Bank Diversification and Lending Resiliency

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Abstract

In this paper, we show the benefits of bank asset diversification for the economy. A more diversified stream of earnings enables banks to better absorb negative shocks, leading to increased and more stable lending. This, in turn, provides positive spillovers to the economy. We demonstrate that this diversification-induced lending resiliency is beneficial during the financial crisis, when maintaining credit availability is of paramount importance. We use changes in bank regulation as exogenous shocks to identify the causal effect of asset diversification. Our results speak to the long-standing debate in the literature and among policy makers about whether the expansion of banks into new activities benefits or threatens the economy, and provide some counterbalance to concerns about systemic risk.

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Over the last few decades, banks have become increasingly diversified. As bank lending helps drive economic activity and encourages recovery following negative shocks (Bernanke and Gertler, 1995; Peek and Rosengren, 1997, 2000), it is important to understand the impact of asset diversification on lending and the real economy. The overall effect of diversification is unclear. On the one hand, it leads to a more varied asset composition, which may reduce bank sensitivity to economic shocks and help maintain credit supply. Alternatively, diversification into non-lending activities may distract banks from lending and create a more interconnected banking system with heightened systemic risk (Acharya, 2009; Ibragimov, Jaffee, and Walden, 2011; Wagner, 2010, 2011; Goldstein, Kopytov, Shen, and Xiang, 2020).

In this paper, we find the effects of bank asset diversification to be largely positive. Asset diversification leads to a higher and more stable credit supply, providing positive spillovers to the economy. We argue that banks achieve a more stable stream of earnings by expanding into new markets and activities that are imperfectly correlated with their existing pool of loans. In response, they expand lending and their credit supply becomes more resilient to negative systematic shocks. This diversification-induced lending resiliency is valuable during crisis periods, when credit supply is especially important. The benefits of asset diversification, that have not yet been fully explored, provide some counterbalance to concerns about systemic risk.

We consider two major types of diversification: lending in more geographic markets and undertaking more non-lending activities. First, we focus on geographic diversification, which we measure using the number of states where a bank reports small business lending activity. Given the local nature of small business activity, this measure captures banks' exposure to customers in areas that are imperfectly correlated with their existing pool of loans. Geographic diversification has become increasingly common over time. In 1999, the average bank conducted small business lending across 7.7 states, whereas in 2017 the average bank is active in 14.5 states.

Although size and diversification are considered closely related, this is not always the case. The cross-sectional correlation between the bank's total assets and the number of states it conducts small business lending was 0.29 in 2017. In our analysis, we make certain to separate the

effect of diversification from the size of the bank.

We establish that for a given bank, increased geographic diversification is associated with a higher and more stable loan supply. Over a sample period of 1997–2017, a one standard deviation increase in geographic diversification is associated with a 1.9% quarterly increase in lending. Lending by banks with higher measures of diversification is also less sensitive to business cycle conditions. For a one standard deviation decrease in log GDP, banks with one standard deviation higher geographical diversification maintain 1.1% more of their credit supply. Consistent with the benefits of diversification stemming from reduced correlation between bank assets, we also show that geographic diversification enhances the stability of the bank's credit risk and total earnings over the business cycle.

Lending resiliency of more diversified banks is especially important during declines in business activity. Bank lending is critical to encourage economic recovery, as prolonged credit scarcity further inhibits growth (Bebchuk and Goldstein, 2011). We focus on the 2008 financial crisis as an unanticipated shock to lending. Exploiting the heterogeneity in diversification prior to the onset of the crisis, we find that the most geographically diversified banks had 5.8% more total lending than the least diversified banks. We find similar results for different lending segments, such as real estate and commercial and industrial (C&I) lending.

If more diversified banks are better able to continue lending despite a strong systematic shock, like the 2008 crisis, we should observe this for riskier categories of lending in particular. To test this idea, we focus on small business lending, a highly bank-dependent and riskier segment by its nature and an economically important one.[1] As this type of lending is reported at a granular county-level, we can better gauge to what extent lending amounts are a result of bank capital supply, and not just variation in loan demand.

In a given county and year, we find the most geographically diversified banks maintain

[1] Small firms accounted for 45% of GDP (SBA, 2010) and over 99% of American firms are small businesses. They employ 47% of the private workforce (SBA, 2020) and account for over half of net job creation (Census, 2014). At the same time, smaller firms are exposed to higher financial constraints due to frictions such as agency and moral hazard problems or the inability to provide strong collateral (Holmstrom, 1979; Holmstrom and Tirole, 1997).

twofold higher levels of small business lending during the crisis, compared to the least diversified banks. In the spirit of Khwaja and Mian (2008), these results are while controlling for local economic conditions using county-year fixed effects. Rather than an artifact of loan demand, more diversified banks choose to provide a higher loan supply in these counties.

While we document that more diversified banks maintain higher levels of small business lending, a remaining question is the importance of this effect on the broader economy. To answer this question, we aggregate banks within each county to measure the overall impact of diversification on county-level lending and employment. We find that counties with a one standard deviation higher share of diversified banks experience 2.9% higher aggregate small business lending. This lending increase translates into meaningful real effects: the higher county-level diversification is associated with 1.1% higher small-business-related employment. More diversified banks do not simply capture market share from other banks, but rather their activity helps stabilize the local economy.

While we argue these effects are coming from a diversification channel, there are other related bank characteristics that may play a role. More diversified banks are likely to be larger and have different risk profiles. Indeed, there is mixed evidence on whether geographic diversification (domestic or international) increases or decreases bank risk (Goetz, Laeven, and Levine, 2016; Berger, El Ghoul, Guedhami, and Roman, 2017). Geographic diversification may also have a beneficial effect on the cost and availability of banks' funding (Levine, Lin, and Xie, 2020; Doerr and Schaz, 2021).

To disentangle these issues, in all our specifications we control for the amount of assets, overall bank risk, the geographic breadth of funding, and other relevant bank characteristics. Our results can therefore be interpreted as measuring the effect of diversification controlling for these related factors. We verify that our results hold across a wide range of banks by splitting them into subsamples by size, geographic diversification, capital ratios, and risk. Across all subsamples, more diversified banks lend more and are less sensitive to changes in the business cycle.

Asset diversification plays an important role for bank lending policy beyond its relation to size and risk. We also demonstrate that the results are coming from the diversification of bank assets, separate from funding diversification. We confirm that the results are not driven by differences in local bank lending competition or from consolidation among banks.

To further address these endogeneity concerns, we use changes in bank regulation as exogenous shocks to diversification. We focus on these shocks' impact on the credit supply to bank-dependent firms (i.e., small businesses), as we are best able to control for potential confounding demand factors in this setting.

