and payroll were used as dependent variables in regressions with the same structure as the ones in Equations 4, 5 and 6. Hence, to arrive at the results related to economic effects, three regressions were run for each of the above stated growth factors and these were performed for the four quartiles derived from the median household income. The regressions for each growth variable were also run for the entire sample.

As for loan origination, regressions were run with interaction variables included for each of the growth factors above as dependent variables. The method used worked exactly as in Section 4.2 Equation 9, see above for closer explanation.

Finally, as for loan origination, the regression explained by Equation 10 was run for each of the income quartiles with employment growth, establishment growth, and payroll growth as the dependent variable instead of loan origination.

5 Results and Empirical Analysis

5.1 Loan origination

In Figure 1, the results from the regression explained by Equation 3 are presented for each of the quartiles. From the figures, a few things become apparent. On the one hand, it becomes clear that there is a relationship between loan origination and the predicted credit shock and that there is some difference, within each quartile, in the effect depending on which shock-group we look at (this can be seen in the difference between the "Low", "Medium", and "High" lines in the graphs). On the other hand, it also becomes clear that loan origination between the quartiles were impacted differently. However, all quartiles show a similar pattern - in 2007, loan origination fell in all quartiles and stayed persistently at this lower level throughout the crisis.

Next, in terms of the effect that the credit supply shocks had on loan origination in the various income quartiles, a summary of our results are shown in Table 2 (see complete results for all quartiles in Tables 15, 16, 17 and 18). First and foremost, all numbers in the table are statistically significant. Hence, we can already now confirm the results found by Greenstone et al. (2020), that there is dependence between loan origination and the credit supply shock. However, for our contribution, the most interesting part is to analyze how the results differ between the quartiles.

For the bottom quartile, the numbers show that a one standard deviation decline in lending in 2008 and 2009 would lead to a 32.53% and 17.62% reduction in loan origination over the 2008 to 2010 and 2009 and 2010 periods respectively. The 2nd quartile was more impacted by the 2008 shock with a 41.93% decline in loan origination and slightly less impacted by the 2009 shock with a 13.91% decline in loan origination.

How then does these numbers compare to the 3rd and top quartiles? For the 2008 shock, a pattern can be spotted between the groups. If the numbers for the bottom and 2nd quartiles are compared to the numbers in the 3rd and top quartiles, we can see that the credit shock had a lesser impact on the 3rd and top quartiles. Here, a decline in loan origination of 18.12% and 27.05% in the respective quartiles would be the effect of a one standard deviation decline in lending - both numbers are lower than the numbers in the bottom and 2nd quartiles. This suggests that a credit supply shock does matter more for lower income groups than it does for higher income groups.

However, when looking at the 2009 shock and its impact on loan origination, a different picture is shown. For this credit shock, a one standard deviation decline in lending would lead to a 21.26% and 14.87% decline in loan origination for the 3rd and top quartiles respectively. Hence, the pattern that emerges is the opposite as for the cumulative 2008 shock. A potential explanation to this difference might lie in that lower income counties were hit harder by the financial crisis early on. In other words, the shock in 2008 alone had a relatively greater impact on these lower income quartiles, than on higher income quartiles. Looking into Tables 15, 16, 17 and 18, this is what is found. The 2008

Credit Shocks and ln(Loan origination)						
Quartiles	All*	Bottom	2nd	3rd	Top	All**
	(1)	(2)	(3)	(4)	(5)	(6)
Cumulative effect of 2008 shock	0.2599	0.3253	0.4193	0.1812	0.2705	0.3613
	(0.0273)	(0.0888)	(0.0533)	(0.0459)	(0.0498)	(0.0484)
$\mathbb{1}${high income}						-0.1218
						(0.0598)
Cumulative effect of 2009 shock	0.1704	0.1762	0.1391	0.2126	0.1487	0.1490
	(0.0175)	(0.0606)	(0.0368)	(0.0289)	(0.0299)	(0.0321)
$\mathbb{1}${high income}						0.0409
						(0.0387)
Observations	30884	5558	7014	8442	9870	30884

*All observations included. Works as a sanity check to ensure that the regressions have been performed correctly. The values comply with Greenstone et al. (2020).
**Interaction with dummy variable indicating if a county is above median, based on median household income. The cumulative effect only includes below median counties and the $\mathbb{1}${high income} row shows the difference between below and above median counties.
Notes: Coefficients from regression with state-by-year effects, baseline controls, and debt-to-income ratio included as control variables. Specification as in Equation 6.

Table 2

shock was larger for both bottom and 2nd quartile counties than it was for 3rd and top quartile counties.

Next, in column (6) of Table 2, the results from the regression in Equation 9 strengthens the results from columns (2)-(5). When including the interaction variable in the regression it becomes clear that there is a difference between counties that have a median household income below and above the median in the US. For the 2008 credit shock it can be seen that there is a significant difference between the below median group and the above median group of 12.18% for every one standard deviation decrease in lending. For the 2009 credit shock there is a significant difference as well, but here the difference is a lot smaller, only 4.09%, and the above median counties have the higher value. Considering that the magnitude of the difference in the 2008 credit shock is larger than for the 2009 credit shock, these results confirm that loan origination was more negatively impacted in below median counties.

Finally, looking at the results from the regression run with Equation 10 presented in Table 3, it becomes evident that there is a significant relationship between the predicted credit shock and the actual loan origination from small businesses in non-crisis years (for complete results for all quartiles see Column (1) in Tables 23, 24, 25 and 26). Since all results are statistically significant, this indicates that we will be able to use the estimated credit shocks to find results for the economic effects in years before the financial crisis.

Credit Shocks and ln(Loan origination)					
Non-crisis years					
Quartiles	All*	Bottom	2nd	3rd	Top
	(1)	(2)	(3)	(4)	(5)
Total effect of 2008 shock	0.1524	0.1842	0.2120	0.0970	0.1631
	(0.0144)	(0.0310)	(0.0267)	(0.0273)	(0.0258)
Total effect of 2009 shock	0.2154	0.1881	0.2220	0.2426	0.1759
	(0.0152)	(0.0431)	(0.0311)	(0.0249)	(0.0277)
Excess effect of 2008 shock	0.0695	0.1069	0.1597	0.0144	0.0685
	(0.0158)	(0.0325)	(0.0279)	(0.0311)	(0.0281)
Excess effect of 2009 shock	0.1326	0.1108	0.1698	0.1599	0.0813
	(0.0160)	(0.0438)	(0.0322)	(0.0285)	(0.0287)
Observations	30160	7330	7590	7710	7530

*All observations included. Works as a sanity check to ensure that the regressions have been performed correctly. The values comply with Greenstone et al. (2020).
Notes: Coefficients from regression in Equation 10. Standard errors in parenthesis. The total effect for 2008 is shock(t)+shock(t-1)+shock(t)*2008+shock(t-1)*2009. The total effect for 2009 is shock(t)+shock(t-1)+shock(t)*2009+shock(t-1)*2010. The excess effect of 2008 is shock(t)*2008+shock(t-1)*2009. The excess effect of 2009 is shock(t)*2009+shock(t-1)*2010. Baseline controls (ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income)) included in regressions.

Table 3

5.2 Economic Effects

There are three main variables that have been studied in order to determine the effects that the financial crisis and the resulting credit supply shock had on the economy - employment growth, establishment growth, and payroll growth. On a general level, it can be said that the results in terms of economic effects have not been as evident as those for loan origination in Section 5.1. For some areas we have found statistical significance. However, this has often only been true for a subset of quartiles and years. Below we will go through each of the effects one by one to try and find patterns. For complete presentations of all results in terms of economic effects in the crisis years, see Tables 19, 20, 21, and 22, and for non-crisis years, see Tables 23, 24, 25, and 26.

5.2.1 Employment Growth

For employment growth, a summary of the main results during the crisis years are presented in Table 4. Here, statistical significance is found for the 2nd and 3rd quartiles for the 2008 shock and for the 2nd and top quartiles for the 2009 shock. However, for all of these cases, the standard errors are large in relation to the coefficients and so the statistical significance is not on a high level. In terms of patterns, for the 2008 shock it can be seen that the bottom and 2nd quartiles have negative coefficients, whilst the 3rd and top qurtiles have positive coefficients.

