Large Banks and the Transmission of Financial Shocks

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We explore the role of large banks in propagating economic shocks across the U.S. economy. We show that in 2007 and 2008, large banks that were operating in U.S. counties most affected by the drop in real estate prices, contracted their credit to small businesses in counties that were not affected by falling real estate prices, relative to healthy banks. These exposed banks were also more likely to completely cease operations in these unaffected counties. On the other hand, healthy banks were more likely to expand operations and even enter new banking markets. This offsetting effect is stronger for counties with bigger spillover effects and resulted in changes in market share composition that had lasting effect. The results are robust across a range of filters, including exclusion of the ten largest U.S. banks from the sample.

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* The opinions in this paper are the authors' own and do not necessarily reflect those of Harvard University, Harvard Business School, the National Bureau of Economic Research, or Acadian Asset Management. This paper is not investment advice.

An increasing amount of credit in the U.S. is provided by large, geographically dispersed banks. This financial integration has been shown to improve cost and access to credit (e.g., Jayaratne and Strahan, 1996 or Rice and Strahan, 2010). A less understood economic effect of large banks' geographical ubiquity is their role in the economic cycle. Local shocks that might affect regional banks can be smoothed out by large diversified banks, but economic shocks in one part of the country may spill over through the balance sheets of large banks to otherwise unaffected areas. We study this effect in the context of the 2007-2009 financial crisis and its aftermath.

The collapse of real estate prices and the subsequent meltdown of sub-prime mortgages raised concerns about the solvency and liquidity of banks and led to the financial panic that started in late 2007 and reached its peak in fall of 2008. Although the overall effect was very large, not all geographical areas and not all banks were exposed to the initial shock. We use this variation among large geographically dispersed banks in their exposure to the initial real estate shock to isolate a supply effect. Specifically, we look at counties that *did not* experience a significant drop in real estate prices, and compare changes in lending behavior by geographically diversified banks that were and were not exposed to the real estate shocks through their branches located in *other* counties.

For very large companies, the source of bank financing is unlikely to be local. In fact, loans to large companies tend to be syndicated, i.e., originated by one bank but funded by a larger group of creditors. Moreover, U.S. firms also may turn to the bond market, as suggested by Becker and Ivashina (2014). Thus, we focus on small business lending, using information on small business lending by county from the Federal Reserve's data on the Community Reinvestment Act (CRA). The advantage of this data is that it has information about the small

business lending (loans smaller than $1M in size) at the county level of all banks above a certain size threshold. The shortfall of the CRA credit data is that it does not identify borrowers, and so we cannot directly track an individual firm's ability to smooth credit supply shocks by borrowing from alternative sources. However, because small firms' tend to rely on local bank credit, we can use county level information to assess the economic impact.

We show that large banks played an important role in propagating through the U.S. economy the credit cycle that was driven by a boom and bust in real estate prices. Specifically, large banks that were exposed to the real estate shock through their operations in counties with a large drop in real estate prices substantially contracted their lending from 2006 to 2008, even in counties that did not experience a fall in real estate. By comparison, over the same period, the lending of large healthy banks stayed the same or even increased. In unaffected counties, those that fall into the top three quartiles of real estate depreciation between June 2006 and December 2007, large banks exposed to real estate shock elsewhere cut their lending by $1.4MM per county from 2006 to 2008, whereas healthy banks increased their lending by $0.4MM per county during the same period. It was not until 2009 (the peak of the widespread economic recession), that healthy banks decreased their lending in a similar fashion as exposed banks. After 2009, healthy banks' lending stayed the same, and, in some size categories, started to increase, whereas the lending of exposed banks continued to decline through 2010. The results on the extensive margin are very similar—just as they are more likely to cut lending, exposed banks are also more likely to stop operations and close their branches in a county than healthy banks are.

We also explore strategic expansion by unaffected banks, and find evidence consistent with opportunistic behavior: not only do strong banks cut their lending less, they even increase in some counties and their credit expansion is most pronounced in areas where in aggregate,

exposed banks cut their lending more. In addition, we find some evidence that healthy banks were able to expand substantially their deposits, mostly by entering new counties. The overall effect is that healthy banks increase their market shares in both deposits and small business loans by the end of 2008, and these increases persist in the long run.

Our core results are constrained to banks with dispersed geographical operation, but the findings are generalizable to small, local banks. That is, relative to dispersed banks affected by the real estate shock, both large and small banks that were initially unaffected by the distant real estate shocks, in aggregate expand their loan issuance in the 2007-2008 period as compared to 2006. All results are robust to the exclusion of the top-10 largest banks and to the exclusion of banks that enter a given county after 2002.

This paper is complementary to research on the role of multinational banks and the role they play in transmitting shocks across borders. This includes Peek and Rosengren (1997, 2000), as well as more recent papers by Acharya and Schnabl (2010), Chava and Purnanandam (2011), Schnabl (2012), Cetorelli and Goldberg (2011, 2012a, 2012b), Acharya, Afonso and Kovner (2013), and Ivashina, Scharfstein and Stein (2013). It also relates to Landier, Sraer, and Thesmar (2013), who show that increased banking integration due to large banks explains one-third of the increase in housing price co-movement across different geographies.

The outline of the paper is as follows. Section I describes the data sources. Section II details the identification strategy. Section III reports the key empirical results, which demonstrate the propagation of distant shocks through the balance sheet of large banks. Section IV discusses the effect of the propagation of shocks on banking market structure. Section V evaluates the robustness of the results and section VI concludes.

I. Data Sources

We compile data from five different sources:

The real estate shock: We obtain county-level real estate price index data from FISERV. FISERV publishes Case-Shiller house price indices using same-house repeated-sales data. Although the data is available at the zip-code level, we use the county-level information in correspondence with our data on small business lending, described below. We add to these county-level measures of real estate prices, county-level demographics data as of 2006 from the Census Bureau.

Lending data: We obtain information on bank small business lending by county from the Federal Reserve's data on the CRA. All commercial banks and thrifts that are larger than a certain size and that are regulated by the Office of the Comptroller of the Currency (OCC), the Federal Deposit Insurance Corporation (FDIC), the Federal Reserve System, or the Office of Thrift Supervision (OTS) must report annual data on their small loans. The data are annual and reported as of December 31st of each year and contains the total number and amount of all loans originated which are smaller than $1 million. The data also break out the number of loans and total amount originated in the following categories: loans smaller than $100,000; loans between $100,000 and $250,000, and loans between $250,000 and $1 million. In addition, the CRA includes the total number and amount of loans issued to small enterprises, with less than $1 million in revenues. For purposes of this paper, we consider the time period of 2005 to 2013 and only include business loans.[1]

[1] Small farm loans and loan purchases are small in magnitude relative to small business loan originations and including them does not qualitatively change our results. On average, small business loan purchases are 4% of small business loan originations and small farm loans are 8% of small business loans. Because the number of banks that

The assets threshold for which banks and thrifts have to report their small business lending data by the CRA increases each year, but throughout our period of interest, banks with assets of less than $1.1 billion did not need to disclose their small business lending. Approximately 700 of the almost 8,000 banks and thrifts with deposits insured by the FDIC reported their small business lending. We further restrict our sample of banks to only include commercial banks and exclude thrifts so as to have consistent and consolidated balance sheet and income statement information at the highest holder level possible. Our final sample includes 648 banks that engage in small business lending and have branches in counties that are covered by FISERV. These banks account for 72% of all bank deposits in 2006.

Banks' balance sheet data (holding company): We obtain quarterly bank and bank-holding accounting data from the Federal Reserve. We use data at the bank holding company (BHC) level (FRB form Y9C), or, if a holding company is not available, we use data at the bank level (Call Report level). Throughout the paper, we use the term "bank" to refer to the consolidated entity.

Deposits (branch level): We use annual Summary of Deposit (SOD) data from the FDIC, measured annually as of June 30th, to ascertain the deposits of each bank across its branches in each county. We aggregate deposits data by county to the corresponding bank holding company if the bank holding company exists, and to the corresponding commercial bank if it does not.

Local economy: Finally, we use annual county-level demographics data from the Census.

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engage in small farm loans or business loan purchases is small, we are not able to confirm that our results hold for just small farm loans or business loan purchases. However, our results remain unchanged when adding small farm loans or business loan purchases to business loan originations.

II. Methodology and Empirical Design

We want to identify the contagion through the banks' balance sheet ("bank lending channel") into the geographical areas that were not affected by the initial shock to real estate prices. To do so, we consider lending behavior in areas that were *not* affected by real estate price shocks, and compare the lending behavior of banks that were exposed to *other* geographies that suffered severe drops in real estate prices to the lending behavior of unaffected banks. This approach allows us to control for any local county level effects unrelated to real estate by including county fixed effects.

To measure the real estate shock, for each county, we look at the change in the Case-Shiller single family home price index from 2006:Q2 to 2007:Q4 (*RE_SHOCK*).[2] We focus on the period starting from the second quarter of 2006 since the real estate market reached its peak in June of 2006. According to the National Bureau of Economic Research, a recession began December 2007 and so even though national real estate prices did not reach their trough until much later, part of the decrease after December 2007 could have been due to the general equilibrium effects of the recession. Thus, to make sure our measure of the real estate drop is plausibly exogenous, we only consider the period from 2006:Q2 to 2007:Q4. Our results are similar if the *RE_SHOCK* variable is calculated as the change from 2006:Q2 to any quarter from 2007:Q2 to 2008:Q2. We classify counties as "strong", "neutral", or "depressed", by whether they are in the upper quartile, second or third quartile, or bottom quartile of the distribution of *RE_SHOCK*, respectively.

[2] For counties that did not have county-level data but had more aggregated MSA-level data, we used the MSA-level data. The results are robust to limiting to counties that only had county-level data.