We rely on the staggered relaxation of state-level banking restrictions as a set of exogenous shocks in a difference-in-differences framework. Specifically, the Riegel-Neal Interstate Banking and Branching Efficiency Act of 1994 removed several obstacles to banks opening branches in other states and reduced barriers to further within-state expansion. The dates vary for each state's exact implementation of the act. Like prior papers that have used these shocks in states with regulatory changes (e.g., Becker, 2007; Demyanyk, Ostergaard, and Sørensen, 2007; Rice and Strahan, 2010; Krishnan, Nandy, and Puri, 2014), we study changes in lending among banks that were affected by the deregulation. However, we focus on these banks' lending response only in states that *do not* experience the regulatory change, and compare them to banks that do not lend in the deregulated state. We identify 19 distinct regulatory shocks over our sample period. To help address the endogenous choice of expansion, we only consider those banks which already had some lending footprint in the affected state prior to its deregulation. Our assumption is that these banks only adjust their lending in unaffected states, relative to other banks, because of their expansion in lending in the deregulated state.

In our analysis, we organize banks into cohorts for each distinct regulatory shock, which allows us to focus on specific time windows around each shock. For each cohort, we include rigorous fixed effects—bank-county by cohort and county-year by cohort—to avoid any influence of potentially overlapping shocks on the estimate of the treatment effect. We find that when a bank experiences a relaxing of branching restrictions in a particular state (the deregu-

lated state), it increases small business lending in otherwise unaffected states by about 17.2% relative to the untreated banks. Aggregating to a county level, lending is 8.8% higher for a one standard deviation increase in the number of treated banks in a county. This effect leads to positive spillovers to the economy by increasing small-business-related employment by 2.0%.

So far, we have discussed one dimension of asset diversification—the effect of geographic diversification on credit supply and the real economy. Now we move to another dimension of asset diversification—non-lending business activities. The imperfect correlation between these activities and lending may enable banks to achieve similar benefits of diversification. However, increased non-lending activities may distract banks from their core business. Further, different business lines may affect banks in different ways, and have a negative impact on the banking system (e.g., Brunnermeier, Dong, and Palia, 2020).

We classify the banks' non-interest activities into five business segments: insurance activities; security broker-dealer and investment banking; securitization; non-deposit trust subsidiaries, such as fiduciaries; and trading activity. First, we look at how these activities affect lending over the full sample. We find all these segments lower a bank's sensitivity to changes in GDP, and typically increase the level of lending as well.

Turning to the financial crisis, we find that insurance activity supports lending activity, while other segments do not significantly affect it, and trading activity reduces lending. This result is not unexpected given the nature of the crisis, which harmed banks that concentrated on activities such as securitization and trading (Mian and Sufi, 2009; Mukherjee and Vig, 2010).

Therefore, we concentrate the remaining analysis on insurance activities. While these activities are expected to reduce bank earnings volatility (Boyd, Graham, and Hewitt, 1993; Lown, Osler, Sufi, and Strahan, 2000), their exact effects are underexplored compared to other non-lending activities. Despite being a relatively new business line, it is among the most common: almost half of the banks own at least one domestic insurance subsidiary by 2017.

Consistent with the diversification benefits of an imperfect correlation between insurance and lending, we find that insurance activities improve lending resiliency. Banks with an estab-

lished insurance subsidiary before the crisis lend about 3.3% more during the crisis compared to other banks. For small business lending, we find banks with an established insurance subsidiary maintain 35% higher levels of lending than otherwise similar banks in a given county and year. Our analysis includes the other bank controls to account for relevant alternative explanations as discussed for the geographic diversification case. Considering the aggregate county-level effects, we find similar positive spillovers in terms of economic magnitude for insurance as with geographic diversification.

As a final test of how banks expansion into insurance affects lending, we use as an exogenous shock the newfound ability of banks to undertake insurance underwriting following the passage of the Gramm–Leach–Bliley Act in 1999. It repealed part of the Glass-Steagall Act of 1933 and allowed financial institutions to combine commercial lending, investment banking, and insurance activities. We compare the small business lending activities of banks that acquire or establish an insurance subsidiary to those that do so at a later time.

We find that these banks increase small business lending around 39.5% relative to their peer banks. On the aggregate level, one standard deviation more treated banks in a county is associated with 4.1% higher county-level lending and 0.9% higher small business related employment. Although different dimensions of diversification, both geographic expansion and insurance activities improve lending resiliency and provide positive spillovers to the communities in which these banks lend.

The main contribution of this paper is to establish that asset diversification leads to a higher and more stable credit supply, providing positive spillovers to the economy. We are the first to show that the combination of insurance activities with traditional banking, as well as geographic diversification, enable banks to better absorb systematic and idiosyncratic shocks. Past work on bank diversification has focused on the sources of funding (Levine, Lin, and Xie, 2020), the risk implications (Demsetz and Strahan, 1997; Goetz, Laeven, and Levine, 2016; Berger, El Ghoul, Guedhami, and Roman, 2017), or its effects on bank profitability and shareholder value (DeLong, 2001; Stiroh and Rumble, 2006; Laeven and Levine, 2007; Schmid and Walter, 2009).

While this literature has come to mixed conclusions on whether diversification is beneficial at a bank level, we find asset diversification leads to positive spillovers from increased lending activity.

We also show the implications of bank diversification on lending to bank-dependent firms. Other papers have considered the dynamics of small business lending by focusing on the relationships between banks and firms (Santikian, 2014; Beck, Degryse, De Haas, and van Horen, 2018), the spillover effects from tax policy (Smolyansky, 2019), and lending changes around the financial crisis (Berger, Cerqueiro, and Penas, 2014; Bord, Ivashina, and Taliaferro, 2018; Cortés, Demyanyk, Li, Loutskina, and Strahan, 2020). Our contribution is to show the effect of bank asset diversification on small business lending and employment.

Our results contribute to the long-standing debate in the literature and among policy makers about whether the expansion of banks into new activities benefits or threatens the economy, and how far banks should be permitted to expand (Yellen, 2013). In the United States, there have been many significant regulatory reforms regarding the nature of banks and their activities. In this paper, we highlight that bank diversification is beneficial for loan supply during crisis periods. Our results may help offset concerns that a higher interdependence among banks caused by asset diversification may lead to risk contagion and a rise in systemic risk (Ibragimov, Jaffee, and Walden, 2011; Wagner, 2011; Allen, Babus, and Carletti, 2012; Berger, El Ghoul, Guedhami, and Roman, 2017; Chu, Deng, and Xia, 2019).