Credit Shocks and Employment Growth						
Quartiles	All*	Bottom	2nd	3rd	Top	All**
	(1)	(2)	(3)	(4)	(5)	(6)
Cumulative effect of 2008 shock	0.0001	-0.0005	-0.0049	0.0070	0.0018	-0.0021
	(0.0026)	(0.0043)	(0.0033)	(0.0057)	(0.0054)	(0.0028)
$\mathbb{1}$\{high income\}						0.0019
						(0.0046)
Cumulative effect of 2009 shock	0.0034	0.0005	0.0034	0.0008	0.0051	0.0020
	(0.0019)	(0.0049)	(0.0024)	(0.0039)	(0.0030)	(0.0025)
$\mathbb{1}$\{high income\}						0.0022
						(0.0035)
Observations	30830	5555	7013	8415	9847	30830

*All observations included. Works as a sanity check to ensure that the regressions have been performed correctly. The values comply with Greenstone et al. (2020).
**Interaction with dummy variable indicating if a county is above median, based on median household income. The cumulative effect only includes below median counties and the $\mathbb{1}$\{high income\} row shows the difference between below and above median counties.
Notes: Coefficients from regression with state-by-year effects, baseline controls, and debt-to-income ratio included as control variables. Specification as in Equation 6.

Table 4

However, when looking at column (6) to try and find a difference between below and above median counties, no statistically significant difference is found between the two groups. Neither the difference indicator for the 2008, nor the 2009 shocks are significant, indicating that we cannot say if lower quartile counties were hit harder than higher quartile counties.

Further, when looking at the employment effects that the credit shocks would have in non-crisis (see Table 5) years, a similar picture to the one found in the crisis years is established. Here, barely any statistically significant results are found between the quartiles, indicating that it is difficult to say that a credit shock in non-crisis years affects various income groups differently.

Credit Shocks and Employment growth					
Non-crisis years					
Quartiles	All*	Bottom	2nd	3rd	Top
	(1)	(2)	(3)	(4)	(5)
Total effect of 2008 shock	-0.0006	-0.0016	-0.0006	0.0008	-0.0014
	(0.0014)	(0.0025)	(0.0018)	(0.0024)	(0.0027)
Total effect of 2009 shock	0.0013	0.0003	-0.0045	0.0013	0.0047
	(0.0018)	(0.0027)	(0.0026)	(0.0028)	(0.0039)
Excess effect of 2008 shock	-0.0018	-0.0030	-0.0014	-0.0004	-0.0026
	(0.0014)	(0.0029)	(0.0020)	(0.0025)	(0.0029)
Excess effect of 2009 shock	0.0001	-0.0011	-0.0053	0.0002	0.0035
	(0.0018)	(0.0028)	(0.0028)	(0.0031)	(0.0037)
Observations	29945	7261	7542	7661	7481

*All observations included. Works as a sanity check to ensure that the regressions have been performed correctly. The values comply with Greenstone et al. (2020).
Notes: Coefficients from regression in Equation 10. Standard errors in parenthesis. The total effect for 2008 is shock(t)+shock(t-1)+shock(t)*2008+shock(t-1)*2009. The total effect for 2009 is shock(t)+shock(t-1)+shock(t)*2009+shock(t-1)*2010. The excess effect of 2008 is shock(t)*2008+shock(t-1)*2009. The excess effect of 2009 is shock(t)*2009+shock(t-1)*2010. Baseline controls (ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income)) included in regressions.

Table 5

5.2.2 Establishment Growth

Next, the results for the regression on establishment growth in the crisis years are presented in Table 6. Here, statistical significance is only found for the 3rd and top quartiles when looking at the 2009 credit supply shock. However, there are patterns that can be found for both the 2008 and 2009 shocks.

For the 2008 shock, when comparing the values in columns (2) to (5), it can be seen that the values show a decreasing trend. For the bottom quartile, a one standard deviation decline in lending would lead to 0.05% negative growth (i.e. decline) in establishment and for the rest of the quartiles it would lead to an increase of 0.12%, 0.13% and 0.32%, respectively. Even though the only statistically significant value is that of the top quartile, it looks as if there is a difference between the lower quartiles and the upper quartiles. However, when looking at column (6), we can see that there is no statistically significant difference between below and above median counties. Hence, we cannot say that lower income counties were hit harder by the 2008 credit shock than higher income counties.

Credit Shocks and Establishment Growth						
Quartiles	All*	Bottom	2nd	3rd	Top	All**
	(1)	(2)	(3)	(4)	(5)	(6)
Cumulative effect of 2008 shock	-0.0018	0.0005	-0.0012	-0.0013	-0.0032	-0.0008
	(0.0015)	(0.0025)	(0.0020)	(0.0018)	(0.0031)	(0.0017)
$\mathbb{1}$\{high income\}						-0.0018
						(0.0026)
Cumulative effect of 2009 shock	0.0028	0.0008	0.0010	0.0021	0.0034	0.0002
	(0.0010)	(0.0025)	(0.0013)	(0.0012)	(0.0018)	(0.0014)
$\mathbb{1}$\{high income\}						0.0036
						(0.0019)
Observations	30830	5558	7013	8415	9847	30830

*All observations included. Works as a sanity check to ensure that the regressions have been performed correctly. The values comply with Greenstone et al. (2020).
**Interaction with dummy variable indicating if a county is above median, based on median household income. The cumulative effect only includes below median counties and the $\mathbb{1}$\{high income\} row shows the difference between below and above median counties.
Notes: Coefficients from regression with state-by-year effects, baseline controls, and debt-to-income ratio included as control variables. Specification as in Equation 6.

Table 6

For the 2009 shock, an inverted pattern to the one found for the 2008 shock is found. As we move from the bottom quartile to the top quartile the values show an increasing trend from 0.08% to 0.34%. Still, statistical significance is only found for the 3rd and top quartiles, but the pattern is still very much prevalent in the data. Here, the results in column (6) actually confirm the pattern. The difference between below median and above median counties is 0.36%, meaning that above median counties were hit harder by the 2009 credit shock than below median counties, in terms of establishment growth.

In terms of the effect that a credit shock would have on establishment growth in non-crisis years, as for employment growth, there are barely any statistically significant results. From the results in Table 7, it seems like there are no obvious differences in how the four quartiles are impacted by the shocks. Hence, we cannot say if bottom quartile counties are more impacted or less impacted than top quartile counties.

Credit Shocks and Establishment growth					
Non-crisis years					
Quartiles	All*	Bottom	2nd	3rd	Top
	(1)	(2)	(3)	(4)	(5)
Total effect of 2008 shock	0.0001	-0.0004	0.0011	0.0008	-0.0017
	(0.0008)	(0.0011)	(0.0010)	(0.0015)	(0.0013)
Total effect of 2009 shock	0.0005	0.0009	-0.0000	0.0009	0.0009
	(0.0010)	(0.0014)	(0.0013)	(0.0014)	(0.0023)
Excess effect of 2008 shock	0.0004	-0.0006	0.0005	0.0016	-0.0010
	(0.0009)	(0.0012)	(0.0011)	(0.0016)	(0.0015)
Excess effect of 2009 shock	0.0008	0.0007	-0.0006	0.0017	0.0015
	(0.0010)	(0.0015)	(0.0014)	(0.0015)	(0.0022)
Observations	29945	7261	7542	7661	7481

*All observations included. Works as a sanity check to ensure that the regressions have been performed correctly. The values comply with Greenstone et al. (2020).
Notes: Coefficients from regression in Equation 10. Standard errors in parenthesis. The total effect for 2008 is shock(t)+shock(t-1)+shock(t)*2008+shock(t-1)*2009. The total effect for 2009 is shock(t)+shock(t-1)+shock(t)*2009+shock(t-1)*2010. The excess effect of 2008 is shock(t)*2008+shock(t-1)*2009. The excess effect of 2009 is shock(t)*2009+shock(t-1)*2010. Baseline controls (ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income)) included in regressions.

Table 7

5.2.3 Payroll Growth

The results in terms of payroll growth are given in Table 8. For payroll growth, the general takeaway is that is is difficult to find patterns in the data. There are some values that are significant, but overall the results are insignificant.

For the 2008 credit supply shock, aside from column (1), only one value is significant. This is the value for the 3rd quartile and shows that a one standard deviation decrease in lending would lead to a 0.63% increase in payroll. However, if taking the lower bound, with the standard error in mind, a one standard deviation decrease in lending would only lead to a 0.15% increase in payroll. In terms of patterns we can see that the bottom and top quartiles have values that are of similar magnitude. Since the values are not significant, it is difficult to make any further conclusions from this. The difference between below median and above median counties for the 2008 credit shock is insignificant as well and therefore nothing can be said regarding differences between the groups.

For the 2009 credit supply shock, two values are statistically significant - that of the bottom quartile and the top quartile. Here, the bottom and top quartiles have values of similar proportion and the same is true for the 2nd and 3rd quartiles. 0.62% and 0.46% would be the effect on payroll resulting from a one standard deviation change in lending. The same thing is true for the 2009 credit shock as for the 2008 credit shock - the results in column (6) give no indication of statistically significant differences between below and above median counties.