We focus on a contagion effect that is transmitted through the balance sheets of the parent banks operating in multiple counties. So, we classify banks in our sample as either "dispersed banks" or "local banks" based on how concentrated they are. For each bank, our measure of dispersion is the Herfindahl-Hirschman Index (HHI) of deposits across the counties the bank operates in, as of June 30, 2006.[3] Specifically, for each bank, we calculate the percent of total deposits that are in each county, and the HHI is the sum of the squared percentages for each bank. The HHI is a measure of concentration, and banks that have most of their deposits booked in just a few counties, local banks, have a high value of the HHI whereas banks that have their deposits split amongst many counties, dispersed banks, have a low value of the HHI. Specifically, we define dispersed banks as those in the lowest quartile of the HHI distribution, and local banks as those in the top three quartiles.[4] Our definition of local is similar to others used in the literature. For example, Cortez (2013) who defines banks as local if more than 66% of their deposits are located in the area—county or MSA—in question. Our definitions characterize as local all banks defined as local by Cortez, and approximately 80% of our local banks are characterized as local by Cortez's definition.

We are interested in the lending behavior of dispersed banks that have exposure to real estate shock in some, but not all, of the counties in which they operate and so we classify banks based on their real estate exposure. To do so, we calculate the deposit-weighted average of the *RE_SHOCK* variable for each bank, across the counties the bank operates in. We call this

[3] The Herfindahl–Hirschman Index is a commonly used measure of concentration equal to the sum of the squared market shares of market participants. The index is a value is higher than 0 and is capped at 10,000.

[4] Since dispersion and size are correlated, we use the top quartile for dispersed banks since these are relatively large banks with branches in many counties, and thus correspond to more observations in our dataset. Our results are robust to other definitions of dispersed, as discussed in the robustness section. For example, our results remain just as strong if using the distribution of the number of counties each bank has branches in instead of the HHI distribution.

variable *BANK_RE_SHOCK*. Within each type of bank—dispersed and local—we classify institutions as "exposed" if they are in bottom quartile of the *BANK_RE_SHOCK* distribution, and as "strong" if they are in the top three quartiles of the distribution.[5]

Our main analysis compares unaffected, or strong, dispersed banks to exposed, dispersed banks. Together, the strong and exposed banks comprise 65% of all bank deposits as of 2006. As an alternative benchmark, we also look at strong local banks. The concern with smaller, local banks might be that they specialize in a different type of credit than large banks. (An ideal setting would be the one used by Khwaja and Mian (2008) where borrower level data is available and the same borrower interacts with multiple banks. But such data is not available for the U.S. market.)

To test our hypotheses, we constrain our analysis to strong and neutral counties, those in the top 3 quartiles of the *RE_SHOCK* distribution, and compare small business lending by strong and exposed banks in those counties. Naturally, exposed banks may reduce lending in counties that experienced a decline in real estate prices, but this may be due to a decrease in demand for loans in those counties. As we show below, however, they also constrain lending in counties that did not experience the real estate shock, a result less plausibly explained by a decline in demand. Formally, we run regressions of the form:

$$\Delta L_{il} = \alpha + \beta S_i + \gamma X_i + \delta_l + \varepsilon_{il}\,. \qquad (1)$$

In our main analysis ΔL_{il} is the change in the amount of small business loans extended by bank i in county l between 2006 and 2008, in millions.[6] Strong Bank, S_i is an indicator variable that

[5] The results are robust to differing definitions of weak and strong-based terciles or quintiles of the distribution. Defining strong banks as those in the bottom 2 quartiles also does not change our results. Finally, as discussed further in the robustness section, defining strong and exposed banks based on the number of weak counties the bank has branches in or the percent of deposits in weak counties does not change the results.

equals 1 for strong banks and 0 for exposed banks and is our main variable of interest. X_i is the set of bank-level control variables such as assets, deposits scaled by assets and tier 1 ratio. These are discussed further in the next section. δ_l are county-level fixed effects; by including these, we make sure that we are identifying the impact of being a strong or an exposed bank on changes in lending within each county.

Table I presents summary statistics for our sample. The first point to note is that even though our samples of exposed and strong banks are both in the upper quartile of the distribution of bank dispersion as measured by the deposits HHI, exposed banks are on average significantly larger than strong banks. The average exposed bank has 443 branches in 60 counties and assets of $100.2 billion, while the average strong bank has 86 branches in 20 counties and assets of $5.6 billion. Exposed banks also have fewer deposits as a fraction of assets: 68% as opposed to 77% for strong banks in 2006. Similarly, they have fewer insured deposits as a fraction of deposits, slightly higher loans as a fraction of assets, lower C&I as a fraction of assets, higher loan commitments as a fraction of total loans, less long term debt, higher tier 1 and leverage ratios, and slightly higher ratio of ABS/assets as of 2006. These differences remain during the crisis period, as shows the second panel of Table I, which compares the balance sheets of exposed and strong banks in June of 2008.

These patterns are not surprising given that very large banks, which fall primarily into the exposed sample, have a different composition of assets and liabilities on their balance sheets. They are less likely to fund themselves with deposits, and more likely to use short term funding

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[6] The results are robust to using the percentage change in lending rather than the change in lending. The loan and deposits data are winsorized at the 0.5% level.

such as repos. However, our analysis not driven by the largest banks since excluding the largest 10 banks from our sample does not qualitatively change the results below.

[TABLE I]

III. Impact of the Propagation of the Real Estate Shock

A. Impact on Lending

Figure 1 shows evolution of lending to small and medium firms between 2006 and 2011, in areas that did *not* experience a real estate shock. Panel A reports the total amount of lending by each type of bank. Panel B reports the mean amount of lending across banks of each type. Each panel shows four figures corresponding to the following CRA classifications: (i) all loans; (ii) loans smaller than $100,000; (iii) loans between $100,000 and $250,000; and (iv) loans between $250,000 and $1 million. All numbers are expressed as percentages of 2005 levels.

The central point that emerges from Figure 1 is the amplification of the credit cycle by banks exposed to the real estate shocks. In an average county that was *not* exposed to a collapse of real estate prices, the lending of exposed banks decreased from 2006 to 2008, while the lending of strong banks stayed the same or even increased. It was not until 2009 that strong banks decreased their lending, and this may have been due to a drop in demand, as a well in supply, since by early 2009 the United States was well into the recession.[7] Further, after 2009, strong banks' lending stays the same or begins to increase, whereas the lending of exposed banks continues to decrease. The results are very similar across panels A and B.

Panels C and D repeat this analysis but for the 1996 to 2012 period. Again the numbers are expressed as percentages of 2005 levels. As Table I made clear, the two sets of banks—exposed

[7] The NBER dates the recession from December 2007 to June 2009.

and healthy—have fairly different characteristics and so it is possible that their lending in the 2006-2008 period differs for reasons other than the real estate shock. Panels C and D suggest that this is not the case, since the lending patterns from 1996 to 2005 are very similar for both groups, especially for the $250,000 to $1M category, which comprises the majority of the value of the small business lending done by the banks. What stands out is the small difference between 2006 and 2008, which we argue is driven by the real state shock propagation, and differences in their lending from 2010 on. The latter, we argue, has to do with changes in market structure that happen because healthy banks use the real estate shock in the 2006 to 2008 period, and the subsequent decline in lending by exposed banks, to gain more market share.

[FIGURE 1]

Table II extends this graphical analysis and compares the performance of strong and exposed banks in a simple univariate setting. The table compares the evolution of deposits and loans from 2006 to 2008 between the exposed and strong banks in our sample. First, we consider several measures related to deposits. On average, the county deposits for exposed banks grew by $35MM between 2006 and 2008, whereas they grew only by $21MM for strong banks. This is consistent with bank deposits being perceived as a safe harbor in economic downturns due to deposit insurance (Gatev and Strahan, 2006). On the other hand, deposits as a fraction of assets grew slightly faster at strong banks, mostly due to the exposed banks' larger size. Further, although both strong and weak banks seem to have expanded in terms of the number of their branches during the 2006 to 2008, strong banks grew more, opening on average 0.39 branches as opposed to 0.15 for exposed. This difference is statistically significant at the 1% level and it is a substantial expansion for strong banks: scaled by the number of banks and counties they are in, the aggregate expansion of strong banks is almost three times more than that of exposed banks.

[TABLE II]

Exposed banks generally contract their lending more than strong banks across all categories. For example, on average, they extend 10.1 fewer loans per county in 2008 than 2006, whereas strong banks decrease the number of loan they extend only by 8.1 loans per county. The one exception is in the category of loans extended to very small businesses (those with revenues of less than $1MM). Healthy banks cut the number of loans to these firms more than exposed firms, but this result does not hold when we control for other covariates, as we do in the next section. The difference between exposed and healthy banks is especially apparent in the loan amounts extended by the two groups of banks. In fact, exposed banks on average contract their lending more than strong banks across all loan categories, and for both the overall origination amount and the amount of originations in the $250,000 to $1M category, strong banks even increase their lending.[8] The difference is economically significant. Across all types of credit to small enterprise, between 2006 and 2008, exposed banks cut their lending by $1.4MM per county (6% drop as compared to 2006 lending amount), whereas strong banks *increased* their lending by $0.4 MM per county (1.8% increase as compared to 2006 lending amount).

One other interesting point from Table II is that most of the difference in lending between the two types of banks seems to be in their lending to firms with revenues of more than $1M. There is no difference in the change in the amount of originations between the two types for firms with revenues less than $1M, and strong banks actually cut the number of loans to this category more than exposed banks. As discussed further in the next section, these results are in line with existing literature. Both the healthy and exposed banks in our sample are large banks, which do

[8] The results hold when using percentage change instead of change of loans.

not have comparative advantage in making informationally-intensive loans to very small firms (Stein 2002). Thus, during the crisis, both types of banks cut their loans in this category. However, whereas exposed banks affected by the real estate shock also cut their lending to medium sized firms with revenues greater than $1M, healthy banks do not and in fact expand their lending in this category.