Finally, our paper speaks to the broader question about the optimal boundaries of the firm. There is a large literature that considers the benefits and costs of firms diversifying across business activities. On the positive side, diversification may increase firm access to better productive opportunities (Gomes and Livdan, 2004) or bring more effective monitoring by the capital provider and better asset deployment (Gertner, Scharfstein, and Stein, 1994; Stein, 1997). On the negative side, it may reduce entrepreneurial incentives and firm frictions may lead to cross-subsidization, divisional rent-seeking, or other agency conflicts that result in inefficient resource allocation (Jensen, 1986; Lamont, 1997; Shin and Stulz, 1998; Scharfstein and Stein, 2000). In

our case, we show diversification can benefit the core business of banks rather than distract from it. These benefits spill over to the broader economy through the positive real effects from increased lending.

The remainder of the paper is organized as follows. In Section I, we discuss the sources of data, our measures of diversification, and other variables used in the analysis. Section II investigates the relation between geographic diversification and lending over the business cycle. In Section III, we analyze the role of geographic diversification on lending during the financial crisis. Section IV uses exogenous shocks to geographic diversification to better understand the effects of diversification on bank lending. Section V discusses the effects of business line diversification in general and during the financial crisis. Section VI considers an exogenous shock to insurance diversification. Section VII concludes.

I Data

For our analysis, we bring together a few sources of data. The majority of our bank-level variables are from the Federal Reserve's quarterly Y-9C (consolidated bank holding company data) reports.[2] For our small business lending data, we use the Federal Financial Institutions Examination Council's (FFIEC) Community Reinvestment Act (CRA) small business lending data. We match and aggregate the small business lending data to the BHC parent level. We also collect the quarterly organizational structure of all the BHCs in our sample. Available from the FFIEC's National Information Center (NIC), the data provides the complete subsidiary structure of each bank, including the institution names, Federal Reserve identifiers (RSSD IDs), location, and a categorization of each institution type.[3] For bank deposit data, we use the FDIC's

[2]Throughout our paper, we consider banks at a bank holding company (BHC) level. We often refer to BHCs as banks for simplicity. This includes financial holding companies (FHCs), which are a classification of BHCs that engage in a broad range of financial activities. Most large BHCs are registered as FHCs (Avraham, Selvaggi, and Vickery, 2012).

[3]The NIC data is generated from FR Y-6 *Annual Report of Bank Holding Companies* and FR Y-10 *Report of Changes in Organizational Structure*. See Avraham, Selvaggi, and Vickery (2012) for an overview of BHC organizational structures and other regulatory details.

Summary of Deposits data, aggregated to the BHC level. For additional county-level economic data, such as employment, we use the data provided by the U.S. Bureau of Economic Analysis.

Our data sample runs from 1997 until 2017.[4] We conduct our aggregate BHC-level lending analysis on a quarterly level. As the small business lending data is annual, the small business lending analysis is at an annual level.

I.A Measures of diversification

We measure diversification among two dimensions in this paper. For geographic diversification, we consider the number of states where the bank operates. Using the CRA data, we define *No. of States, Loans* as the number of states that a bank reports some small business lending activity in a given year.[5] Separately, we also count the number of states where banks report deposit activity (*No. of States, Deposits*). Interestingly, we find the majority of banks have larger lending than deposit footprints. The median bank in our sample lends in three times as many states as it reports deposits. This difference suggests that banks can have quite different geographic diversification when it comes to their assets and liabilities, and controlling for both types of diversification separately may be important.

The top panel of Figure 1 presents the change in geographic diversification over time. While in 1997 the banks conducted small business lending across 7.7 states, in 2017 it increased to 14.5 states. Following the 2008 crisis, there was a moderate decrease in the expansion to new states, but it continued the pre-crisis trend in 2011.

For business line diversification, we consider both the amount of non-interest income as a general measure of non-lending diversification (Brunnermeier, Dong, and Palia, 2020) and separate measures of activities. We consider five distinct lines of activity: insurance, securities broker-dealer, trust and fiduciary services, securitization, and trading. For most of these

[4]Small business lending data is available starting in 1996 and as we rely on lagged lending activity for some of our measures, we begin analysis in 1997.

[5]The measure counts each distinct state FIPS code, which includes Washington D.C. and U.S. territories such as Puerto Rico. Limiting our analysis to the fifty states does not change our results.

lines, we identify the presence of these activities by identifying pertinent domestic subsidiaries from the NIC BHC organizational data. Appendix A details the exact procedure for classifying business-line-related subsidiaries. For trading activity, as we use the fraction of trading income to assets as we are not able to cleanly identify subsidiaries associated with trading.

The bottom Panel of Figure 1 presents the change in business segment diversification over time as measured by the presence of subsidiaries. Insurance activity is the most common of the activities. In 2017, 49% of banks have at least one domestic insurance subsidiary. It has also grown the most over our sample. The other business lines have remained relatively similar over the time period. In 2017, about 17% of banks have a securities broker-dealer subsidiary, 10% have non-deposit trust subsidiaries that engage in fiduciary activities, and 5% have subsidiaries linked to securitization. Over the full sample, 79% of banks report some trading activity, as measured by non-zero trading income.

I.B Other bank variables

We consider three categories of lending at the BHC level: total loans, real estate loans, and C&I loans. We use the reported values of the loan types from the quarterly BHC balance sheet data. For small business loans (SBL), this is the total volume originated by a bank in a year. Small-business loans are those loans whose original amounts are $1 million or less and fall into either the "Loans secured by nonfarm or nonresidential real estate" or "Commercial and industrial loans" categories on a bank's balance sheet. All banks over a certain threshold of total assets are required to report this data.[6] Importantly for our purposes, this small business lending data is reported at a county-level, which allows us to more robustly control for economic conditions in the specific area.

Apart from lending data, we include other common bank-level variables such as the natural

[6]The threshold is $250 million for the earlier part of our sample (1996-2006). Starting in 2007, the FFIEC began annual updates of the asset threshold level required for reporting. For 2007, the asset threshold was increased to $1.033 billion. By 2017, the threshold reached $1.226 billion. See `https://www.ffiec.gov/cra/reporter.htm` for the yearly thresholds.

logarithm of total assets (*Log Assets*), *Equity to Assets*, and *Deposits to Assets*. As a measure of bank profitability, we calculate the bank's average ROA over the past three years (*Average ROA*) and the bank's *Z-Score* as a measure of the total risk of the bank. For some analysis, we include the bank's three-year growth in loans (*Loan Growth*) and its fraction of originated SBL (at a BHC level) to its total balance sheet loans at the end of the year (*SBL to Loans*). The summary statistics for these variables are reported in Table I.