Credit Shocks and Payroll Growth						
Quartiles	All*	Bottom	2nd	3rd	Top	All**
	(1)	(2)	(3)	(4)	(5)	(6)
Cumulative effect of 2008 shock	-0.0059	-0.0027	-0.0002	-0.0063	-0.0028	-0.0030
	(0.0030)	(0.0051)	(0.0060)	(0.0048)	(0.0063)	(0.0035)
$\mathbb{1}$\{high income\}						-0.0026
						(0.0057)
Cumulative effect of 2009 shock	0.0065	0.0062	0.0036	0.0030	0.0046	0.0050
	(0.0021)	(0.0049)	(0.0043)	(0.0047)	(0.0028)	(0.0031)
$\mathbb{1}$\{high income\}						0.0020
						(0.0042)
Observations	26507	4461	6071	7378	8597	26507

*All observations included.
**Interaction with dummy variable indicating if a county is above median, based on median household income. The cumulative effect only includes below median counties and the $\mathbb{1}$\{high income\} row shows the difference between below and above median counties.
Notes: Coefficients from regression with state-by-year effects, baseline controls, and debt-to-income ratio included as control variables. Specification as in Equation 6.

Table 8

Finally, the results for non-crisis years in terms of payroll growth are presented in Table 9. From this table it can be seen that in some regards, there are differences in the magnitude by which the different quartiles have been affected by the shocks. For example, for the total effect of 2008, it can be seen that the bottom quartile would have had a decline in payroll of 0.97% following a one standard deviation decline in lending. For the top quartile an equally large decline in lending would not have had a negative effect on payroll. In fact, it would have led to a growth in payroll of 0.71%. The same pattern is found for the excess effect of 2008. This might suggest that counties with lower median household income, where more people work in smaller firms, are adversely more impacted by a credit shock. More specifically, the negative impact is worse in the beginning - which can be seen in that the excess effect is larger than the total effect for the bottom quartile.

Credit Shocks and Payroll growth

Non-crisis years

Quartiles	All*	Bottom	2nd	3rd	Top
	(1)	(2)	(3)	(4)	(5)
Total effect of 2008 shock	-0.0008	0.0097	0.0012	0.0076	-0.0071
	(0.0026)	(0.0043)	(0.0029)	(0.0058)	(0.0042)
Total effect of 2009 shock	-0.0072	-0.0045	-0.0026	-0.0042	-0.0053
	(0.0026)	(0.0047)	(0.0049)	(0.0042)	(0.0055)
Excess effect of 2008 shock	-0.0014	0.0120	0.0007	0.0086	-0.0084
	(0.0027)	(0.0048)	(0.0032)	(0.0058)	(0.0045)
Excess effect of 2009 shock	-0.0078	-0.0023	-0.0030	-0.0033	-0.0066
	(0.0027)	(0.0052)	(0.0048)	(0.0045)	(0.0058)
Observations	29166	6909	7401	7565	7291

*All observations included. Works as a sanity check to ensure that the regressions have been performed correctly. The values comply with Greenstone et al. (2020).

Notes: Coefficients from regression in Equation 10. Standard errors in parenthesis. The total effect for 2008 is shock(t)+shock(t-1)+shock(t)*2008+shock(t-1)*2009. The total effect for 2009 is shock(t)+shock(t-1)+shock(t)*2009+shock(t-1)*2010. The excess effect of 2008 is shock(t)*2008+shock(t-1)*2009. The excess effect of 2009 is shock(t)*2009+shock(t-1)*2010. Baseline controls (ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income)) included in regressions.

Table 9

6 Discussion

6.1 Method of Research

Significant to our research was the magnitude of the data collection. The amount of data used was uniquely extensive and comprehensive, collected by governmental resources, and used in other renowned papers such as Greenstone et al. (2020). The vast magnitude of data makes it difficult to control its accuracy, but its extensiveness is also what contributes viability to our findings. That it was collected by the US government is a fact that further strengthens its credibility and controllability. That entails that the data is trustworthy and comprehensive enough both to be able to make significant research, and consider the results to be factful.

Throughout the examination of the data, different sample sizes were used for the respective income quartiles. This because some data were missing for some counties (e.g the debt-to-income ratio), but in order for the research to be as extensive and correct as possible, we chose to include all counties with all available data. If we had only included the counties where all data was available for all quartiles with all factors researched, the total research sample would have been vastly reduced and the results therefore less trustworthy and accurate for the entire population. Sorting the sample sizes the way that we did, we could also check our findings by comparing it to what Greenstone et al. (2020) found in their article, and it could be used as a sanity check to make sure the method was correct.

6.2 The Results

While examining the effects of our different research factors (employment growth, establishment growth, and payroll growth, in addition to loan origination), some proved to have been insignificantly affected by the shocks, especially in the sense that little to no difference could be seen between quartiles. This can be seen in e.g. table 4, where the result for e.g. the cumulative effect of the 2008 shock in regard to employment growth for all columns apart from the 2nd and 3rd quartile is insignificant. This pattern is not unique for this specific shock or quartile, but rather a reoccurring pattern. Interestingly enough, Ebrahimian and Mansouri (2021) find that the same does not apply for newborn firms. Instead, newborn firms are affected in regard to both employment and payroll growth in all counties apart for the ones in the top income quartile.

Our paper does not find any remarkable difference to small businesses exposure to the credit shock between the four quartiles of income. That entails that there was no real difference between the higher income counties and the lower income counties in regard to small business exposure. This was the opposite of our hypothesis, and unlike much previous research, such as the findings of Kroszner et al. (2007) who argues that small firms ought to be more exposed to a financial crisis, since they in general are more heavily reliant on credit. That should cause lower income counties, the first and second quartile in our research, to display larger effect in contrast to the higher income counties, our

third and fourth quartile. The logic behind that assumption is consequential to the fact that the firm structure of the lower income counties are of a smaller character than in the higher income counties.

The findings of Duygan-Bump et al. (2015) further explain how unemployment of small businesses who are dependant on credit was more prominent than to larger firms during several financial crises. Since Kroszner et al. (2007) concluded that smaller firms are over-represented in the lower income counties, it would make sense for our data to have displayed larger effect that what we received. That raises the question as to why the true exposure of small businesses to times of financial crisis apparently is independent on the wealth of its surroundings, and is hit more or less equally as hard irregardless of the income factor.

6.3 Why Such Little Effect?

While conducting this research, underlying our hypothesis was the presumption that we would receive results indicating a larger effect than what we actually got. Instead of being a difference between exposure in low and high income counties, there is an apparent difference between the exposure of small businesses and newborn businesses, in accordance with the findings of Ebrahimian and Mansouri (2021). Why that is the case is a difficult question to answer, but a possible explanation is the importance of relationship lending. It has been established by Berger and Udell (1995b) that larger, complex banks consistently reduce the supply of small business lending in sync with their organic growth, even though other institutions may replace many of those loans. According to Berger and Udell (1995b), that pattern emerged when the US financial landscape changed rapidly, with increasingly volatile marketplaces and pace of financial innovation.

While the changes in the financial landscape have been severe, they have mostly been noticeable in the banking sector, where the large corporate clientele have received a new, wider product mix of services. This is a factor that does not only affect small businesses in times of crisis, but is rather a trend that is likely to continue going forward. The Interstate Banking and Branching Efficiency Act of 1994 has already accelerated the mega-bank trend, it did for example cause Bank of America to merge with Security Pacific. While the big banks and corporations thrive of the act, the small businesses credit falls victim. The new sizes and managerial career paths of the mega-banks entails less incentive to pay attention to "less important" borrowers, such as the small businesses.

The needs of small businesses differ greatly from the larger corporate clientele in the regard that the products and services are less generic. When a small business manages to get a loan from a large bank, it is however with relatively better conditions - lower interest rate and less collateral. But to get a loan at all is much more of a rare opportunity. That leaves the fact that small businesses require small banks in order to receive financing.

The relationship between banks and borrowers has also been proven to be of important significance by Berger and Udell (1995a). The paper concludes that small firms with long banking relationships pay lower interest rates and pay less collateral. Their findings are consistent with the presumption that relationship lending generates highly valuable information regarding the quality of borrowers. Small businesses are, as previously concluded, more heavily reliant on banks and more exposed to information asymmetry, which a borrower-bank relationship have the possibility to resolve. That entails that when banks fail during economic crises, it is not only the book value of the banks that disappears, but also the relationships. Previous research from the Great Depression and other financially difficult times commented by Berger and Udell (1995a) confirm that theory.