Table III repeats this analysis in a multivariate setting for all small business loan originations. The dependent variable is the change in small business lending from June 2006 to June 2008 and it is regressed on an indicator for strong bank (S_i) and the logarithm of the bank's small business loan originations in the county measured as of June 2006. Controlling for the amount of lending they do, strong banks still cut their lending less than weak banks. Specification (2) adds county fixed effects (δ_l) and specification (3) also controls for log assets to account for the size of the bank. Further, to control for differences in bank strategy, in specification (4) we control for deposits as a fraction of assets, insured deposits as a fraction of total deposits, loans as a fraction of assets, and real-estate loans as a fraction of assets. Specification (5) also controls for the amount of loans that are past due as a fraction of total loans, the amount of net charge-offs (charge-offs minus recoveries) as a fraction of total loans, tier 1 ratio, and the amount of asset-backed securities as a fraction of total assets. All bank variables are measured as of June 30, 2006. Specifications (4) and (5) show that our results are not driven by differences in strategy or differences in exposure to real estate or to the securitization market. The standard errors in all specifications are clustered at the bank level. Clustering at both the bank and county levels does not change the standard errors or the significance of the coefficients.

[TABLE III]

The central result is that the difference in lending by strong and exposed banks is economically and statistically significant and is robust across specifications. On average, a strong bank cuts its lending by $3.7 million less per county than an exposed bank. The control variables mainly have the signs that would be expected. The log of the loan originations as of 2006, which is a measure of the bank's activity in the county, is negative and significant suggesting that banks with more market power cut lending more. The log of assets becomes significant once we control for other bank balance sheet variables.[9] Banks with more deposits over assets cut lending less, probably because the strong dispersed banks are on average smaller and so have higher deposits as a fraction of assets. Banks with a higher percentage of real estate loans cut back lending less. However, recall that the analysis is constrained to counties that were not affected by the real estate shock.

As discussed further in the robustness section, the results detailed above hold and in some cases are even stronger when using the percent change in lending rather than the change in lending, as above. These unreported results imply that on average, the percent change in lending from 2006 to 2008 is a statistically significant 10% higher for healthy banks than exposed banks. These results are omitted for brevity but available upon request. Our preferred specification retains the change in lending as the dependent variable because it relates to the actual effect on credit availability in the county. This is especially important when we consider the effect of our results on market structure, as discussed further in section IV.

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[9] This is due to non-linearities in the relationship between bank performance and assets. As mentioned earlier, exposed banks, which performed worse, tend to be larger. However, some of the largest exposed banks actually performed better than smaller banks, a result which is potentially explained by government policies such as TARP which were primarily targeted to large banks. As we discuss below, our results are unchanged when we run them on a constrained sample that removes the largest banks. When we do so, assets impact the change in the amount of loans in a statistically significant way.

B. Decreases in Lending by Type of Loan

As mentioned above, the CRA data includes a breakdown of the number and amount of loans each reporting bank originates by loan size category. Table IV repeats the analysis of the last column of Table III for different size categories. The dependent variable in column 1 is the amount of loans less than $100,000 in size; in column 2, it is the amount of loans with origination size between $100,000 and $250,000; and in column 3, the dependent variable is the amount of loans with origination size between $250,000 and $1 million. As the table shows, exposed banks cut their lending more for each of these three loan categories. As expected, the coefficient on the Strong Bank indicator, S_i, is much larger in magnitude for the 3rd column, as the dependent variable is much larger in magnitude. Whereas in the first column, the strong bank indicator is not significant, the results for the other two loan categories are highly statistically significant and robust. Thus, both exposed and healthy banks cut lending about the same for the smallest loan category, but exposed banks decrease originations more for larger loans.

[TABLE IV]

Columns 4 and 5 extend this analysis by splitting the sample between the loans extended to small firms with revenues of less than $1 million (Column 4) and those to firms with revenues greater than $1 million (Column 5). As was suggested by Table 2, most of the difference in the decreases in small business lending between exposed and healthy banks comes from the loans they extend to medium and large firms with revenues greater than $1 million. Both exposed and healthy banks decrease their new lending to firms with revenues of less than $1 million from 2006 to 2008 and their lending in the smallest loan category generally, because these are

probably informationally-intensive loans. However, exposed banks cut their originations in the larger loan categories and to firms with revenues of more than $1M (which are probably taking out larger loans) much more than healthy banks do.

Although we do not show them for brevity, the results are similar when considering the number of loans made instead of the total amount originated. In aggregate, exposed banks do not decrease the number of loans originated more than healthy banks. However, splitting by size shows the same pattern as in Table IV. Exposed banks decrease the number of loans originated more than healthy banks do for loans larger than $100,000, and most of this difference is coming from loans to firms with revenues greater than $1 million.

C. Impact of Competition

Having established that strong banks decreased their lending less than exposed banks through the end of 2008, we now turn to the issue of competition. In Table V, we examine whether a bank's market power in a county and the competitiveness of the county impacts the differences between strong and exposed banks that we documented above. The first two specifications split counties by whether the Herfindahl–Hirschman Index (HHI) of loan amount indicates the county is concentrated or competitive. As mentioned above, the HHI is sum of squared market shares, so in this case the HHI is the sum of squared bank market shares of loans in each county. Note that most counties have a high HHI implying that in most counties small business lending is highly concentrated. For instance, while the median HHI is 3100, the Department of Justice uses an HHI of 1,800 as a rule of thumb cutoff for whether a market is competitive or not (DOJ Guidelines, "Concentration and Market Shares"). Because of this, we define counties with an

HHI below the 1st quartile (1984) as not concentrated and those with an HHI in the second quartile or above as concentrated. [10]

Columns 1 and 2 rerun the results of Table III on competitive and concentrated counties, respectively. Columns 3 and 4 rerun this analysis adding the market share of each bank and the interaction between market share and the Strong Bank Indicator S_i. Firstly, columns 1 and 2 confirm that in both competitive and concentrated counties strong banks cut lending less than exposed banks. Secondly, we find that how market share impacts whether banks cut their lending more or not differs by market concentration. In competitive counties, on average, strong banks do not cut their lending less than exposed banks, and both types of banks with more market power cut lending more. However, strong banks with more market power cut their lending less than strong banks with less market power. This makes sense since in competitive counties, healthy banks should be better able to leverage their size and economies of scale to get more market share. On the other hand, in more concentrated markets, healthy banks on average cut lending less than exposed banks, but market share does not seem to impact how much banks cut their lending by. That is, in these counties, all strong banks cut their lending less because they are not impacted by the real estate shock, but strong banks with bigger market share do not try to expand more since they already have a large market share.

[TABLE V]

Splitting the analysis by the three loan-size categories we discussed earlier—loans less than $100,000, loans between $100,000 and $250,00 and loans greater than $250,00—shows

[10] We use the set of counties in the second quartile or above of the HHI distribution so as to have roughly the same number of observations in each column, since there are more banks in our sample with branches in counties that fall in the first quartile. Defining counties in the top 2 or top 3 quartiles of the HHI distribution as concentrated does not change the results.

similar results for the group of large loans greater than $250,000. (The results are omitted for brevity.)

D. Exit from Existing Counties

In Tables II - V, we constrain our analysis to counties and banks that originate small business loans in those counties in 2006 and 2008. Thus, we underestimate the difference between strong and exposed banks because we only estimate the intensive margin of lending. If exposed banks are more likely to withdraw from counties completely, or even go bankrupt, the difference between strong and exposed banks may be even larger. Table VI begins to address this question.

To do so, we consider the extensive margin; namely, whether strong banks are less likely to exit a county than exposed banks. Exit is defined as a bank that had branches as of June 2006 but no longer has branches in that county as of June 2008. Specification (1) estimates this regression using OLS with county fixed effects and errors clustered at the bank level. Specification (2) estimates a probit and clusters standard errors at the bank level. Clustering at both the bank and county level or just at the county level produces similar results. Because probit produces inconsistent estimates when using fixed effects, we drop the county fixed effects and instead include county-level controls.[11] The county variables we control for include the number of households, median household income, housing density (number of houses per square mile), the change in real estate prices from 2006 to 2008, the fraction of the population in the labor force, the unemployment rate, and the fraction of the population living in poverty.

[11] Our results of Tables II-IV, and all other results in the paper, are robust to using county controls instead of county fixed effects

Specification (3) drops observations that correspond to banks failing or bought by others. The results remain, suggesting that amongst banks that survived the crises, exposed banks were more likely to withdraw from some counties they had branches in than healthy banks. Specification (4) estimates the regression using a fixed effects logistic model with county fixed effects and standard errors clustered at the county level. This regression has a smaller number of observations because fixed effects logit regression only uses counties in which there is variation in the dependent variable, eg counties from which at least one bank exited. In all four regressions, the strong bank indicator is negative and significant, confirming that healthy banks are less likely to close down their branches in a county between 2006 and 2008.[12] For example, specification 1 suggests that healthy banks are 15% less likely to exit a county, relative to an exposed bank in the same county.

[TABLE VI]

IV. Impact on Market Structure and Long Term Effects

In the previous sections, we established that healthy banks cut lending less, and are less likely to exit a county, than similar exposed banks in the same county. We now turn to how healthy banks take advantage of their better balance sheets. As exposed banks contract lending, it is plausible to suppose that banks healthy enough to expand did so in order to gain more market share. This is especially true since deposits are well known to be sticky, and so a financial crisis that causes some banks to perform poorly is a good opportunity for the other banks to take

[12] Interestingly, there does not seem to be a pattern as to which counties the banks exit from. In unreported results we test whether banks are more likely to exit counties with a stronger real estate shock, more competitive counties, or counties where they have a lower market share. The results are inconclusive.

advantage of the situation and gain more deposit market share. Thus, our hypotheses are that healthy banks used the opportunity provided by the real estate shock to expand into new counties and to gain more market share, gains which remained even after the initial shock subsided. We test these hypotheses in the next sections.