I.C County variables

Apart from bank-level variables, we include a few county-level variables as well. Specifically, we aggregate all the SBL in a given county and year to measure the aggregate amount of small business lending. To investigate the impact of small business lending on the county economy, we use a measure of small business employment. Specifically, we use the total full-time and part-time employment for nonfarm proprietors. The BEA estimates this employment data using IRS data from tax return forms primarily submitted by small businesses.

When we consider the effects of diversification at a county-level, we need aggregate versions of our diversification measures and other control variables. To accomplish this, we create county-level weighted-averages of our main variables. For weights, we use each bank's reported SBL amount in a county from a prior period, depending on the particular analysis. For the financial crisis, we use the SBL amounts at the end of 2006. For the analysis of the shocks to geographic or business-line diversification, we use the SBL amount in the year prior to the shock.[7] We use past SBLs for aggregate weights, as opposed to deposits, because of the evidence that many banks report small business loans in states where they do not report collecting deposits.

[7] See Sections IV and VI for more details on the specific shocks used in the analysis.

II Diversification and bank lending over the business cycle

Our analysis begins with the effect of a bank's diversification on its lending levels and lending sensitivity to aggregate business cycle conditions. We use the following specification:

$$\begin{aligned}\text{Loans to Assets}_{it} =& \beta_1 \text{Log No. States, Loans}_{it-1} + \beta_2 \text{Log No. States, Loans}_{it-1} \times \text{Log GDP}_{t-1} \\ &+ \beta_3 \text{Bank Controls}_{it-1} + \alpha_i + \gamma_t + \varepsilon_{it}, \end{aligned} \tag{1}$$

where *Loans to Assets* is calculated as bank i's total loans scaled by its total assets in quarter t. We capture variation in business cycle conditions using *Log GDP*, measured as the log of the quarterly national real gross domestic product (in billions of chained 2012 dollars, seasonally adjusted). Our measure for a bank's geographic diversification is *Log No. States, Loans*, estimated as the log of the number of states with reported small business lending activity. The interaction term *Log No. States, Loans* $\times$ *Log GDP* captures whether diversification affects lending sensitivity to aggregate business cycle conditions. As asset diversification is related to other bank characteristics, we include some additional control variables. To capture deposit diversification, we include *Log No. States, Deposits*, calculated as the log of the number of states with reported bank deposits. We also include the log of the bank's total assets (*Log Assets*), the bank's *Z-Score* (the bank's ROA plus its equity ratio divided by its standard deviation of ROA), the bank's average quarterly ROA over the past three years (*Average ROA*), the bank's equity to assets ratio (*Equity to Assets*), and the bank's deposits to assets ratio (*Deposits to Assets*). We include bank fixed effects to account for any time-invariant bank characteristics and year-quarter fixed effects to control for macroeconomic factors that influence all banks in a given quarter. Standard errors are clustered by bank and the sample period is between 1997-2017.

Columns 1-4 in Table II present the results. Across all specifications, diversification is associated with higher bank lending activity. The coefficient estimate of *Log No. States, Loans* is significantly positive, indicating that for a given bank, geographic diversification enhances

credit supply. The magnitude of this result is meaningful. A one standard deviation increase in the log number of states (0.838) increases the bank's quarterly loans to assets by 1.9% (using Column 4). This result is found while controlling separately for the bank's size, risk, deposit diversification and other pertinent bank characteristics.

Not only do more diversified banks increase lending, but their credit supply is also more resilient to aggregate business cycle shocks. The coefficient of the interaction term *Log No. States, Loans* $\times$ *Log GDP* is negative and statistically significant. For a one standard deviation decrease in log GDP (.13), banks with one standard deviation higher geographic diversification maintain more of their credit supply (scaled by assets) by 1.1%.

As banks expand into new activities and markets, the correlation between their various earnings streams decreases. This leads to increased lending and a more resilient credit supply. The results show that asset diversification has a meaningful effect on the bank's credit supply separate from other bank characteristics. Differences in bank size, risk, profitability, or the geographic diversification of deposit funding cannot explain the effect of asset diversification.

As robustness checks for our geographic diversification measure, we rerun the analysis with two alternative measures, *Log No. Counties, Loans* and *Geographic Share, Loans*. *Log No. Counties, Loans* is the log of the number of counties where a bank reports small business lending. *Geographic Share, Loans* is evaluated as one minus the Herfindahl index of a bank's lending across states. This measure captures the relative concentration of a bank's lending. Appendix Table A.2 presents the results, which mirror the results in Table II. The coefficients for *Log No. Counties, Loans* and *Geographic Share, Loans* are both significantly positive, while the interaction terms with *Log GDP* are negative and statistically significant for both measures.

Next, we verify that our results hold across a wide range of banks by splitting them into subsamples by size, geographic diversification, capital ratios, and risk. One may claim that each of those characteristics could be the source for our results. For example, banks with higher capital ratios might have more resources and ability to diversify, thus the effect that we observe is concentrated only among those banks. Alternatively, lack of capital might drive banks to

diversify to take advantage of the higher earnings stability obtained by higher diversification. Hence, for each characteristic we perform the specification in Equation (1), splitting banks into groups by the median value of the distribution. Table A.3 in the Appendix presents the results. We find across all subsamples, more diversified banks lend more and are less sensitive to changes in the business cycle. Section IV presents an in-depth endogeneity analysis using regulatory changes as exogenous shocks to bank diversification.

As higher geographic diversification is associated with more lending and less sensitivity to changes in macroeconomic conditions, we demonstrate the benefits of asset diversification on bank resiliency. To this end, we explore how geographic expansion affects the stability of the bank's credit risk and its total earnings over the business cycle. We perform the following specification:

$$\mathrm{Y}_{it} = \beta_1 \text{Log No. States, Loans}_{it-1} + \beta_2 \text{Bank Controls}_{it-1} + \alpha_i + \gamma_t + \varepsilon_{it}, \tag{2}$$

where Y_{it} includes different measures of lending volatility, specifically the volatility of non-performing loans, loan loss reserves, interest income, and ROA. The variables are calculated using the four quarters from time t to $t+3$ and converted to an annualized percent.

Column 1 of Table III present the results for the one-year volatility of non-performing loans. Non-performing loans include loans with payments more than 90 days past due and nonaccrual loans scaled by total loans. We find that geographic diversification has a negative coefficient, meaning that more diversified banks exhibit more stable risk in their loan portfolios over the business cycle. A one standard deviation increase in the log number of states (.838) is associated with a .15% decrease in the volatility of non-performing loans. This change equates to above 11% of the sample average for NPL volatility.