Not only does the failure of banks create loss of relationships, but for small businesses, there are also effect from the so-called credit crunches. Credit crunches are reductions in the supply of credit, primarily affecting small business owners, which in turn leaves them with both more required collateral as well as higher loan rates when the bank they previously had a good relationship with fails.

With the reasoning above in mind, a possible reason for the difference of newborn and small businesses and their access to loans appears. Newborn firms has not had the same chance of establishing good relations with the banks, irregardless of size, as smaller older businesses have. It is also apparent that small businesses will prefer small banks, as they are more likely to receive loans there, as well as the very important relationship. The existence of the relationship between small businesses and their banks is likely to be of similar importance irregardless of the overall wealth of the county.

6.4 Finance and Inequality

As Cihak and Sahay (2020) found, the financial systems have the ability to be of significant importance in reducing inequality. This becomes more apparent in regard to the role of relationship lending, and the exclusion of small businesses lending in large banks. To some extent, it is probably possible to make large banks more inclined to work with the smaller firms, and keep the relationship with the counterparts going. To create incentive for that, the government may be able to create policies or beneficial programs to make banks more inclusive than the traditional ways of a mega-bank.

The inequality of loan origination discussed by Ebrahimian and Mansouri (2021) is another thing apparent in our research, since we got a noticeable difference of the loan origination between the lower and higher quartiles. The interesting find from an inequality perspective, in accordance with Ebrahimian and Mansouri (2021), is how newborn firms gets affected more, as compared to small firms. Only newborn firms in already wealthier counties seem to survive times of crisis - which to some degree is understandable, as there is several other means of financing more available there. Newborn firms do pose larger risk to banks than already established ones, and it therefore makes sense form banks to be more risk averse in worse economic times. In order to change how risk averse

the banks are, since it is wise to be so in times of financial uncertainty, that would entail regulations. The banking industry is already heavily regulated, but the governments also prove to be prone to aiding banks in times of distress, as described by Greenstone et al. (2020). That is done through the so called Toxic Assets Relief Program, which is basically costless loans that the US government extends to banks. To reduce the inequality in loan origination, a demand could follow the program to fill a certain quota of newborn investments. The program could also make sure to include more smaller banks in order to make sure the hit on small businesses would be contained to be as minimal as possible.

6.5 Further Lines of Research

After concluding our results and finding that there are such little effect, we began to speculate in why that might be. While relationship lending might be important, it is likely not the sole explanatory factor as to why our results are as they are. And so, a possible extension of this paper would be to investigate why there is such insignificance of the wealth of the county in question in this case, but such significance in other cases (e.g. as for the research of Ebrahimian and Mansouri (2021)).

Furthermore, it could be very interesting to see whether the pattern of effect remains the same through different sizes of firms. At what size does it change and become more impactful? Are medium-sized firms such as grocery stores less exposed than multinational firms? Could that have to do with different levels of exposure to macroeconomic trends?

While size is one parameter, and another very relevant one is firm age. At what age or point in development has a business gained enough of a relationship with a bank so that the loan origination is "secured"? This may also differ with lower and higher income counties in the sense that richer entrepreneurs is more likely to already have a relationship of some sort with the people providing financing. And so, firm age across different income counties examining the extent of relationship lending could be an interesting find. It could also be of importance to investigate if it was possible to extract which loans were originated due to relationships, and which were originated without any relationships at all to see how that differs across the country. That could be further connected to where smaller and larger banks operate and how prone they are to interact with a certain kind of business.

7 Conclusion

In this paper, the methodology used by Greenstone et al. (2020) has been adapted to try and find differences in how small companies in counties with varying levels of household income were hit by the credit shocks that followed the Great Recession of 2007 to 2009. We have looked at the effects that the credit shocks had on the economy by studying employment growth, establishment growth, and payroll growth in order to evaluate our hypothesis - that low income counties were adversely harder impacted by the shocks.

The first thing we found was that, for all quartiles, the credit shocks of 2008 and 2009 both had significant effects on loan origination. For the 2008 credit shock, the impact of a one standard deviation decrease in lending was 12.18 percentage points higher for below median counties than it was for above median counties. This indicates that small firms in low income regions experienced a larger decline in loan origination than higher income regions. Secondly, when looking at the economic effects, the general pattern found was that there were no significant differences between counties with different levels of income. Only for the 2009 credit shock, when evaluating establishment growth, could we find a statistically significant difference between above and below median counties. Here, establishment growth in above median counties was affected with 0.36 percentage points more for every one standard deviation decrease in lending, compared to below median counties. This result speaks against our initial hypothesis. Overall, our results suggest that the economic impacts that the credit shocks of the financial crisis had were similar across all income groups of society. We cannot say, with statistical support, that low income counties were impacted harder than high income counties.

Why the results differ from the hypothesis can in this stage only be speculated upon. A plausible explanatory factor is the impact of relationship lending, and how small businesses get prioritized in retrieving loans due to this phenomenon. That could further play a part in why the lower income counties experienced a sharper decline in loan origination - they do not have equal opportunity to retrieve relationships with the people controlling the financing as wealthier people do. However, it is still likely that several factors play a contributing part to our surprising results, and that opens up to new lines of research.

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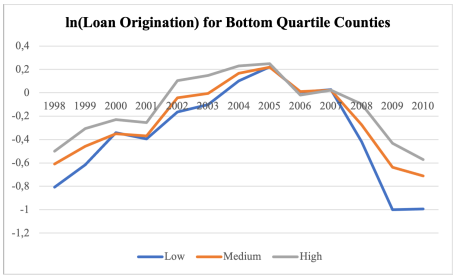
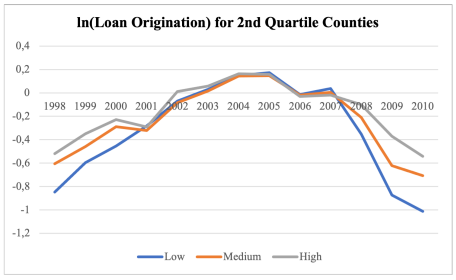
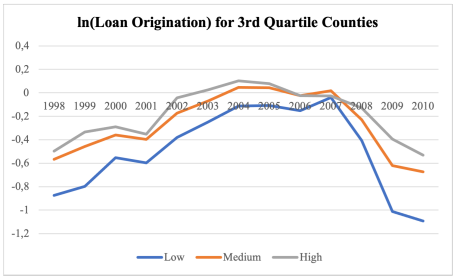
Appendix



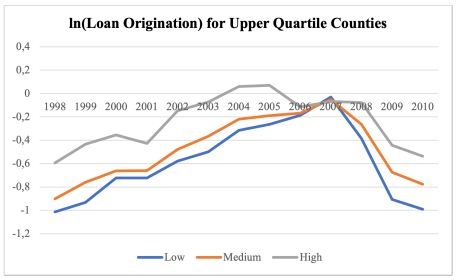
(a) Bottom quartile



(b) 2nd quartile



(c) 3rd quartile



(d) Upper quartile

Figure 1. ln(Loan Origination) for the four income quartiles. Regressions based on Equation 3.

Summary of County Characteristics					
Quartiles	All	Bottom	2nd	3rd	Top
	(1)	(2)	(3)	(4)	(5)
Employment Growth	0.042	0.010	0.026	0.041	0.090
	[0.121]	[0.129]	[0.116]	[0.103]	[0.118]
Wage Growth	0.146	0.152	0.146	0.146	0.142
	[0.082]	[0.096]	[0.089]	[0.073]	[0.065]
ln(Per capita income)	10.583	10.303	10.499	10.635	10.896
	[0.238]	[0.108]	[0.040]	[0.041]	[0.161]
Debt-to-income ratio	1.574	1.194	1.418	1.545	1.920
	[0.584]	[0.325]	[0.471]	[0.514]	[0.635]
ln(Population)	10.260	9.465	9.832	10.429	11.342
	[1.446]	[1.073]	[1.217]	[1.318]	[1.418]
ln(Population density)	-10.976	-11.770	-11.464	-10.867	-9.770
	[1.709]	[1.440]	[1.516]	[1.522]	[1.642]
Poverty rate	15.413	22.677	16.306	13.195	9.465
	[6.230]	[5.994]	[3.127]	[2.780]	[2.815]
Change in home prices	0.374	0.495	0.424	0.370	0.365
	[0.209]	[0.282]	[0.232]	[0.235]	[0.192]
Change in bank lending	0.051	0.006	0.022	0.014	0.163
	[0.671]	[0.796]	[0.721]	[0.627]	[0.489]
Construction share	0.651	0.046	0.061	0.067	0.086
	[0.046]	[0.040]	[0.042]	[0.040]	[0.052]
Manufacturing share	0.169	0.167	0.169	0.184	0.156
	[0.132]	[0.149]	[0.131]	[0.127]	[0.120]

Notes: Data on employment growth, wage growth, construction share, and manufacturing share from the QCEW. Data on per capita income, poverty rates, population and population density are from the United States Census Bureau. Home price data from Zillow. County debt-to-income ratios from the Federal Reserve Bank of New York. Change in lending from the FFIEC. Mean numbers for all quartiles. Standard deviations in brackets.