A. Expansion

First, we consider whether healthy banks are more likely to increase the number of branches they operate in a county. To do so, we extend the univariate analysis of Table II by regressing the change in the number of branches from 2006 to 2008 on our Strong Bank indicator S_i and our set of controls. This is the first specification of Table VII. In addition to the controls described above, we also include the number of branches each bank has in each county as of 2006.[13] The coefficient on S_i is positive and significant, implying that healthy banks that had branches in a county in 2006 were more likely to expand their number of branches from 2006 to 2008 than similar exposed banks. To ensure that these results are not driven by a few healthy banks that expanded a great deal, in specification (2), we replace the dependent variable with an indicator variable that equals 1 if the number of branches increased, -1 if it decreased and 0 if it stayed the same. We run this regressing using an ordered probit model, again controlling for county covariates rather than employing fixed effects. Standard errors are clustered at the bank level but clustering at both the bank and county levels produces similar results. Our results remain strong and highly statistically significant—healthy banks are much more likely to expand their number of branches in the counties they are already in. Interestingly, these results are not driven purely

[13] We do this for consistency with analogous regressions in Table III. Omitting this control does not change the results in any way.

by mergers and acquisitions since excluding observations corresponding to M&A activity produces similar results.

[TABLE VII]

Not only do healthy banks expand in existing markets, but they are also more likely to expand into new markets, as specifications 3-6 show. In these regressions, each observation corresponds to a bank-county pair such that the bank did not have any branches in the county in 2006. [14] In specification 3, the dependent variable is an indicator for whether the bank enters into the county and it is regressed on S_i and on our set of controls. We use probit regression and control for county covariates.[15] The coefficient on S_i is positive and significant suggesting that healthy banks were more likely to expand into new counties that exposed banks. Specifications 4-6 further test whether healthy banks were relatively more likely to expand into counties that are traditionally difficult to enter. In specification 4, we measure the difficulty of entry into a county by the number of banks that had entered that county in the previous 10 years. The variable *Num Banks Entered* is the negative of the number of banks that entered the county from 1996 to 2005, so that a larger value implies that the county is harder to enter since very few banks have done so. The coefficient on this variable is negative and significant, while the coefficient on its interaction with S_i is positive and significant, implying that whereas exposed banks are less likely to expand into hard to enter counties, healthy banks are relatively more likely to.

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[14] The results are robust if we use all bank-county pairs that correspond to all counties in the state or all counties in the state or adjacent states as the set of counties that the bank could potentially enter.

[15] These results for both county exit, Table VI and exit VII are robust to using a fixed effect logit model. We cannot use fixed effects logit in specifications 4-6 of table VII because the variables for difficulty of expanding into a county are at a

Another measure for the difficulty of expanding into a county is the HHI of deposits in that county, a measure we use in specification 5. More concentrated markets should be harder to enter because a few banks control most of the market share in those markets and so consumers probably have longer relationships with one of these banks. The table supports this hypothesis. The coefficient on the Deposits HHI variable is negative and significant, whereas the coefficient on the interaction between the HHI and S_i is positive and significant. Again, exposed banks are less likely to enter into concentrated markets, whereas healthy banks are relatively more likely to.

A final measure of difficulty of entry is an index compiled by Rice and Strahan (Rice and Strahan 2010). This is a state-level index that measures the barriers to cross-state entry that a state imposes on its banking markets. The index takes on values 0 to 4 corresponding to how many of the following restrictions a state imposes: a minimum age of 3 for institutions of out-of-state acquirers; ban on de novo branching; ban on acquisition of individual branches by out-of-state institutions; a deposit cap of 30% for each institution. In specification 5, we use this variable as our proxy for difficulty of entry and restrict the observation to the set of out-of-state counties that each bank can expand into. As expected, the coefficient on this variable, which we term the RS Index, is negative and significant, but the interaction with S_i is positive and significant. Exposed bank are less likely to enter counties in states with restrictions, but healthy banks are relatively more like to do so.

B. Market Structure

Having established that healthy banks are more likely to add new branches and enter new counties, we next turn to the overall effect on county market structure. As exposed banks cut

their lending and exit counties, healthy banks should respond by capturing more of the market share in the deposits and lending markets. Tables VIII and IX show this is indeed the case.

To begin, we test whether in addition to healthy banks decreasing lending less than exposed banks, they also are able to increase deposits more than exposed banks. In the first column of table VIII, we run the analysis of Table IV but with change in deposits as the dependent variable. As before, we include county fixed effects and cluster at the bank level. The strong bank indicator is positive but not significant, implying that healthy banks do not increase their deposits more than exposed banks. This is not very surprising since deposits, especially retail deposits, are sticky and getting a higher market share may be difficult. However, in specification 1, we only include banks that had branches in the county in both 2006 and 2008, as we do in previous tables. In specification 2, we include banks that enter and exit. That is, for banks that enter a new county, the change in deposits is the value of deposits in the new county in 2008 and for banks that exit, the change in deposits is the negative value of deposits in 2006. In specification 2, the coefficient on Strong Bank is positive and statistically significant at the 5% level. This suggests that healthy banks are able to increase their deposits more than exposed banks, but the way they do this is through entering new counties rather than capturing deposits in existing counties.

In specifications 3 and 4, we consider the change in market share as the dependent variable. In specification 3, we regress the change in deposit market share from 2006 to 2008 on our set of controls and the strong bank indicator, S_i. Our definition of market share is holistic and captures both entries and exits, as described above. S_i is positive and significant at the 5% level which suggests that relative to exposed banks in the same county, healthy banks increase their market share of deposits in the county more than exposed banks. The coefficient on S_i is small, probably

because deposits do tend to be sticky, and suggests that the increase in the market share in deposits is 2.4% higher for healthy banks than for exposed banks. Specification 4 repeats the analysis using the market share of all small business lending. Again, S_i is positive and significant, this time at the 1% level. In addition, it is much larger and implies a difference between the changes in market share of loans of exposed and healthy banks equal to 6.2%. This difference between the sizes of coefficients in specifications 3 and 4 is to be expected since retail depositors are slow to change institutions whereas small businesses that do not receive lending from their usual bank may apply to a different bank.

[TABLE VIII]

What is the overall effect of these changes in market share? In 2006, in an average county, exposed banks hold 30% of the market share in deposits, 3% of which belongs to banks that exit the county by 2008. By 2008, exposed banks hold only 27% of the market share in deposits, 26% of which comes from banks that remain from 2006. By contrast, healthy banks hold 38% of the market share in deposits in 2006 and 39% in 2008.

Next, we examine the extent to which the smaller contraction or even expansion of lending and deposits by strong banks was due to them capturing market share from exposed banks. Since our analysis only includes dispersed (large banks) whereas the market shares are calculated off total lending and deposits, Table VIII does not distinguish between healthy banks capturing market share from exposed banks or from local banks not in our analysis. To make this distinction, we constrain our analysis to strong banks only and test whether they are more likely to expand their lending in counties in which the exposed banks cut their lending more. We cannot use county fixed effects in this analysis because we want to include county-level variation

in the amount of lending originated. Instead, we use the county-level controls described above to control for county characteristics.

[TABLE IX]

The first specification in Table IX uses the change in originations from 2006 to 2008 as the dependent variable. Our main variable of interest is the lending decrease from all exposed banks in the county, *LENDING DECREASE*. The coefficient on *LENDING DECREASE* is negative and statistically significant at the 5% level, which implies that healthy banks increase lending more in counties where the exposed banks, in aggregate, contract their lending more. Specification (2) repeats this analysis for the market of deposits. In this specification, we use the change in deposits as the dependent variable and the deposits decrease by exposed banks, *DEPOSITS DECREASE*, as the main variable of interest. Although the coefficient on *DEPOSITS DECREASE* is negative, it is not statistically significant.

Specifications (3) and (4) repeat the analysis using lending and deposits market shares as the dependent variables. As before, the coefficient on *LENDING DECREASE* is negative and significant, whereas the coefficient on *DEPOSITS DECREASE* is not significant. As discussed with regard to Table VIII, the expansion of deposits by healthy banks takes place mainly through entering new markets, rather than capturing more deposits in existing markets. Thus, even though columns 2 and 4 of Table IX show that healthy banks do not increase deposits more in counties where the contraction from exposed banks is greater, it could still be the case that healthy banks are more likely to enter counties in which exposed banks contracted their activities. Specifications (5) and (6) test this, using the same sample as in Table VII, but limiting the analysis to just healthy banks. In both regressions, the dependent variable is an indicator for whether the bank entered the counties and the regressions are estimated using probit. In

specification (5), the main variable of interest is again *DEPOSITS DECREASE*. The coefficient is negative and significant at the 1% level, implying that in addition to being more likely to enter counties that are hard to enter, which we showed in Table VII, healthy banks are also more likely to enter counties where exposed banks contracted their deposits more. In specification (6), we use the decrease in branches by the exposed banks as the variable of interest. Again, healthy banks are more likely to expand into countries where exposed banks closed some of their branches, although this result is only significant at the 10% level. Note that these last results are robust to excluding M&A activity—it is not the case that we are just capturing healthy banks buying exposed banks and entering new counties that way.

C. Long-Term Effects

Table X examines the long-term effects of the difference between exposed and healthy banks. In all of the regressions, the dependent variable is the change from 2006 to 2012 in the variable of interest. Specification (1) regresses the change in the small business loan origination on the strong bank indicator and our set of controls. As first suggested by Figure 1, although originations are almost the same in 2009, at the trough of the crisis, healthy banks recover faster than exposed banks. The coefficient on S_i is positive and significant, implying that the change in lending from 2006 to 2012 is higher for strong banks than exposed banks. Specification (2) uses the change in deposits as the dependent variable and again we see that healthy banks are able to expand deposits more, and most of this comes from entering new counties. In specification (3), the dependent variable is the market share in terms of small business lending and in specification (4), it is the market share of deposits. In both cases, healthy banks increase their market shares more than exposed banks and the difference is both statistically and economically significant.

The change in market shares from 2006 to 2012 is 5.0% higher for healthy banks in the market shares in lending and 1.0% higher in the market shares in deposits.

[TABLE X]

V. Robustness of the Results

In this section, we discuss some of the robustness tests we performed. One possible problem with our analysis is that as Table I shows, the samples of strong banks and exposed banks have different characteristics. In particular, exposed banks tend to be larger and show other qualities pertaining to large banks: they are funded less by deposits and more by short term funding; they have lower capital ratios; they have higher net charge-offs and loan commitments; and they are more likely to engage in activities that are not traditional banking businesses such as trading, securitization and holding asset backed securities. Although we control for these variables in our regressions, the criticism remains that the largest banks—the top- five or ten too-big-too-fail institutions—may be very different from even other large banks in so far as their business strategy is driven by factors not associated with traditional banking. To ameliorate these concerns, we repeat our analysis excluding the five, or even ten, largest institutions.