More diversified banks are also associated with lower levels of one-year volatility of the bank's loan loss provisions (Column 2). This expense, set aside as an allowance for future uncollected loans and loan payments, represents the bank's forecast of future losses. Therefore,

not only do the more diversified banks exhibit less volatile credit risk by gaining exposure to borrowers that are imperfectly correlated, but their own forward-looking estimation of credit losses is more stable as well.

Finally, Columns 3 and 4 present the effect of asset diversification on the one-year volatility of interest income (scaled by loans) and ROA, respectively.[8] Consistent with the findings above, we find that more diversified banks exhibit more stable interest income and total earnings. The more diversified pool of loans enables banks to better absorb negative shocks, and these banks maintain higher lending levels that vary less over the business cycle.

III Diversification and lending during the financial crisis

III.A Bank-level lending behavior

In this section, we analyze how diversification affected banks' lending behavior during the 2008 financial crisis. Our reason for considering this period is two-fold. First, it serves as an unanticipated shock to the banking system, which led to a large disruption in lending. This shock enables us to better understand how differences in diversification leading up to the crisis affected banks' response to the crisis. Second, how bank structure affects lending during a crisis period is inherently important, as lending is a key factor for economic recovery (e.g., Kang and Stulz, 2000; Paravisini, 2008).

To analyze the impact of diversification in a time of crisis, we estimate different versions of the following specification:

$$\begin{aligned} Y_{it} =& \beta_1 \text{High Geographic Diversification}_{i,\text{Pre-Crisis}} \times \text{Post-Crisis}_t \\ &+ \beta_2 \text{Bank Controls}_{i,\text{Pre-Crisis}} \times \text{Post-Crisis}_t + \alpha_i + \gamma_t + \varepsilon_{it}. \end{aligned} \tag{3}$$

[8] For the ROA specification (Column 4), we do not include the lagged average ROA and Z-Score as control variables, as their construction overlaps with the dependent variable. However, we find similar results if we include these control variables.

Here Y_{it} represents different lending variables for bank i in quarter t scaled by the pre-crisis level of the bank's assets: total lending, real estate loans and C&I loans. *Post-Crisis* is an indicator variable for the crisis period, which begins in 2008Q1. For *High Geographic Diversification*, we divide the sample into quartiles based on the number of states in which each bank operated in 2007Q4. *High Geographic Diversification* equals one for the banks in the top quartile (thirteen or more states) and zero for banks in the bottom quartile (three or fewer states). To clearly identify the effect of diversification, we exclude the middle two quartiles from the analysis. In unreported results, we find similar effects if we use *Log No. States, Lending* as a continuous measure of geographic diversification and include all the banks in the sample. In addition to our main diversification measure, *Bank Controls* include other bank characteristics that likely relate to lending activity, such as *Log No. States, Deposits*, *Log Assets*, *Z-Score*, *Average ROA*, *Equity to Assets*, and *Deposits to Assets*.

Here, we fix our control variables at their 2007Q4 values and interact each control variable with the *Post-Crisis* indicator for two reasons. First, as the crisis also affects many of the other bank controls, we seek to avoid changes in those variables affecting our outcomes of interest (i.e., the "bad controls" problem as discussed in Angrist and Pischke, 2009). Second, by interacting these variables with the crisis indicator, we control for a host of alternative channels that are correlated with but not the exact diversification mechanism in which we are interested. For example, more diversified banks tend to be larger and more profitable. It could be that a bank's pre-crisis size or profitability has an effect on its crisis lending separate from its diversification. In all specifications, we include bank fixed effects (α_i), time fixed effects (γ_t), and cluster standard errors by bank. We focus on a time window around the crisis, from 2005Q1 through 2010Q4.

Table IV presents the results. In Columns 1-2, we consider banks' total loans, in Columns 3-4 real estate loans, and Columns 5-6 C&I loans. In all columns, the outcome variables are scaled by the pre-crisis level of the bank's assets. For similar reasons as for our other control variables, we use the bank's total assets as of 2007Q4 as our scaling factor.

In general, we find positive coefficients for the interaction term *High Geographic Diversification* × *Post-Crisis*, meaning that more diversified banks maintain their lending during the crisis relative to less diversified banks. For total lending, the most geographically diversified banks have 4.6% higher lending in the crisis and post-crisis period than the least geographically diversified banks (Column 1).[9] In Column 2, we include other pre-crisis variables interacted with the *Post-Crisis* indicator. We find a similar effect for diversification with slightly higher magnitude. The diversification measure is not simply picking up differences in size, risk, or other characteristics that correlate with diversification but could presumably have unique impacts on lending during the crisis. As a prior literature finds that bank diversification also has implications for the funding of banks (Levine, Lin, and Xie, 2020; Doerr and Schaz, 2021), in Column 2, we separately control for the geographic breadth of funding sources (*Log No. States, Deposits*). We do not find a meaningful effect of funding diversification on lending in our setting.[10]

We find meaningful economic effects if we focus on real estate loans (Columns 3 and 4) or C&I loans (Columns 5 and 6), with similar economic magnitudes for both types of loans. Overall, diversification is associated with more robust lending during and immediately following the crisis. These results appear related to a bank having more diversified lending and are not explained by differences in other bank characteristics.

In times of crisis, there are spikes in uncertainty and counterparty risk. More diversified banks maintain higher levels of lending during such times, relative to more concentrated banks. If banks systematic risk exposure increases with diversification, this could potentially counteract this effect. In Appendix B, we consider this possibility. We find that any negative effect from increased systematic risk is outweighed by the bank's reduction in idiosyncratic risk during the financial crisis.

[9] Since the specification includes bank and time fixed effects, the standalone coefficients for *Post-Crisis*, *High Geographic Diversification*, and the other fixed bank control variables are absorbed.

[10] In unreported results, we also do not find funding diversification to have a significant effect if we exclude our *High Geographic Diversification* measure.

III.B Diversification, the financial crisis, and small business lending

In this section, we focus on small business loans. Small businesses are particularly reliant on bank credit and are important for the overall economy. Further, small business lending has the additional benefit that it is available at a very granular county level, which allows for more robust control of loan demand. Specifically, we use the following specification:

$$\begin{aligned}\text{Log SBL}_{ict} =& \beta_1 \text{High Geographic Diversification}_{i,\text{Pre-Crisis}} \times \text{Post-Crisis}_t \\ &+ \beta_2 \text{Bank Controls}_{i,\text{Pre-Crisis}} \times \text{Post-Crisis}_t + \alpha_{ic} + \gamma_{ct} + \varepsilon_{ict}, \end{aligned} \tag{4}$$

where *Log SBL* represents the logarithm of small business loans originated by bank i in county c in year t. As the small business lending data is on an annual basis, we necessarily perform our analysis at that level. As before, the *Post-Crisis* indicator begins in 2008. As in Section III.A, *High Geographic Diversification* is an indicator variable that equals one for the banks in the top quartile according to the number of states in which they operated in 2007 and zero for banks in the bottom quartile. All the explanatory variables are as of the end of 2007. In addition to our prior control variables, we include the ratio of small business lending to total lending at the bank level (*SBL to Loans*) to account for differences in specialization in small business lending. We also include the past three-year loan growth at the bank level to account for differences in growth strategies (*Loan Growth*). We interact each of the control variables with our *Post-Crisis* indicator to allow these variables to have a distinct effect on small business lending.