Table 10

Bottom Quartile County Characteristics					
	Above median in predicted lending shock	Below median in predicted lending shock	p-value on difference	Within state above median - below median in predicted lending shock	p-value on difference within state
Employment growth	0.008	0.012	0.114	-0.004	0.681
	[0.114]	[0.132]		(0.010)	
Wage growth	0.149	0.155	0.000	-0.006	0.421
	[0.078]	[0.087]		(0.007)	
ln(Per capita income)	10.311	10.292	0.000	0.019	0.019
	[0.212]	[0.270]		(0.008)	
Debt-to-income ratio	1.188	1.206	0.000	-0.018	0.619
	[0.529]	[0.689]		(0.037)	
ln(Population)	9.565	9.319	0.000	0.246	0.002
	[1.303]	[1.670]		(0.078)	
ln(Population density)	-11.580	-12.048	0.000	0.468	0.000
	[1.567]	[1.929]		(0.104)	
Poverty rate	22.547	22.866	0.000	0.318	0.477
	[5.950]	[6.728]		(0.447)	
Change in home prices	0.358	0.665	0.000	-0.306	0.087
	[0.199]	[0.203]		(0.154)	
Change in bank lending	-0.046	0.081	0.104	-0.127	0.034
	[0.609]	[0.772]		(0.060)	
Construction share	0.048	0.043	0.000	0.005	0.115
	[0.043]	[0.052]		(0.003)	
Manufacturing share	0.182	0.147	0.000	0.035	0.002
	[0.129]	[0.136]		(0.011)	

Notes: Data on employment growth, wage growth, construction share, and manufacturing share from the QCEW. Data on per capita income, poverty rates, population and population density are from the United States Census Bureau. Home price data from Zillow. County debt-to-income ratios from the Federal Reserve Bank of New York. Change in lending from the FFIEC. Standard deviations in brackets. Standard errors in parenthesis.

Table 11

2nd Quartile County Characteristics					
	Above median in predicted lending shock	Below median in predicted lending shock	p-value on difference	Within state above median - below median in predicted lending shock	p-value on difference within state
Employment growth	0.029	0.021	0.000	0.008	0.404
	[0.114]	[0.132]		(0.010)	
Wage growth	0.144	0.150	0.000	-0.006	0.442
	[0.078]	[0.087]		(0.007)	
ln(Per capita income)	10.499	10.500	0.000	-0.001	0.875
	[0.220]	[0.270]		(0.003)	
Debt-to-income ratio	1.419	1.412	0.000	0.007	0.901
	[0.529]	[0.689]		(0.057)	
ln(Population)	10.054	9.370	0.000	0.684	0.000
	[1.303]	[1.670]		(0.089)	
ln(Population density)	-11.206	-12.000	0.000	0.794	0.000
	[1.567]	[1.929]		(0.110)	
Poverty rate	16.727	15.427	0.000	1.300	0.000
	[5.950]	[6.728]		(0.232)	
Change in home prices	0.390	0.594	0.000	-0.204	0.015
	[0.199]	[0.203]		(0.081)	
Change in bank lending	0.019	0.030	0.687	-0.011	0.856
	[0.609]	[0.772]		(0.060)	
Construction share	0.062	0.059	0.000	0.003	0.390
	[0.043]	[0.052]		(0.004)	
Manufacturing share	0.178	0.151	0.000	0.028	0.007
	[0.129]	[0.136]		(0.010)	

Notes: Data on employment growth, wage growth, construction share, and manufacturing share from the QCEW. Data on per capita income, poverty rates, population and population density are from the United States Census Bureau. Home price data from Zillow. County debt-to-income ratios from the Federal Reserve Bank of New York. Change in lending from the FFIEC. Standard deviations in brackets. Standard errors in parenthesis.

Table 12

3rd Quartile County Characteristics					
	Above median in predicted lending shock	Below median in predicted lending shock	p-value on difference	Within state above median - below median in predicted lending shock	p-value on difference within state
Employment growth	0.036	0.053	0.000	-0.017	0.078
	[0.114]	[0.132]		(0.010)	
Wage growth	0.138	0.164	0.000	-0.026	0.000
	[0.078]	[0.087]		(0.007)	
ln(Per capita income)	10.636	10.634	0.000	0.001	0.707
	[0.220]	[0.270]		(0.003)	
Debt-to-income ratio	1.531	1.587	0.000	-0.057	0.297
	[0.529]	[0.689]		(0.054)	
ln(Population)	10.576	10.084	0.000	0.492	0.000
	[1.303]	[1.670]		(0.107)	
ln(Population density)	-10.692	-11.278	0.000	0.586	0.000
	[1.567]	[1.929]		(0.120)	
Poverty rate	13.291	12.967	0.000	0.325	0.000
	[5.950]	[6.728]		(0.220)	
Change in home prices	0.315	0.509	0.000	-0.194	0.000
	[0.199]	[0.203]		(0.046)	
Change in bank lending	0.020	0.001	0.695	0.020	0.720
	[0.609]	[0.772]		(0.055)	
Construction share	0.066	0.068	0.000	-0.002	0.574
	[0.043]	[0.052]		(0.003)	
Manufacturing share	0.191	0.167	0.000	0.024	0.018
	[0.129]	[0.136]		(0.010)	

Notes: Data on employment growth, wage growth, construction share, and manufacturing share from the QCEW. Data on per capita income, poverty rates, population and population density are from the United States Census Bureau. Home price data from Zillow. County debt-to-income ratios from the Federal Reserve Bank of New York. Change in lending from the FFIEC. Standard deviations in brackets. Standard errors in parenthesis.

Table 13

Top Quartile County Characteristics					
	Above median in predicted lending shock	Below median in predicted lending shock	p-value on difference	Within state above median - below median in predicted lending shock	p-value on difference within state
Employment growth	0.093	0.085	0.000	-0.007	0.375
	[0.114]	[0.132]		(0.008)	
Wage growth	0.138	0.150	0.000	-0.013	0.006
	[0.078]	[0.087]		(0.007)	
ln(Per capita income)	10.875	10.934	0.000	-0.059	0.000
	[0.220]	[0.270]		(0.013)	
Debt-to-income ratio	1.847	2.054	0.000	-0.208	0.000
	[0.529]	[0.689]		(0.052)	
ln(Population)	11.163	11.652	0.000	-0.489	0.000
	[1.303]	[1.670]		(0.116)	
ln(Population density)	-9.978	-9.413	0.000	-0.566	0.000
	[1.567]	[1.929]		(0.132)	
Poverty rate	9.517	9.375	0.000	0.142	0.499
	[5.950]	[6.728]		(0.210)	
Change in home prices	0.318	0.422	0.000	-0.104	0.000
	[0.199]	[0.203]		(0.019)	
Change in bank lending	0.088	0.296	0.000	-0.207	0.000
	[0.609]	[0.772]		(0.037)	
Construction share	0.084	0.089	0.000	-0.005	0.247
	[0.043]	[0.052]		(0.004)	
Manufacturing share	0.168	0.134	0.000	0.034	0.000
	[0.129]	[0.136]		(0.009)	

Notes: Data on employment growth, wage growth, construction share, and manufacturing share from the QCEW. Data on per capita income, poverty rates, population and population density are from the United States Census Bureau. Home price data from Zillow. County debt-to-income ratios from the Federal Reserve Bank of New York. Change in lending from the FFIEC. Standard deviations in brackets. Standard errors in parenthesis.

Table 14

Bottom Quartile Predicted Credit Shock and ln(Loan origination)			
	(1)	(2)	(3)
2009 shock * 2010	0.0640	0.0621	0.0603
	(0.0243)	(0.0246)	(0.0336)
2009 shock * 2009	0.1197	0.1234	0.1159
	(0.0237)	(0.0241)	(0.0328)
2008 shock * 2010	0.0951	0.0826	0.0829
	(0.0370)	(0.0363)	(0.0455)
2008 shock * 2009	0.1012	0.0935	0.0919
	(0.0292)	(0.0305)	(0.0385)
2008 shock * 2008	0.1332	0.1373	0.1505
	(0.0174)	(0.0178)	(0.0217)
Cumulative effect 2008 shock	0.3295	0.3133	0.3253
	(0.0671)	(0.0691)	(0.0888)
Cumulative effect 2009 shock	0.1837	0.1854	0.1762
	(0.0433)	(0.0438)	(0.0606)
F-test of joint significance of shock interactions (p-value)	0.000	0.000	0.000
Observations	10724	10262	5558
State-by-year fixed effects	Yes	Yes	Yes
Baseline controls	No	Yes	Yes
Debt-to-income ratio	No	No	Yes

Notes: Coefficients in columns (1), (2), and (3) from regressions in Equations 4, 5, 6 respectively. Standard errors in parenthesis. Baseline controls include ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income).