Although our results become weaker, it is still the case that controlling for various balance sheet variables, exposed banks reduce their lending more than strong banks. The first specification of Table XI reports our main regression of interest, the equivalent of specification (5) of Table III, excluding the ten biggest banks.

[TABLE XI]

Another, related concern is that exposed and strong banks may have different expansionary policies. For example, it could be that exposed banks only entered many of the counties we examine in the early to mid-2000s, during the real estate boom and expansionary monetary policy of the period. If they over-expanded and decided to scale back, then it is natural that from 2006 to 2008, they decreased lending in many of the counties that they had just recently entered. These might be non-core counties for the bank business, and as such it might make sense to cut the credit in such counties even if there was no shock in demand. Although this still represents a contraction in credit that is propagated intro otherwise healthy geographical areas by large dispersed banks, it is a different channel, and it might have different implications for borrowers. To alleviate this concern, in specification (2) of Table XI, we re-estimate our main results using only counties a bank has had branches in since at least 2002. In addition we use only counties a bank has had branches in since at least 2002 when creating the dispersed and exposed variables. Again, it is still the case that controlling for various balance sheet variables, exposed banks reduce their lending more than strong banks. Furthermore, the results remain the same if we exclude observations corresponding to bank mergers and acquisitions and failures. The results are reported in specification (3).

One potential problem with our analysis is that, as we mentioned earlier, the small loans contained in the CRA include not only commercial and industrial loans but also loans secured by nonresidential and nonfarm real estate. By constraining our analysis only to counties where the real estate index did not fall too much, we make sure that our results are not driven by exposed banks cutting their commercial real estate originations due to plummeting real estate prices.

However, if exposed banks originated and potentially securitized more of these commercial mortgages during the boom period, it is possible that they then cut originations more because of

their inability to securitize these types of loans during the 2006-2008 time period when real estate securitization became difficult. To check that this is not driving our results, we obtain at the bank level the total amount of small business loans outstanding and what part of this amount comprised commercial and industrial loans and what part comprised loans secured by nonresidential real estate. Constraining our sample to include only banks for which commercial and industrial loans made up at least 50% of the total amount of small business loans outstanding as of June 30, 2006, our results hold.[16] Unfortunately, the number of banks for which commercial and industrial loans make up more than 55% of total small business loan originations outstanding small, less than 800, and quickly falls for higher percentages. Thus, due to a small number of observations and lack of power, we cannot confirm that our results hold for the small number of banks for which commercial and industrial loans comprise the vast majority of their lending.

In addition, healthy banks on average have a lower ratio of C&I loans to total loans outstanding (40%) than exposed banks (46%), a difference that is statistically significant at the 5% level. If our results are driven by exposed banks reducing originations due to their inability to securitize the loans, then we would expect exposed banks to have a lower percentage of C&I loans than healthy banks.

We perform further robustness checks to determine that our results are not driven by the precise definition of dispersed and exposed banks. In specification (4), we present the results when defining "dispersed" as the top quartile of the distribution for the number counties the bank

[16] Our results are robust to constraining the sample to any other cutoff smaller than 50% as well.

has branches in and "exposed" as the top quartile of the distribution for the number of weak counties (defined as the bottom quartile of the REBUST distribution) the bank has branches in.

Our last robustness compares the dispersed exposed banks with local strong banks. As mentioned earlier, the central result of our analysis is that dispersed banks that experience a negative real estate shock in some areas where they operate, reduce their lending in other areas, areas that did not experience the shock. In this way, dispersed banks are a source of contagion for reductions in loan supply. However, to properly identify this effect, we need to control for the unobservable level of demand in the counties we are analyzing. By comparing dispersed exposed banks relative to dispersed strong banks in each county, we subtract out the level of demand. However, because our group of strong banks is also dispersed, their lending behavior may respond to demand and supply shocks elsewhere, not just in the counties we analyze.

As an alternative, we compare dispersed exposed banks to local strong banks. Since these banks are by definition local, their lending reflects only the local supply and demand shocks, and since we focus on counties not impacted by the real estate shock, systematic supply shocks are not an issue. Thus, the lending of small strong banks should reflect the local demand for loans, and by comparing these banks to dispersed exposed banks, we can identify the causal effect of exposed banks on lending. Specification (5) of Table XI reports our result for this last robustness test. The coefficient on S_i is positive and statistically significant.

VI. Final remarks

The years 2008-2010 were hard times. In the United States, unemployment rose to the highest levels in thirty years, and GDP per capita fell by 3% in a single year. While these adverse outcomes were broadly felt across the economy, their causes were more localized. Real estate prices collapsed in certain local markets, and the instruments that had provided financing

were correspondingly less valuable. This paper studies one mechanism that propagated these local shocks into the broader economy, namely the reduction in lending in *many* markets by banks that had unusually high exposure to the *particular* markets in which the house price correction was most acute.

We find that "exposed" banks reduced their lending in local markets that had *not* experienced sharp declines in real estate prices, as compared to less exposed banks lending in the same markets. These results hold across all sizes of small business loans and are both statistically and economically significant. Further, we find that "exposed" banks were more likely to exit by closing all branches in markets that had not experienced real estate price declines, as compared to stronger, less exposed banks. We also show that healthy banks use their stronger balance sheets to enter new markets and gain market shares in both deposits and small business lending. These gains in market shares remain in the long run.

Throughout the analysis, we consider only lending and deposit-taking activities in counties that did not experience the real-estate shock and show that difference in behavior amongst banks was correlated with the banks' exposure to the real estate shock in other counties. Thus, we believe we have identified and described one transmission channel, a bank lending channel, that served to propagate the financial crisis through the broader economy.

Our results can be interpreted as describing a potential cost that may partially offset the benefits of geographically diversified branch banking. A large branch system that has exposure to many uncorrelated lending markets may be better able to weather a storm in a particular market, compared to a smaller bank that lends only in that troubled market. On the other hand, the diversified branch system might introduce into a relatively healthy local market contagion effects from troubled far-away markets to which the diversified bank has substantial exposure.

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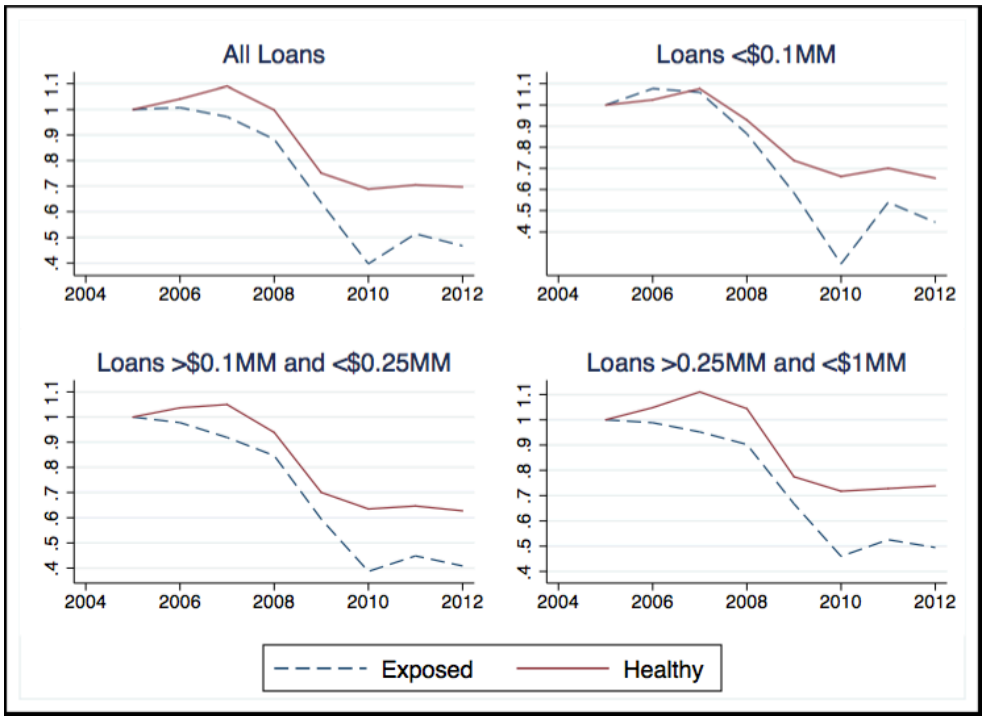
Figure 1
The Evolution of Credit, 2005-2012

This figure shows evolution of lending to small firms by loan size. The data is from CRA. Loan volume is indexed to 2006 level. Panels A and B puts higher weight on large banks; Panels C and D reports an equally-weighted average. The focus is on the difference between exposed and strong dispersed (i.e., matched) banks.