Given the county-level data, we include bank-county fixed effects (α_{ic}) in all specifications. These fixed effects account for the time-invariant locality-specific characteristics of each bank. We also include either year fixed effects or county-year fixed effects (γ_{ct}). The county-year fixed effects control for time-varying county factors, such as local loan demand. In this case, the estimates can be interpreted as estimates for the supply of lending capital, separate from the demand for capital (Khwaja and Mian, 2008). Our time window runs from 2005 through 2010.

Columns 1-2 of Table V present the results. Similar to the bank-level loan results in Table IV, we find positive coefficients for the interaction of diversification and the *Post-Crisis* indicator. During the crisis, the more diversified banks maintain more small business lending than the less diversified banks. Further, we can rule out any arguments about differential demand shocks for loans or any differences in banks' specific locations thanks to the county-year fixed effects (Column 2). Indeed, the difference in magnitude is sizeable: the most diversified banks originate more than twice as many loans following the crisis as the least diversified banks in a given county and year. In Appendix Table A.4, we repeat the analysis in Table V but include two additional variables: the 2007 county-level SBL market HHI and an indicator for whether the bank engaged in a merger in 2007. While both variables affect small business lending, the economic importance of geographic diversification remains largely unchanged. Diversification enables banks to maintain a higher lending supply during crisis periods, even to riskier segments such as small business lending.

III.C Aggregate small business lending during the crisis

Small business lending is an interesting segment because of its spillover effects to the real economy (Neumark, Wall, and Zhang, 2011; Haltiwanger, Jarmin, and Miranda, 2013). While more diversified banks maintain more of their small business lending, it need not translate to an aggregate increase in lending. If this increase is coming entirely at the expense of the lending of the least diversified banks, total lending may not be meaningfully affected. To understand to what extent diversification affects total lending, we aggregate banks to a county level and compare lending dynamics across counties.

To analyze the effect of diversification among the banks that operate in a county on the

aggregate small business lending, we perform the following specification:

$$\begin{aligned}\text{Log SBL}_{ct} =& \beta_1 \text{County Geographic Diversification}_{c,\text{Pre-Crisis}} \times \text{Post-Crisis}_t \\ &+ \beta_2 \text{Bank Controls}_{c,\text{Pre-Crisis}} \times \text{Post-Crisis}_t \\ &+ \beta_3 \text{County Geographic Diversification}_{c,\text{Pre-Crisis}} \\ &+ \beta_4 \text{Bank Controls}_{c,\text{Pre-Crisis}} + \alpha_{LMA} + \gamma_t + \varepsilon_{ct}, \end{aligned} \tag{5}$$

where *Log SBL* represents the logarithm of the small business loans originated in county c in year t for the banks in our sample. As we are interested in understanding the overall effect, we include all banks in this aggregation and not just the most and least diversified groups. All the explanatory variables are calculated by weighting each bank by its small business loans in that county in 2007, the year prior to the onset of the crisis. *County Geographic Diversification* is the weighted average of the log number of states in which banks operate that report lending in county c. To provide a marginal effect interpretation, we scale *County Geographic Diversification* by its sample standard deviation. *Post-Crisis* is defined as in Equation (4). *Bank Controls* are fixed at their 2007 values, aggregated to the county level, and interacted with the *Post-Crisis* indicator. We include labor market area (LMA) fixed effects (α_{LMA}) and year or state-year fixed effects (γ_t). A LMA—defined by the BLS—is an economically-integrated area within which individuals can reside and find employment within a reasonable distance or can readily change jobs without changing their place of residence. We use LMA fixed effects to control for persistent differences in labor market areas that might affect county-level lending.[11] Standard errors are clustered by county.

Columns 3-4 of Table V present the results. We find a significant positive coefficient for *County Geographic Diversification*× *Post-Crisis*. For a one standard deviation increase in

[11] In unreported results, we instead use county-level fixed effects and find similar estimates to the ones presented here. However, as we are only considering six years of data for each county, using such a fixed effect removes the majority of the variation in county-level small business lending. We believe that LMA-level fixed effects remove the primary concern of variation in local economic conditions without an overly aggressive transformation of the data.

county diversification, aggregate lending increases by about 3.5% (Column 4). Similar to the bank-level regressions, we control for differences in bank size, profitability, and risk. Higher county diversification before the crisis is associated with higher aggregate lending during the crisis.

III.D Employment during the crisis

Having established that counties with more diversified banks exhibit higher lending during the crisis, we now turn to spillovers to the economy. Continued lending during turbulent periods is more necessary than in normal times, and especially for the small business sector.

We use the county-level specification from the previous section but focus on county-level small business related employment as our outcome variable. We scale the diversification variable by the sample standard deviations. Columns 5-6 of Table V present the results.

We observe that the more diversified banks in a county prior to the crisis, the higher the positive impact on local employment levels. The result remains consistent across our different sets of fixed effects. For a one standard deviation higher county-level diversification, there is 0.9% higher small business employment (Column 6). Comparing the estimates from Columns 4 and 6, this suggests that each percent increase in lending is associated with 0.25% higher employment. As banks with a more diversified stream of earnings can lend more freely to risky segments, we document positive real effects from this increase in lending.

IV Geographic diversification shock

In the previous section, we showed a positive effect of ex-ante diversification on lending during the financial crisis. However, such diversification may have been the outcome of other bank decisions, such as seeking to increase assets. Therefore, to better isolate the effects of the diversification decision from other bank choices, in this section we use a change in bank regulation

as an exogenous shock to diversification. We focus on this shock's impact on small business lending, as we are best able to control for potential confounding demand factors in this setting.