Table 15

2nd Quartile Predicted Credit Shock and ln(Loan origination)			
	(1)	(2)	(3)
2009 shock * 2010	0.0700	0.0703	0.0638
	(0.0194)	(0.0187)	(0.0219)
2009 shock * 2009	0.0767	0.0761	0.0753
	(0.0160)	(0.0157)	(0.0182)
2008 shock * 2010	0.1557	0.1486	0.1574
	(0.0205)	(0.0210)	(0.0250)
2008 shock * 2009	0.1282	0.1269	0.1298
	(0.0189)	(0.0189)	(0.0215)
2008 shock * 2008	0.1162	0.1255	0.1321
	(0.0159)	(0.0160)	(0.0195)
Cumulative effect 2008 shock	0.4001	0.4010	0.4193
	(0.0446)	(0.0453)	(0.0533)
Cumulative effect 2009 shock	0.1467	0.1464	0.1391
	(0.0321)	(0.0312)	(0.0368)
F-test of joint significance of shock interactions (p-value)	0.000	0.000	0.000
Observations	10836	10626	7014
State-by-year fixed effects	Yes	Yes	Yes
Baseline controls	No	Yes	Yes
Debt-to-income ratio	No	No	Yes

Notes: Coefficients in columns (1), (2), and (3) from regressions in Equations 4, 5, 6 respectively. Standard errors in parenthesis. Baseline controls include ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income).

Table 16

3rd Quartile Predicted Credit Shock and ln(Loan origination)			
	(1)	(2)	(3)
2009 shock * 2010	0.0977	0.0973	0.0942
	(0.0144)	(0.0147)	(0.0155)
2009 shock * 2009	0.1094	0.1165	0.1185
	(0.0164)	(0.0155)	(0.0161)
2008 shock * 2010	0.0377	0.0646	0.0775
	(0.0184)	(0.0168)	(0.0180)
2008 shock * 2009	0.0207	0.0340	0.0377
	(0.0211)	(0.0198)	(0.0221)
2008 shock * 2008	0.0346	0.0493	0.0660
	(0.0215)	(0.0166)	(0.0174)
Cumulative effect 2008 shock	0.0931	0.1479	0.1812
	(0.0510)	(0.0433)	(0.0459)
Cumulative effect 2009 shock	0.2071	0.2138	0.2126
	(0.0277)	(0.0277)	(0.0289)
F-test of joint significance of shock interactions (p-value)	0.000	0.000	0.000
Observations	10906	10794	8442
State-by-year fixed effects	Yes	Yes	Yes
Baseline controls	No	Yes	Yes
Debt-to-income ratio	No	No	Yes

Notes: Coefficients in columns (1), (2), and (3) from regressions in Equations 4, 5, 6 respectively. Standard errors in parenthesis. Baseline controls include ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income).

Table 17

Top Quartile Predicted Credit Shock and ln(Loan origination)			
	(1)	(2)	(3)
2009 shock * 2010	0.0703	0.0793	0.0808
	(0.0166)	(0.0168)	(0.0169)
2009 shock * 2009	0.0611	0.0660	0.0678
	(0.0149)	(0.0144)	(0.0143)
2008 shock * 2010	0.0444	0.0862	0.0903
	(0.0194)	(0.0192)	(0.0200)
2008 shock * 2009	0.0671	0.0948	0.1015
	(0.0180)	(0.0181)	(0.0190)
2008 shock * 2008	0.0467	0.0697	0.0788
	(0.0149)	(0.0156)	(0.0164)
Cumulative effect 2008 shock	0.1582	0.2507	0.2705
	(0.0470)	(0.0474)	(0.0498)
Cumulative effect 2009 shock	0.1314	0.1453	0.1487
	(0.0302)	(0.0299)	(0.0299)
F-test of joint significance of shock interactions (p-value)	0.000	0.000	0.000
Observations	10892	10542	9870
State-by-year fixed effects	Yes	Yes	Yes
Baseline controls	No	Yes	Yes
Debt-to-income ratio	No	No	Yes

Notes: Coefficients in columns (1), (2), and (3) from regressions in Equations 4, 5, 6 respectively. Standard errors in parenthesis. Baseline controls include ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income).

Table 18

Bottom Quartile Predicted Credit Shock and Economic Effects									
	Employment growth			Establishment growth			Payroll growth		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2009 shock * 2010	0.0038	0.0040	0.0034	-0.0006	0.0002	0.0005	-0.0012	-0.0017	-0.0010
	(0.0023)	(0.0022)	(0.0027)	(0.0012)	(0.0011)	(0.0013)	(0.0035)	(0.0033)	(0.0043)
2009 shock * 2009	-0.0030	-0.0021	-0.0029	-0.0006	-0.0002	0.0003	0.0052	0.0057	0.0072
	(0.0024)	(0.0025)	(0.0029)	(0.0014)	(0.0012)	(0.0014)	(0.0028)	(0.0026)	(0.0032)
2008 shock * 2010	-0.0006	-0.0003	-0.0005	-0.0001	-0.0007	-0.0006	0.0004	0.0026	0.0030
	(0.0023)	(0.0023)	(0.0028)	(0.0010)	(0.0009)	(0.0010)	(0.0037)	(0.0035)	(0.0041)
2008 shock * 2009	-0.0007	-0.0010	-0.0012	0.0012	0.0011	0.0011	-0.0056	-0.0067	-0.0071
	(0.0023)	(0.0018)	(0.0021)	(0.0009)	(0.0009)	(0.0011)	(0.0029)	(0.0029)	(0.0035)
2008 shock * 2008	0.0018	0.0009	0.0011	0.0006	-0.0001	0.0000	0.0012	0.0022	0.0015
	(0.0016)	(0.0016)	(0.0019)	(0.0009)	(0.0008)	(0.0009)	(0.0026)	(0.0027)	(0.0031)
Cumulative effect of 2008 shock	0.0005	-0.0004	-0.0005	0.0017	0.0003	0.0005	-0.0040	-0.0019	-0.0027
	(0.0040)	(0.0037)	(0.0043)	(0.0024)	(0.0021)	(0.0025)	(0.0043)	(0.0044)	(0.0051)
Cumulative effect of 2009 shock	0.0009	0.0019	0.0005	-0.0012	-0.0000	0.0008	0.0040	0.0040	0.0062
	(0.0041)	(0.0041)	(0.0049)	(0.0025)	(0.0021)	(0.0025)	(0.0039)	(0.0039)	(0.0049)
F-test of joint significance of shock interactions (p-value)	0.050	0.072	0.253	0.606	0.373	0.629	0.285	0.123	0.167
Observations	10589	10197	5555	10589	10197	5555	8767	8454	4461
State-by-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Debt-to-income ratio	No	No	Yes	No	No	Yes	No	No	Yes

Notes: Coefficients from regression in Equations 4, 5, 6. Dependent variables are employment, establishment, and payroll growth. For employment and establishment growth, averages from the CBP and QCEW were used. For payroll growth, data from the QWI was used. Standard errors in parenthesis. Baseline controls include ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income).