A. Total Loan Volume



B. Total Loan Volume

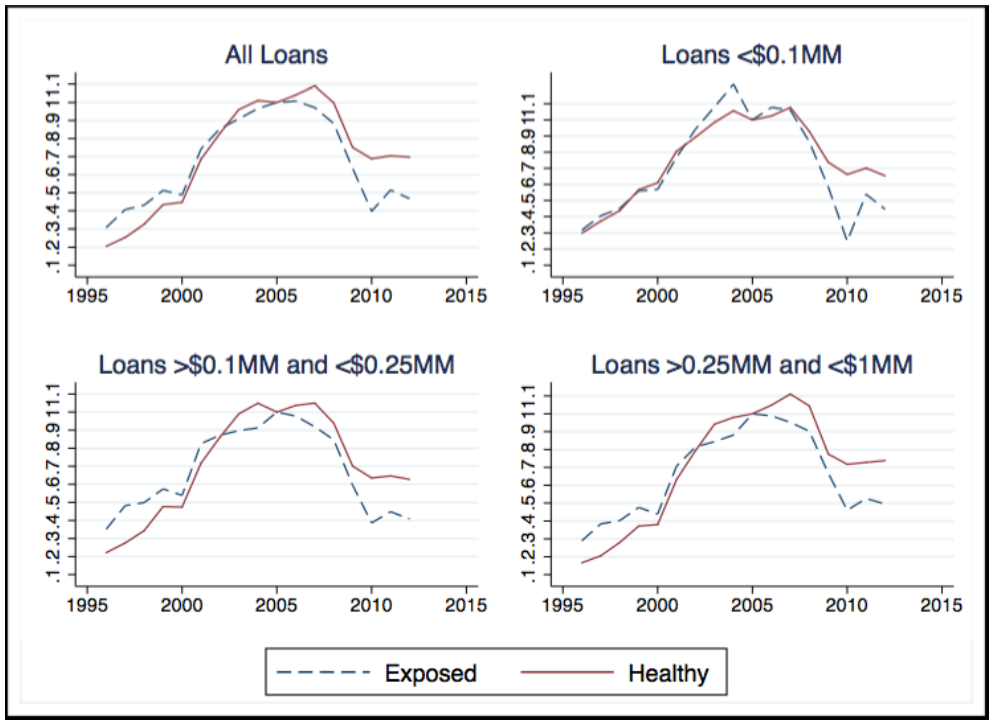
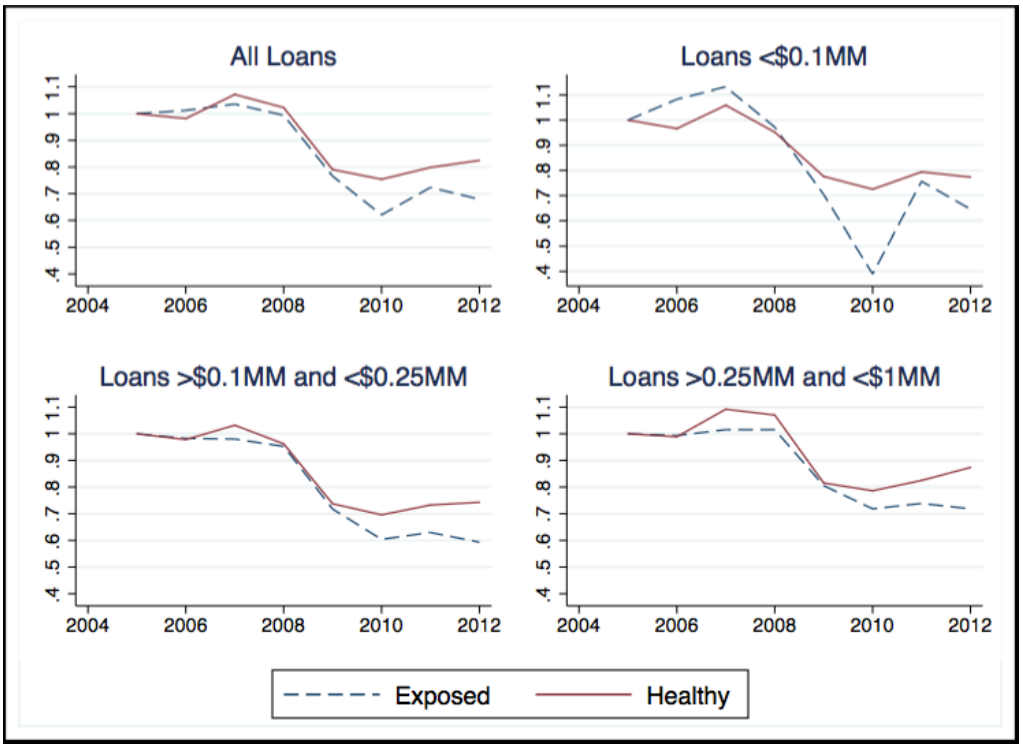


Figure 1 – continued

C. Equal-Weighted Average Loan Volume



D. Equal-Weighted Average Loan Volume

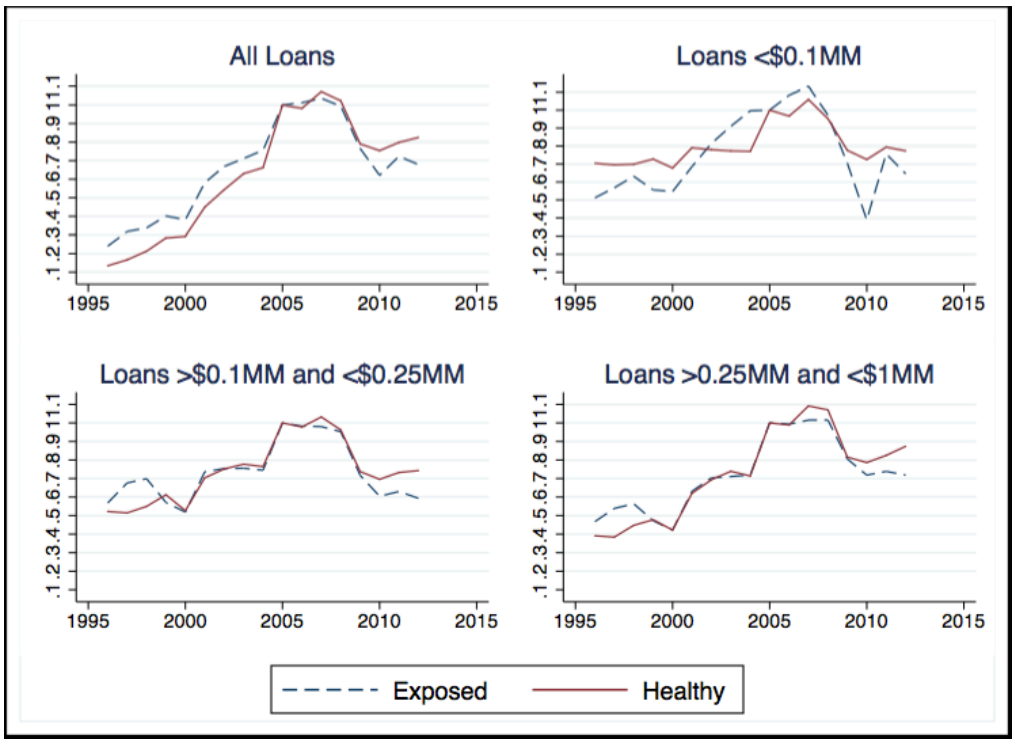


Table I
Counties not Experiencing a Real Estate Shock: Exposed Dispersed Banks vs. Strong Dispersed Banks

This table compares activities of banks exposed to a real estate shock and banks that were unaffected by a real estate shock. The analysis is constrained to counties that did not experience a collapse in real estate prices. All banks in the sample operate in other counties; they are in the top quartile of the distribution of deposit concentration calculated as the deposit HHI across counties the banks operates in. ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively.

	Exposed banks (Obs.= 71)	Strong banks (Obs. =184)	Diff.	
Number of counties with branches	60.208	20.194	40.013	***
As of December 31, 2006:				
Number of branches	443.675	85.822	357.853	***
Assets	100,273,493.714	5,595,118.494	94,678,375.220	***
Trading assets/Total assets	0.013	0.001	0.012	**
Deposits/Assets	0.682	0.774	-0.092	***
Brokered deposits/Total deposits	0.145	0.135	0.009	
Insured deposits/Deposits	0.457	0.497	-0.040	***
Loans/Assets	0.650	0.675	-0.025	
Consumer loans/Loans	0.083	0.091	-0.007	
Real estate loans/Loans	0.726	0.734	-0.008	
C&I loan /Loans	0.178	0.154	0.024	*
Past due/Loans	0.014	0.013	0.001	
Commitments/Loans	0.257	0.164	0.094	**
Net charge-offs/Loans	0.001	0.001	0.000	
Long-term debt/Liabilities	0.057	0.040	0.017	**
Tier 1 capital ratio	0.106	0.118	-0.012	***
Leverage ratio	0.084	0.091	-0.007	***
Risky assets ratio	0.127	0.133	-0.006	
ABS/Assets	0.005	0.001	0.004	**
Credit and Liq Commitments/Assets	0.001	0.000	0.001	
As of December 31, 2008:				
Number of branches	477.727	98.128	379.599	***
Assets	132,690,079.648	7,206,769.635	125,483,310.013	***
Trading assets/Total assets	0.017	0.001	0.015	**
Deposits/Assets	0.655	0.750	-0.095	***
Brokered deposits/Total deposits	0.172	0.159	0.013	
Insured deposits/Deposits	0.641	0.659	-0.018	
Loans/Assets	0.676	0.693	-0.016	
Consumer loans/Loans	0.079	0.079	0.001	
Real estate loans/Loans	0.713	0.744	-0.031	
C&I loan /Loans	0.185	0.153	0.032	**
Past due/Loans	0.033	0.025	0.009	**
Commitments/Loans	0.237	0.143	0.094	***
Net charge-offs/Loans	0.004	0.002	0.002	***
Long-term debt/Liabilities	0.075	0.050	0.025	***
Tier 1 capital ratio	0.098	0.114	-0.016	***
Leverage ratio	0.080	0.090	-0.010	***
Risky assets ratio	0.120	0.129	-0.009	**
ABS/Assets	0.005	0.001	0.004	***
Credit and Liq Commitments/Assets	0.001	0.000	0.001	

Table II

Change in Deposits and Lending: Exposed Dispersed Banks vs. Strong Dispersed Banks

This table compares the evolution of deposits and loans from 2006 to 2008 for exposed and strong banks in our sample. As before, the analysis is constrained to counties that did not experience a collapse in real estate prices. ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively.