IV.A Institutional setting

The regulatory changes we utilize are driven by the Riegel-Neal Interstate Banking and Branching Efficiency Act of 1994 (IBBEA). The IBBEA removed any remaining federal interstate banking and branching barriers, but allowed individual states to decide on many of the specific rules for interstate branching. For branching, it provided five regulatory dimensions for states to control: (1) the minimum age of an in-state bank that can be acquired and merged into an out-of-state bank, (2) whether out-of-state banks are permitted to establish de novo branches, (3) whether out-of-state banks can acquire individual bank branches, (4) whether banks are subject to a statewide deposit cap, and (5) whether reciprocity conditions for (1)–(3) are required with the out-of-state bank's home state. The initial branching regulations each state chose went into effect by 1997. After the initial implementation of the IBBEA, states are free to change the five regulatory dimensions through legislative action. As small business lending data is only available from 1996 onward, we focus on 19 distinct state-level regulatory changes after the initial implementation—from 1998 through 2008—that loosen restrictions on interstate branching.[12] Table A.6 lists the specific changes.

While the IBBEA is not the only source of bank regulatory change, it is a significant and well-studied one.[13] Before the act, out-of-state branches where rare, but have become relatively common.[14] Related to small business lending, papers have considered the effect of the IBBEA

[12]The majority of these changes are identified in Johnson and Rice (2008). Included among these shocks is the decisions of Texas and Montana to opt into the IBBEA after initially opting out. As the sample used in Johnson and Rice (2008) ends in 2005, we identify two additional shocks: Alabama opted to allow de novo branching and individual branch acquisition (with reciprocity) in 2007 and New York opted to allow de novo branching (with reciprocity) in 2008.

[13]See Appendix C for a more comprehensive discussion of other regulatory changes and how they have been used in the banking literature.

[14]For example, Johnson and Rice (2008) report that only 62 out-of-state branches existed in 1994 but that the number grows to 24,728 or 37.28% of all domestic branches by 2005.

on small business credit (Rice and Strahan, 2010), small firms' total factor productivity (Krishnan, Nandy, and Puri, 2014), firm creation (Becker, 2007), and personal income insurance (Demyanyk, Ostergaard, and Sørensen, 2007). In these papers, the focus is on the changes in outcomes in the specific state experiencing the regulatory change.

Our focus, in contrast, is on the change in small business lending in states *unaffected* by the deregulation. From the asset diversification perspective, we argue that the increased bank assets in the deregulated state will lead the bank to adjust its assets in other regions. Specifically, increased lending in the deregulated allows the bank to expand lending in other states as well. For a given regulatory change, we group banks into two types: banks that have some lending activity in the deregulated state (the treatment group) and banks that do not (the control group). As the IBBEA changes are specific to out-of-state banks, we only include those banks that are not headquarted in the deregulated state in in the treatment group. We perform a difference-in-differences specification in which we observe the response of small business lending for the two groups in a common set of unaffected states. We observe the SBL data for each bank at a county level, which allows us to control for local changes in loan demand and other time-varying local effects via county-year fixed effects.

As we use 19 different shocks between 1998 and 2008 across 15 states, we do not believe the identified effect is driven by a particular regional or macroeconomic factor. Figure 2 shows the average small business lending for treated and control banks in counties outside of the deregulated states for the 19 different shocks. Time zero represents the regulatory change year for each of the 19 shocks, the time when obstacles to bank operation in the particular state were removed. The figure shows that for the three years prior to the deregulation, the treated and the control groups had a similar small business lending trend in the unaffected states. At time zero, the lending of the treated banks increases significantly in the unaffected states, which persists over the following three years.

IV.B The diversification shock and small business lending

In this section, we use the setting above to investigate the causal impact of changes in diversification. We perform the following difference-in-differences specification to establish the relationship between diversification and small business lending:

$$Y_{icth} = \beta_1 \text{Treat}_i \times \text{Post}_{th} + \beta_2 \text{Bank Controls}_i \times \text{Post}_{th} + \alpha_{ich} + \gamma_{cth} + \varepsilon_{icth}, \quad (6)$$

where Y_{icth} represents the logarithm of small business lending for bank i in year t in county c in cohort h. Each cohort relates to one of the 19 shocks. Therefore, each cohort-sample only includes counties outside of the cohort-specific deregulated state. The cohort approach for difference-in-differences allows us to identify a common treatment effect over multiple treatment events while controlling for many potentially confounding factors with cohort-bank-county (α_{ich}) or cohort-county-year fixed effects (γ_{cht}) (Gormley and Matsa, 2011). *Treat* is a dummy variable equal to one for banks that operated in the deregulated state before its regulatory change and zero if the bank had no presence in that state during the sample period. *Post* is an indicator variable that equals one in the diversification-shock year or the following two years, and zero for the three years before the shock. All the control variables are the same as in the specification in Equation (4), fixed at the year before the shock and interacted with *Post*.[15] Standard errors are clustered by bank.

Table VI presents the results. In Column 1, we find a significant positive coefficient for *Treat*×*Post*. The magnitude of the effect remains statistically significant and economically meaningful even when allowing the shock to influence small business lending through other channels, such as bank size or bank specialization in small business lending (Column 2). Banks that were exposed to the deregulatory shock increased their small business lending by 13.6% relative to control banks (Column 2). In Columns 3 and 4, we include both bank-county and county-year fixed effects. We use this set of fixed effects to absorb any local changes in the

[15] Due to the fixed effects used in all specifications, the standalone *Post*, *Treat*, and *Bank Controls* are absorbed.

demand for small business loans and other local economic factors. The results remain consistent, confirming that the observed effects are the consequence of banks increasing their lending supply and not differential loan demand.

Our analysis above considers a bank's change in lending in all states that do not experience a deregulatory shock. However, one potential concern is regarding neighboring states. As the correlation with the existing pool of loans can be higher in these states relative to more distant ones, banks may not consider the shock as diversifying for their loan portfolios. While the inclusion of county-year fixed effects addresses any local economic conditions, as a further robustness check, we exclude from the analysis any states that border the state that experiences the deregulatory shock. Appendix Table A.7 Panel A shows that our results remain similar to Table VI.

In Equation (6), we organize banks into cohorts for each distinct regulatory shock, which allows us to focus on specific time windows around each shock. For each cohort, we include rigorous fixed effects—bank-county by cohort and county-year by cohort—to avoid any influence of potentially overlapping shocks on the estimate of the treatment effect. However, as an alternative approach, in Appendix Table A.7 Panel B, we implement the difference-in-differences estimator proposed by Callaway and Sant'Anna (2021). We find similar results to Table VI.

IV.C County-level effects of geographic deregulation

We next analyze the effect of diversification on aggregate small business lending in each county. The fact that some banks diversify and increase their supply of lending does not necessarily mean that on aggregate, an increase in small business lending occurs. Rather, it is possible that non-diversified banks lose market share to the diversified ones and at the aggregate county level, total lending remains unchanged.