Table 19

2nd Quartile Predicted Credit Shock and Economic Effects									
	Employment growth			Establishment growth			Payroll growth		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2009 shock * 2010	0.0001	0.0001	0.0003	0.0005	0.0005	0.0005	0.0023	0.0023	0.0033
	(0.0014)	(0.0014)	(0.0017)	(0.0008)	(0.0008)	(0.0008)	(0.0030)	(0.0030)	(0.0036)
2009 shock * 2009	0.0022	0.0023	0.0031	0.0005	0.0005	0.0004	0.0015	0.0018	0.0003
	(0.0015)	(0.0014)	(0.0015)	(0.0007)	(0.0007)	(0.0007)	(0.0021)	(0.0021)	(0.0023)
2008 shock * 2010	0.0013	0.0014	0.0021	-0.0003	-0.0006	-0.0005	0.0021	0.0021	0.0022
	(0.0015)	(0.0016)	(0.0019)	(0.0008)	(0.0009)	(0.0010)	(0.0034)	(0.0036)	(0.0043)
2008 shock * 2009	-0.0005	-0.0024	-0.0032	0.0004	0.0001	-0.0005	-0.0024	-0.0009	-0.0008
	(0.0020)	(0.0017)	(0.0019)	(0.0008)	(0.0009)	(0.0009)	(0.0027)	(0.0028)	(0.0031)
2008 shock * 2008	-0.0007	-0.0020	-0.0038	0.0001	-0.0001	-0.0002	0.0004	-0.0002	-0.0016
	(0.0017)	(0.0017)	(0.0016)	(0.0007)	(0.0007)	(0.0008)	(0.0033)	(0.0037)	(0.0041)
Cumulative effect of 2008 shock	0.0001	-0.0029	-0.0049	0.0002	-0.0006	-0.0012	0.0001	0.0011	-0.0002
	(0.0034)	(0.0032)	(0.0033)	(0.0018)	(0.0019)	(0.0020)	(0.0048)	(0.0052)	(0.0060)
Cumulative effect of 2009 shock	0.0023	0.0023	0.0034	0.0010	0.0010	0.0010	0.0038	0.0041	0.0036
	(0.0022)	(0.0021)	(0.0024)	(0.0013)	(0.0013)	(0.0013)	(0.0036)	(0.0036)	(0.0043)
F-test of joint significance of shock interactions (p-value)	0.641	0.290	0.025	0.904	0.915	0.9747	0.800	0.856	0.921
Observations	10724	10562	7013	10724	10562	7013	9386	9251	6071
State-by-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Debt-to-income ratio	No	No	Yes	No	No	Yes	No	No	Yes

Notes: Coefficients from regression in Equations 4, 5, 6. Dependent variables are employment, establishment, and payroll growth. For employment and establishment growth, averages from the CBP and QCEW were used. For payroll growth, data from the QWI was used. Standard errors in parenthesis. Baseline controls include ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income).

Table 20

3rd Quartile Predicted Credit Shock and Economic Effects									
	Employment growth			Establishment growth			Payroll growth		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2009 shock * 2010	-0.0012	-0.0008	-0.0012	-0.0001	0.0005	0.0006	0.0022	0.0027	0.0030
	(0.0019)	(0.0019)	(0.0020)	(0.0008)	(0.0007)	(0.0007)	(0.0032)	(0.0034)	(0.0034)
2009 shock * 2009	0.0014	0.0020	0.0020	0.0006	0.0015	0.0016	-0.0017	0.0003	0.0000
	(0.0021)	(0.0021)	(0.0022)	(0.0009)	(0.0007)	(0.0007)	(0.0025)	(0.0031)	(0.0033)
2008 shock * 2010	0.0008	0.0015	0.0017	-0.0020	-0.0008	-0.0010	-0.0038	-0.0016	-0.0022
	(0.0025)	(0.0028)	(0.0030)	(0.0012)	(0.0009)	(0.0009)	(0.0033)	(0.0034)	(0.0036)
2008 shock * 2009	-0.0011	-0.0013	-0.0001	-0.0013	-0.0001	-0.0010	-0.0019	-0.0026	-0.0011
	(0.0023)	(0.0025)	(0.0027)	(0.0010)	(0.0009)	(0.0008)	(0.0033)	(0.0033)	(0.0035)
2008 shock * 2008	-0.0005	0.0001	-0.0008	0.0001	0.0009	0.0007	-0.0021	-0.0012	-0.0030
	(0.0014)	(0.0014)	(0.0015)	(0.0007)	(0.0006)	(0.0006)	(0.0029)	(0.0032)	(0.0033)
Cumulative effect of 2008 shock	-0.0007	0.0028	0.007	-0.0031	0.0000	-0.0013	-0.0078	-0.0054	-0.0063
	(0.0048)	(0.0053)	(0.0057)	(0.0025)	(0.0020)	(0.0018)	(0.0047)	(0.0048)	(0.0048)
Cumulative effect of 2009 shock	0.0002	0.0011	0.0008	0.0005	0.0020	0.0021	0.0005	0.0029	0.0030
	(0.0037)	(0.0036)	(0.0039)	(0.0016)	(0.0012)	(0.0012)	(0.0043)	(0.0045)	(0.0047)
F-test of joint significance of shock interactions (p-value)	0.649	0.553	0.620	0.091	0.106	0.126	0.415	0.868	0.731
Observations	10826	10726	8415	10826	10726	8415	9524	9452	7378
State-by-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Debt-to-income ratio	No	No	Yes	No	No	Yes	No	No	Yes

Notes: Coefficients from regression in Equations 4, 5, 6. Dependent variables are employment, establishment, and payroll growth. For employment and establishment growth, averages from the CBP and QCEW were used. For payroll growth, data from the QWI was used. Standard errors in parenthesis. Baseline controls include ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income).

Table 21

Top Quartile Predicted Credit Shock and Economic Effects									
	Employment growth			Establishment growth			Payroll growth		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2009 shock * 2010	-0.0003	0.0007	0.0007	0.0003	0.0017	0.0016	-0.0013	0.0017	0.0014
	(0.0015)	(0.0016)	(0.0016)	(0.0009)	(0.0008)	(0.0008)	(0.0025)	(0.0022)	(0.0022)
2009 shock * 2009	0.0042	0.0047	0.0044	0.0003	0.0020	0.0018	0.0029	0.0034	0.0032
	(0.0017)	(0.0017)	(0.0019)	(0.0010)	(0.0010)	(0.0011)	(0.0024)	(0.0023)	(0.0023)
2008 shock * 2010	0.0009	0.0012	0.0008	-0.0027	-0.0013	-0.0018	-0.0034	0.0038	0.0035
	(0.0020)	(0.0019)	(0.0019)	(0.0013)	(0.0011)	(0.0011)	(0.0031)	(0.0032)	(0.0032)
2008 shock * 2009	-0.0049	0.0008	-0.0004	-0.0025	-0.0008	-0.0015	-0.0044	-0.0017	-0.0020
	(0.0028)	(0.0024)	(0.0026)	(0.0018)	(0.0015)	(0.0014)	(0.0031)	(0.0029)	(0.0030)
2008 shock * 2008	-0.0021	0.0022	0.0014	-0.0014	0.0009	0.0001	-0.0026	-0.0028	-0.0043
	(0.0022)	(0.0021)	(0.0022)	(0.0010)	(0.0009)	(0.0010)	(0.0038)	(0.0037)	(0.0038)
Cumulative effect of 2008 shock	-0.0061	0.0041	0.0018	-0.0066	-0.0012	-0.0032	-0.0103	-0.0007	-0.0028
	(0.0060)	(0.0051)	(0.0054)	(0.0037)	(0.0031)	(0.0031)	(0.0064)	(0.0063)	(0.0063)
Cumulative effect of 2009 shock	0.0039	0.0053	0.0051	0.0005	0.0038	0.0034	0.0017	0.0052	0.0046
	(0.0027)	(0.0028)	(0.0030)	(0.0018)	(0.0017)	(0.0018)	(0.0030)	(0.0028)	(0.0028)
F-test of joint significance of shock interactions (p-value)	0.059	0.104	0.265	0.397	0.130	0.321	0.435	0.164	0.206
Observations	10808	10488	9847	10808	10488	9847	9383	9195	8597
State-by-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Debt-to-income ratio	No	No	Yes	No	No	Yes	No	No	Yes

Notes: Coefficients from regression in Equations 4, 5, 6. Dependent variables are employment, establishment, and payroll growth. For employment and establishment growth, averages from the CBP and QCEW were used. For payroll growth, data from the QWI was used. Standard errors in parenthesis. Baseline controls include ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income).