			Exposed banks		Strong banks	
Variable	Diff.		Mean	Obs.	Mean	Obs.
Num. (1000s) loans to small enterprise, 2006	0.061	***	0.215	1,796	0.154	1,799
Amount $M of loans to small enterprise, 2006	2.549	**	22.856	1,796	20.307	1,799
Change between 2006 and 2008:						
Deposits/Assets	-0.006	***	0.001	1,754	0.007	1,735
Deposits	13.279	**	34.577	1,796	21.298	1,799
Number of branches	-0.244	***	0.147	1,754	0.391	1,735
Deposits per branch	10.322		13.194	1,754	2.871	1,735
Number of small business loans	-1.984		-10.130	1,796	-8.146	1,799
Number of loans <100K	0.286		-8.177	1,796	-8.463	1,799
Number of loans >100K, <250K	-0.920	**	-1.849	1,796	-0.929	1,799
Number of loans > 250K, <1M	-1.935	***	-0.932	1,796	1.004	1,799
Num of loans to firms with<$1M revenue	8.184	***	-4.261	1,796	-12.445	1,799
Num of loans to firms with >$1M revenue	-10.168	***	-5.869	1,796	4.298	1,799
Amount of small business loans	-1.722	***	-1.363	1,796	0.359	1,799
Amount of loans <100K	-0.483	***	-0.684	1,796	-0.200	1,799
Amount of loans >100K, <250K	-0.179	***	-0.315	1,796	-0.136	1,799
Amount of loans >250K, <1M	-1.095	***	-0.420	1,796	0.675	1,799
Amt of loans to firms with <$1M revenue	0.021		-0.770	1,796	-0.791	1,799
Amt of loans to firms with >$1M revenue	-1.743	***	-0.593	1,796	1.150	1,799

Table III

Non-Weak Counties: Exposed vs. Strong Banks

The analysis is constrained to counties that did not experience a collapse in real estate prices. The variable of interest is *Strong bank*, equal to 1 if a bank was not exposed to the collapse in real estate prices across the counties in which it operates. Standard errors (reported in brackets) are clustered at the bank level. ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively

Dependent variable:	Change in loan amount from 2006 to 2008				
	(1)	(2)	(3)	(4)	(5)
Strong bank (S_i)	2.091**	2.592***	3.110*	3.705**	3.753**
	[0.915]	[0.966]	[1.656]	[1.432]	[1.541]
Log(SBL Loans in County), 2006	-78.11***	-95.77***	-96.66***	-87.74***	-88.49***
	[25.73]	[30.13]	[29.82]	[31.31]	[30.44]
Log(Assets), 2006	--	--	0.15	1.031**	0.859**
			[0.292]	[0.405]	[0.420]
Deposits/Assets, 2006	--	--	--	12.78**	14.09**
				[5.759]	[5.989]
Insured deposits/Deposits, 2006	--	--	--	-1.887	-4.369
				[6.367]	[7.157]
Loans/Assets, 2006	--	--	--	-2.057	-3.022
				[4.854]	[5.027]
Real estate loans/Total loans 2006	--	--	--	6.427*	7.616
				[3.733]	[4.653]
Net Charge-offs/Total loans 2006	--	--	--	--	354
					[434.8]
Past due loans/Total loans, 2006	--	--	--	--	15.09
					[89.88]
Tier 1 ratio, 2006	--	--	--	--	-11.48
					[15.00]
ABS/Assets, 2006	--	--	--	--	63.32
					[44.83]
Constant	0.178	0.289	-1.544	-21.56**	-19.46**
	[0.409]	[0.551]	[3.732]	[8.803]	[9.653]
Fixed effect: County (δ_l)	No	Yes	Yes	Yes	Yes
Observations	3481	3481	3481	3162	3162
R^2	0.078	0.216	0.217	0.212	0.216

Table IV

Non-Weak Counties: Different Types of Loans

The analysis is constrained to counties that did not experience a collapse in real estate prices. The variable of interest is *Strong bank*, an indicator equal to 1 if a bank was not exposed to the collapse in real estate prices across the counties in which it operates. Standard errors (reported in brackets) are clustered at the bank level. ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively

Dependent variable:	Change in loan amount from 2006 to 2008				
	Loans <100K	Loans>100 K, <250K	Loans>250 K, <1M	Firms with Rev<1M	Firms with Rev>1M
Strong bank (S_i)	0.745	0.635**	2.420***	-0.334	4.087*
	[0.556]	[0.304]	[0.877]	[1.239]	[2.143]
Log(SBL Loans by Size), 2006	-23.72**	-17.67***	-42.83**	-41.83**	-46.66**
	[9.586]	[6.080]	[16.89]	[16.90]	[21.22]
Log(Assets), 2006	0.308**	0.190**	0.338	0.131	0.728
	[0.141]	[0.0851]	[0.241]	[0.304]	[0.505]
Deposits/Assets, 2006	5.035***	2.637*	6.559*	10.79**	3.299
	[1.636]	[1.358]	[3.715]	[4.176]	[4.481]
Insured deposits/Deposits, 2006	-2.514	0.102	-1.566	-4.655	0.286
	[2.538]	[1.566]	[4.748]	[3.714]	[5.827]
Loans/Assets, 2006	1.325	-0.86	-4.309	-5.11	2.088
	[1.394]	[1.284]	[2.948]	[3.582]	[4.126]
Real estate loans/Total loans 2006	1.523	1.266	4.57	1.7	5.916*
	[0.983]	[0.876]	[3.155]	[2.181]	[3.516]
Net Charge-offs/Total loans 2006	53.88	28.29	270.8	146.4	207.6
	[120.1]	[89.22]	[276.0]	[297.4]	[442.0]
Past due loans/Total loans, 2006	39.16	-3.336	-25.24	-7.566	22.66
	[27.74]	[17.15]	[51.67]	[54.26]	[72.66]
Tier 1 ratio, 2006	3.725	-3.473	-12.73	-1.234	-10.24
	[4.388]	[3.273]	[9.845]	[9.094]	[11.68]
ABS/Assets, 2006	11.32	11.9	38.99	13.07	50.24*
	[9.961]	[10.22]	[29.86]	[23.13]	[27.90]
Constant	-8.491***	-3.869**	-6.345	-3.909	-15.55
	[2.955]	[1.943]	[5.735]	[6.378]	[9.765]
Observations	3162	3162	3162	3162	3162
R^2	0.276	0.2	0.184	0.224	0.198

Table V
Impact of Competition

This table examines whether a bank's market power in a county and how competitive a county is impacts the differential behavior in credit between strong and exposed banks shown in Table III. The two specifications split the counties by whether the Herfindahl–Hirschman Index (HHI) of loan amount is below (specifications 1 and 3) or above (specifications 2 and 4) the first quartile. Standard errors (reported in brackets) are clustered at the bank level. ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent variable:	Change in loan amount from 2006 to 2008			
	(1)	(2)	(3)	(4)
Strong Bank	5.594**	2.449**	2.762	2.285*
	[2.314]	[1.146]	[2.505]	[1.376]
Strong Bank x Market Share in Loans 2006				
	--	--	0.293*	0.00894
			[0.154]	[0.0362]
Market Share in Loans 2006	--	--	-0.217*	-0.0278
			[0.115]	[0.0273]
Fixed effect: County (δ_l)	Yes	--	--	Yes
Observations	1159	2003	1159	2003
R^2	0.195	0.278	0.201	0.28

Table VI
Extensive Margin: Exit

This table examines whether exposed banks are more likely to exit a county they operate in. In all regressions, the dependent variable is whether the bank exits the county by 2008. Specification (1) corresponds to OLS with county fixed effects. Specification 2 is a probit and controls for county characteristics. Specification (3) excludes observations where a bank failed or was bought. Specification (4) is a fixed effects logit. Standard errors (reported in brackets) are clustered at the bank level, except in Specification (4) which clusters at the county level. ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent variable:	Indicator for whether the bank exits the county by 2008			
	(1)	(2)	(3)	(4)
Strong Bank	-0.151*	-0.671*	-0.717*	-1.246***
	-0.087	-0.385	-0.391	-0.184
Number of households (million)	--	0.000	0.000	--
		(0.000)	(0.000)	
Median household income ($ thousand)	--	0.000	0.000	--
		(0.000)	(0.000)	
Number of houses per square mile	--	0.000*	0.000*	--
		(0.000)	(0.000)	
Change in real estate prices 2006Q2-2007Q4	--	0.305	0.781	--
		(1.172)	(1.178)	
Fraction of population >16 in labor force	--	-3.006**	-2.692**	--
		(1.239)	(1.263)	
Fraction of labor force unemployed	--	-4.741	-4.584	--
		(4.013)	(3.981)	
Fraction of population below the poverty line	--	-0.507	-0.379	--
		(2.087)	(2.142)	
Constant	0.742*	4.664**	2.87	--
	-0.379	-2.217	-2.182	
Fixed effect: County (δ_l)	Yes	--	--	Yes
Observations	3688	3688	3671	1806
R^2	0.290	0.154	0.158	0.226

Table VII
Extensive Margin: Entry

This table examines whether healthy banks are more likely to exit a county they operate in. In all regressions, the dependent variable in Specification (1) is the change in number of branches and the regression is done using probit. In specification (2) it is equal to 1 if the number of branches increased, 0 if it stayed the same and -1 if it decreased. An ordered probit is estimated. In Specifications (3)-(6), the dependent variable is whether the bank entered the county and a probit is estimated. Standard errors (reported in brackets) are clustered at the bank level. ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent Variable	(1) Chg in Num Branches	(2) Chg in Num Branches	(3) Enter	(4) Enter	(5) Enter	(6) Enter
main						
Strong Bank	0.370**	0.201**	0.193	-0.013	0.013	0.167
	(0.171)	(0.101)	(0.124)	(0.168)	(0.153)	(0.205)
Num. Banks Entered '96-'05 (Neg)				-2.423***		
				(0.906)		
Strong Bank x Num. Banks Entered				1.521*		
				(0.914)		
Deposits HHI (2006)					-0.128***	
					(0.045)	
Strong Bank x Deposits HHI					0.091*	
					(0.055)	
Rice-Strahan Index						-0.308***
						(0.107)
Strong Bank x Rice-Strahan Index						0.238*
						(0.135)
Observations	3322	3322	9743	9743	9743	2081
R-Squared	0.26	0.052	0.101	0.109	0.104	0.201

Table VIII
Impact on Overall Market Structure

The first specification regresses the change in deposits on the Strong Bank indicator. The dependent variable in specifications (1) and (2) is the change in deposits. In specification (3), it is the change in market share of deposits and in specification (4) it is the change in the market share of loans. The regressions are estimated using OLS with county fixed effects. Standard errors (reported in brackets) are clustered at the bank level. ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent variable:	Change in Deposits	Change in Deposits (include Entry/Exit)	Change in Market Share of Deposits	Change in Market Share of Loans
	(1)	(2)	(3)	
Strong bank (S_i)	23.69	74.45**	2.461**	6.211***
	[14.55]	[31.52]	[1.149]	[2.198]
Log(SBL Loans by Size), 2006	1198.0***	317.9	-26.85***	-45.77**
	[355.7]	[654.7]	[8.625]	[21.67]
Log(Assets), 2006	2.773	10.66	0.435*	1.967***
	[4.391]	[8.723]	[0.224]	[0.572]
Deposits/Assets, 2006	-152.7**	-219.3	-1.857	16.89*
	[64.10]	[204.1]	[3.497]	[9.717]
Insured deposits/Deposits, 2006	52.16	277.7**	4.381	3.619
	[97.20]	[117.5]	[3.482]	[5.959]
Loans/Assets, 2006	-7.897	-51.2	-0.479	-7.391
	[54.18]	[127.2]	[2.471]	[6.312]
Real estate loans/Total loans 2006	13.85	-60.22	-1.774	0.048
	[35.57]	[61.38]	[1.695]	[3.066]
Net Charge-offs/Total loans 2006	-1141.3	-14999.3	-525.8	-814.9
	[5820.9]	[11072.4]	[348.7]	[616.7]
Past due loans/Total loans, 2006	-1292.5	1370.4	58.03	165.1**
	[792.2]	[1571.7]	[43.22]	[81.50]
Tier 1 ratio, 2006	-116	-89.84	-2.384	18.65
	[353.6]	[428.3]	[9.362]	[17.73]
ABS/Assets, 2006	373	1178.0**	25.70**	55.65
	[435.2]	[519.0]	[10.98]	[42.86]
Constant	71.75	-50.12	-5.462	-33.92***
	[95.10]	[183.9]	[4.313]	[10.92]
Observations	3322	3702	3689	3529
R^2	0.203	0.116	0.253	0.263

Table IX

Did Strong Banks Make up for the Cut in Exposed Banks' Lending?

These regressions test whether healthy banks increase lending in, deposits in, and are more likely to enter, counties where exposed banks cut their activities more. All regressions are constrained to just healthy banks. Specifications (1) and (2) use the change in the amount of loans and change in amount of deposits as the dependent variables. Specifications (3) and (4) use the change in the market share of loans and change in the market share of deposits, respectively. In specifications (5) and (6), the dependent variable is an indicator for whether the bank enters the county. In specifications (1) and (3), the variable of interest is the aggregate amount of lending decrease by exposed banks in the county from 2006 to 2008. In specifications (2), (4), and (5), it is the aggregate decrease in deposits by exposed banks from 2006 to 2008. In specification (6), it is the aggregate decrease by exposed banks in the number of branches from 2006 to 2008. All regression are estimated using county controls. Standard errors (reported in brackets) are clustered at the bank level. ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent variable:	Change in the Amount of Loans	Change in the Amount of Deposits	Change in the Market Share of Loans	Change in the Market Share of Loans	Enter	Enter
	(1)	(2)	(3)	(4)	(5)	(6)
Lending Decrease from Exposed Banks	-39.35**		-20.57***			
	[17.26]		[5.970]			
Deposits Decrease from Exposed Banks		-3.951		0.00333	-0.0613**	
		[4.323]		[0.0521]	[0.0247]	
Branch Decrease from Exposed Banks						-0.0107*
						[0.00625]
Constant	-12.72	-98.33	-18.46	-4.385	-6.814***	-6.591***
	[9.516]	[152.9]	[11.37]	[6.486]	[1.604]	[1.538]
Observations	1425	1723	1574	1720	5036	5225
R^2	0.068	0.025	0.037	0.021	0.0842	0.0804

Table X
Long-Term Effects

This table repeats our central results, but the dependent variable is defined as the change from 2006 to 2012. Specification (1) has the change in loans as the dependent variable. Specification (2) uses the change in deposits and Specifications (3) and (4) use the market shares of loans and deposits, respectively. Throughout, standard errors (reported in brackets) are clustered at the bank level. ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively.

	(1) Change in Loans	(2) Change in Deposits	(3) Change in Market Share of Loans	(4) Change in Market Share of Deposits
Strong Bank	4.223*	130.4**	5.005**	0.998**
	[2.287]	[55.25]	[2.009]	[0.472]
Log(Loans) 2006	-352.5***	3382.6	22.93**	4.918
	[45.64]	[2444.6]	[11.06]	[6.479]
Log(Assets)2006	0.348	8.706	0.329	0.0637
	[0.433]	[18.99]	[0.477]	[0.163]
Deposits / Assets 2006	13.22	13.36	17.79**	4.63
	[9.230]	[301.5]	[7.127]	[2.921]
Insured Deposits / Deposits 2006	-17.77	167.6	-16.81	0.135
	[14.77]	[298.2]	[10.98]	[2.724]
Loans / Assets 2006	-12.44*	-222.5	-13.97**	-3.404*
	[7.201]	[270.7]	[6.727]	[1.912]
Real Estate Loans / Loans 2006	-8.5	-71.15	-4.99	-0.715
	[6.503]	[208.0]	[5.039]	[1.429]
Net Chargeoffs / Loans 2006	-491.6	45478	136.3	62.92
	[844.9]	[37392.3]	[669.0]	[205.4]
Past Due / Loans 2006	-273.7**	3908.9	-280.1***	21.49
	[118.3]	[3958.8]	[95.42]	[39.96]
Tier 1 ratio 2006	-5.77	-1284.1*	-12.89	-11.77
	[29.19]	[752.0]	[27.06]	[7.355]
ABS / Assets 2006	120	-673.6	31.03	0.746
	[72.73]	[1654.8]	[60.60]	[18.73]
Constant	14.73	-43.15	13.16	-0.752
	[9.400]	[406.4]	[10.07]	[3.909]
Observations	2550	3322	2532	2850
R^2	0.513	0.248	0.606	0.327

Table XI
Robustness

This table repeats our central results, but excludes the largest institutions from the sample. Specification (1) is equivalent to specification (5) in Table 3, but excluding the ten biggest banks. Specification (2) we discard observations where a given bank had entered after 2002 (i.e., new or non-traditional markets). Specification (3) further discards observations corresponding to mergers and acquisitions and bank failures. Specification 4 defines "large" as the in the top quartile of the distribution of the number of counties each bank operates in and "exposed" as the top quartile of the distribution of the number of weak counties each bank operates in. In specification 5, we change our control group from strong dispersed banks to local banks. Since the analysis is constrained to counties which did not experienced contraction in real estate prices, local banks were also not exposed to the real estate shock. Throughout, standard errors (reported in brackets) are clustered at the bank level. ***, ** and * indicate statistical significance at 1%, 5% and 10%, respectively.

Dependent Variable					
	(1)	(2)	(3)	(4)	(5)
Strong Bank	2.554***	2.913***	2.111**	1.704**	3.030*
	[0.778]	[1.031]	[0.978]	[0.784]	[1.770]
Log(Loans) 2006	-80.83***	-76.55***	-76.65***	-71.08***	-65.79***
	[17.23]	[16.97]	[18.78]	[17.27]	[25.19]
Log(Assets)2006	0.614***	0.437*	0.426	0.718**	0.561
	[0.203]	[0.257]	[0.282]	[0.281]	[0.439]
Deposits / Assets 2006	11.48***	8.632**	13.55***	12.69***	6.084
	[3.568]	[4.129]	[3.473]	[3.121]	[4.129]
Insured Deposits / Deposits 2006	-2.832	2.588	-4.782	-3.171	-3.016
	[3.394]	[4.628]	[4.148]	[3.671]	[3.991]
Loans / Assets 2006	-4.081	2.206	-3.255	-2.236	-4.061
	[2.834]	[3.882]	[3.808]	[3.000]	[2.923]
Real Estate Loans / Loans 2006	4.470*	1.95	3.793	6.306**	6.558
	[2.494]	[2.724]	[2.906]	[2.680]	[4.078]
Net Chargeoffs / Loans 2006	222.1	5.17	661.5**	424.4*	-192.8
	[227.3]	[240.1]	[303.7]	[231.0]	[271.8]
Past Due / Loans 2006	26.79	-56.36	32.02	-9.686	68.67
	[49.02]	[41.94]	[48.76]	[47.37]	[63.51]
Tier 1 ratio 2006	-2.852	0.834	-5.18	15.59*	15.81
	[8.717]	[9.110]	[11.11]	[8.215]	[18.45]
ABS / Assets 2006	35.21	41.73	50.32	26.6	47.06
	[28.13]	[35.60]	[34.56]	[28.35]	[36.37]
Constant	-13.91***	-14.92**	-12.81**	-18.95***	-13.16
	[4.660]	[5.976]	[6.379]	[6.324]	[8.681]
Observations	2.554***	2.913***	2.111**	1.704**	3.030*
	[0.778]	[1.031]	[0.978]	[0.784]	[1.770]
	-80.83***	-76.55***	-76.65***	-71.08***	-65.79***
	[17.23]	[16.97]	[18.78]	[17.27]	[25.19]
	0.614***	0.437*	0.426	0.718**	0.561
	[0.203]	[0.257]	[0.282]	[0.281]	[0.439]
	11.48***	8.632**	13.55***	12.69***	6.084
	[3.568]	[4.129]	[3.473]	[3.121]	[4.129]
	-2.832	2.588	-4.782	-3.171	-3.016
	[3.394]	[4.628]	[4.148]	[3.671]	[3.991]
Observations	3161	2064	2284	3227	1747
R^2	0.263	0.357	0.326	0.242	0.385