Table 22

Bottom Quartile Predicted Credit Shock and Economic Effects

All shocks from non-crisis years included

	Log Originations	Employment (CBP/CQEW)	Establishment (CBP/CQEW)	Payroll (QWI)
	(1)	(2)	(3)	(4)
Shock (t)	0.0406	0.0009	0.0004	-0.0004
	(0.0077)	(0.0008)	(0.0004)	(0.0014)
Shock (t-1)	0.0367	0.0005	-0.0002	-0.0019
	(0.0061)	(0.0007)	(0.0004)	(0.0017)
Shock (t) * 2008	0.0724	-0.0035	-0.0018	0.0034
	(0.0195)	(0.0024)	(0.0008)	(0.0039)
Shock (t-1) * 2009	0.0345	0.0005	0.0013	0.0086
	(0.0270)	(0.0018)	(0.0008)	(0.0035)
Shock (t) * 2009	0.0787	0.0002	-0.0006	0.0024
	(0.0247)	(0.0018)	(0.0008)	(0.0032)
Shock (t-1) * 2010	0.0322	-0.0014	0.0013	-0.0046
	(0.0254)	(0.0021)	(0.0010)	(0.0039)
Total effect of 2008 shock	0.1842	-0.0016	-0.0004	0.0097
	(0.0310)	(0.0025)	(0.0011)	(0.0043)
Total effect of 2009 shock	0.1881	0.0003	0.0009	-0.0045
	(0.0431)	(0.0027)	(0.0014)	(0.0047)
Excess effect of 2008 shock	0.1069	-0.0030	-0.0006	0.0120
	(0.0325)	(0.0029)	(0.0012)	(0.0048)
Excess effect of 2009 shock	0.1108	-0.0011	0.0007	-0.0023
	(0.0438)	(0.0028)	(0.0015)	(0.0052)
F-test of joint significance of interactions (p-value)	0.000	0.530	0.031	0.008
Observations	7330	7261	7261	6909

Notes: Coefficients from regression in Equation 10. Standard errors in parenthesis. The total effect for 2008 is shock(t)+shock(t-1)+shock(t)*2008+shock(t-1)*2009. The total effect for 2009 is shock(t)+shock(t-1)+shock(t)*2009+shock(t-1)*2010. The excess effect of 2008 is shock(t)*2008+shock(t-1)*2009. The excess effect of 2009 is shock(t)*2009+shock(t-1)*2010. Baseline controls (ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income)) included in all regressions.

Table 23

2nd Quartile Predicted Credit Shock and Economic Effects

All shocks from non-crisis years included

	Log Originations	Employment (CBP/CQEW)	Establishment (CBP/CQEW)	Payroll (QWI)
	(1)	(2)	(3)	(4)
Shock (t)	0.0384	0.0002	0.0004	0.0004
	(0.0050)	(0.0005)	(0.0002)	(0.0012)
Shock (t-1)	0.0139	0.0006	0.0002	0.0001
	(0.0050)	(0.0005)	(0.0002)	(0.0009)
Shock (t) * 2008	0.0703	-0.0012	-0.0001	-0.0001
	(0.0160)	(0.0014)	(0.0007)	(0.0022)
Shock (t-1) * 2009	0.0894	-0.0002	-0.0006	0.0008
	(0.0183)	(0.0012)	(0.0007)	(0.0025)
Shock (t) * 2009	0.0605	-0.0023	-0.0005	-0.0013
	(0.0175)	(0.0018)	(0.0008)	(0.0039)
Shock (t-1) * 2010	0.1092	-0.0030	-0.0001	-0.0018
	(0.0202)	(0.0019)	(0.0009)	(0.0031)
Total effect of 2008 shock	0.2120	-0.0006	0.0011	0.0012
	(0.0267)	(0.0018)	(0.0010)	(0.0029)
Total effect of 2009 shock	0.2220	-0.0045	-0.0000	-0.0026
	(0.0311)	(0.0026)	(0.0013)	(0.0049)
Excess effect of 2008 shock	0.1597	-0.0014	0.0005	0.0007
	(0.0279)	(0.0020)	(0.0011)	(0.0032)
Excess effect of 2009 shock	0.1698	-0.0053	-0.0006	-0.0030
	(0.0322)	(0.0028)	(0.0014)	(0.0048)
F-test of joint significance of interactions (p-value)	0.000	0.342	0.919	0.959
Observations	7590	7542	7542	7401

Notes: Coefficients from regression in Equation 10. Standard errors in parenthesis. The total effect for 2008 is shock(t)+shock(t-1)+shock(t)*2008+shock(t-1)*2009. The total effect for 2009 is shock(t)+shock(t-1)+shock(t)*2009+shock(t-1)*2010. The excess effect of 2008 is shock(t)*2008+shock(t-1)*2009. The excess effect of 2009 is shock(t)*2009+shock(t-1)*2010. Baseline controls (ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income)) included in all regressions.

Table 24

3rd Quartile Predicted Credit Shock and Economic Effects

All shocks from non-crisis years included

	Log Originations	Employment (CBP/CQEW)	Establishment (CBP/CQEW)	Payroll (QWI)
	(1)	(2)	(3)	(4)
Shock (t)	0.0479	0.0008	-0.0008	-0.0014
	(0.0065)	(0.0005)	(0.0003)	(0.0013)
Shock (t-1)	0.0348	0.0004	0.0000	0.0005
	(0.0066)	(0.0005)	(0.0002)	(0.0009)
Shock (t) * 2008	0.0108	-0.0002	0.0013	0.0124
	(0.0156)	(0.0018)	(0.0012)	(0.0042)
Shock (t-1) * 2009	0.0035	-0.0001	0.0003	-0.0038
	(0.0202)	(0.0016)	(0.0007)	(0.0035)
Shock (t) * 2009	0.0698	-0.0007	0.0017	-0.0002
	(0.0157)	(0.0016)	(0.0007)	(0.0037)
Shock (t-1) * 2010	0.0901	0.0008	-0.0000	-0.0031
	(0.0164)	(0.0025)	(0.0010)	(0.0038)
Total effect of 2008 shock	0.0970	0.0008	0.0008	0.0076
	(0.0273)	(0.0024)	(0.0015)	(0.0058)
Total effect of 2009 shock	0.2426	0.0013	0.0009	-0.0042
	(0.0249)	(0.0028)	(0.0014)	(0.0042)
Excess effect of 2008 shock	0.0144	-0.0004	0.0016	0.0086
	(0.0311)	(0.0025)	(0.0016)	(0.0058)
Excess effect of 2009 shock	0.1599	0.0002	0.0017	-0.0033
	(0.0285)	(0.0031)	(0.0015)	(0.0045)
F-test of joint significance of interactions (p-value)	0.000	0.897	0.056	0.040
Observations	7710	7661	7661	7565

Notes: Coefficients from regression in Equation 10. Standard errors in parenthesis. The total effect for 2008 is shock(t)+shock(t-1)+shock(t)*2008+shock(t-1)*2009. The total effect for 2009 is shock(t)+shock(t-1)+shock(t)*2009+shock(t-1)*2010. The excess effect of 2008 is shock(t)*2008+shock(t-1)*2009. The excess effect of 2009 is shock(t)*2009+shock(t-1)*2010. Baseline controls (ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income)) included in all regressions.

Table 25

Top Quartile Predicted Credit Shock and Economic Effects

All shocks from non-crisis years included

	Log Originations	Employment (CBP/CQEW)	Establishment (CBP/CQEW)	Payroll (QWI)
	(1)	(2)	(3)	(4)
Shock (t)	0.0572	0.0004	-0.0006	-0.0003
	(0.0048)	(0.0008)	(0.0005)	(0.0018)
Shock (t-1)	0.0373	0.0007	-0.0001	0.0016
	(0.0048)	(0.0007)	(0.0003)	(0.0011)
Shock (t) * 2008	0.0113	-0.0004	-0.0005	-0.0034
	(0.0148)	(0.0018)	(0.0009)	(0.0033)
Shock (t-1) * 2009	0.0573	-0.0021	-0.0005	-0.0050
	(0.0167)	(0.0017)	(0.0007)	(0.0032)
Shock (t) * 2009	0.0119	0.0027	0.0019	-0.0028
	(0.0141)	(0.0022)	(0.0010)	(0.0042)
Shock (t-1) * 2010	0.0694	0.0008	-0.0003	-0.0037
	(0.0167)	(0.0024)	(0.0015)	(0.0034)
Total effect of 2008 shock	0.1631	-0.0014	-0.0017	-0.0071
	(0.0258)	(0.0027)	(0.0013)	(0.0042)
Total effect of 2009 shock	0.1759	0.0047	0.0009	-0.0053
	(0.0277)	(0.0039)	(0.0023)	(0.0055)
Excess effect of 2008 shock	0.0685	-0.0026	-0.0010	-0.0084
	(0.0281)	(0.0029)	(0.0015)	(0.0045)
Excess effect of 2009 shock	0.0813	0.0035	0.0015	-0.0066
	(0.0287)	(0.0037)	(0.0022)	(0.0058)
F-test of joint significance of interactions (p-value)	0.000	0.226	0.050	0.219
Observations	7530	7481	7481	7291

Notes: Coefficients from regression in Equation 10. Standard errors in parenthesis. The total effect for 2008 is shock(t)+shock(t-1)+shock(t)*2008+shock(t-1)*2009. The total effect for 2009 is shock(t)+shock(t-1)+shock(t)*2009+shock(t-1)*2010. The excess effect of 2008 is shock(t)*2008+shock(t-1)*2009. The excess effect of 2009 is shock(t)*2009+shock(t-1)*2010. Baseline controls (ln(population density), construction share of GDP, manufacturing share of GDP, and ln(per capita income)) included in all regressions.

Table 26