To this end, we perform the following specification to establish the relationship between the

level of diversification of the banks in a county and the aggregate county small business lending:

$$Y_{cth} = \beta_1 \text{County-Level Treat}_{ch} \times \text{Post}_{th} + \beta_2 \text{Bank Controls}_{ch} \times \text{Post}_{th} + \beta_3 \text{County-Level Treat}_{ch} + \beta_4 \text{Bank Controls}_{ch} + \alpha_{LMAh} + \gamma_{th} + \varepsilon_{cth}, \quad (7)$$

where Y_{cth} represents either the logarithm of annual small business lending or the logarithm of the small-business-related employment, aggregated to county c in year t for cohort h. County-level aggregation is achieved by weighting each bank by its small business loans in that county in the year prior to the shock. The outcome variable includes only counties outside of the deregulated state in each cohort, similar to the approach in Section IV.B. *Post* is an indicator variable that equals one for the diversification-shock year and the years following and zero for the pre-shock period. *County-Level Treat* and the other bank control variables are the same as in Equation (6) but are aggregated to the county level. The values are from the year prior to the diversification shock. To make the *County-Level Treat* variable more interpretable, we scale it by its sample standard deviation. The coefficients are therefore interpreted as for a one standard deviation increase in the percentage of treated banks in a county. The specifications include LMA-cohort fixed effects (α_{LMAh}) and cohort-year or cohort-state-year fixed effects (γ_{th}).[16]

Table VII presents the results. In Columns 1 and 2, we find a significant positive coefficient of the interaction *County-Level Treat*×*Post*. Following the deregulation, for a one standard deviation increase in county diversification, aggregate lending increases by about 8.8% relative to the control group (using the estimates from Column 2). Since not all banks in a county are treated by the shocks and not all banks have substantial small business loan volume, these magnitudes are meaningful. The rise in lending among the diversified banks is not driven only by a reduction in the loan supply of the less-diversified banks.

Having established the positive impact of diversification on small business lending at the county level, we now show that the rise in lending has a positive real effect on the economy.

[16] In these specifications, the *Post* variable is absorbed.

Increased lending should enable small businesses to start and expand their operations and create jobs that support economic activity. To this end, we use the same county-level specification but focus on small business related employment as our outcome variable. Columns 3 and 4 of Table VII present the results.

We find a positive coefficient for the *County-Level Treat*×*Post* term, indicating that geographic diversification enhances county-level employment. The result remains consistent for both cohort-year and cohort-state-year fixed effects. For a one standard deviation increase in county-level diversification, there is a 2.9% increase in employment (Column 4). The more banks in a county that are exposed to the diversification shock, the higher the positive impact on local employment levels. As banks with a more diversified stream of earnings can lend more freely to risky segments, we document positive real effects from this increase in lending.

V Additional dimensions of diversification

In the previous sections, we establish a positive impact of bank asset diversification on bank lending and its lending resilience, both across time and in the crisis. We use the geographic breadth of lending as our measure of the bank's diversification. However, asset diversification can be also achieved by operating across a variety of business segments, beyond lending. The imperfect correlation between those activities and the core business of lending may also enable banks to achieve the benefits of diversification.

For our research question, it is also interesting to analyze the influence of non-interest activities, as it shows the degree of the bank's focus away from its core business of lending. While geographic diversification in lending increases the bank's core business, business line diversification does the opposite. Different types of business line activities may affect banks in different ways, and have a negative impact on the banking system (e.g., Brunnermeier, Dong, and Palia, 2020). Thus, in this case, we do not expect ex-ante to find similar results.

To estimate the bank's presence in non-interest activities, we use the establishment or ac-

quisition of relevant subsidiaries. This methodology is preferable over observing the share of income of different activities, as it enables us to better observe the full impact of diversification, as an increase of 1% in the share of non-interest income is not necessarily associated with a rise in diversification. Hence, similarly to our measure of geographic diversification based on presence in different states, we argue that the fact that the bank has made distinct organizational investments in different activities is a better estimate of diversification.

Analyzing the banks' non-interest subsidiaries based on their holding structures, we group them into four main business segments: insurance activities; security broker-dealer and investment banking; securitization; and non-deposit trust subsidiaries, such as fiduciaries. However, after studying the full extent of banks' non-interest activity from the income statements in the Y-9C reports, we identify a fifth category—trading activity—which is not conducted under distinct subsidiaries that can be distinguished separately. Thus, for this group we rely on income data.

To study the effect of non-interest income activities on the bank's total lending and lending resiliency both for the time-series and around the 2008 crisis, we first use the total non-interest income (out of the bank's assets), and then we perform a separate analysis for each of the five groups.

V.A Time series analysis

For the time-series analysis, we perform the specification in Equation (1), changing the main explanatory variable of diversification to the non-interest income of the last four quarters scaled by assets. Then, we change the diversification estimate to a dummy variables that represent whether the bank established or acquired one of the first four subsidiaries groups, and whether the bank reports trading income in a given quarter. We also interact each diversification measure with *Log GDP*, to observe lending resiliency over the business cycle. Table VIII presents the results.

For all the diversification measures, we observe similar results to our geographic diversification measure (see Column 4 of Table II). In general, we find a positive effect of diversification on lending, and the effect is statistically significant for the total non-interest income measure, insurance, non-deposit trust activity, and trading. Further, the resiliency over the business cycle is consistently higher and statistically significant with any type of increase in non-lending activity. As those activities enable banks to gain exposure to income sources that are imperfectly correlated with their core activity of lending, credit supply becomes more resilient to negative systematic shocks and banks maintain more stable lending over time.

The magnitudes of the results are significant. For example, for the insurance measure, we find that a one standard deviation change in log number of subsidiaries is associated with a 0.8% increase in loans to assets. For a one standard deviation decrease in log GDP, banks with one standard deviation more insurance subsidiaries maintain more of their credit supply (scaled by assets) by 0.5%.

V.B Financial crisis analysis

Next, we analyze the effect of business line diversification during the 2008 financial crisis. Therefore, we perform the specification in Equation (3), changing the diversification variable as conducted in the time-series analysis above. Panel A of Table IX presents the results.

Observing the interaction terms of each estimate with the *Post-Crisis* variable, we find mixed results. The aggregate non-interest income measure has a negative, but statistically insignificant effect on lending, meaning that banks with higher non-income income maintained less credit supply in the crisis. Decomposing the effect into the five groups, we find a positive effect in insurance, while a typically statistically insignificant effect for the rest of the group activities. For trading, the negative effect is statistically significant.

These results are not surprising given the nature of the crisis, which caused high losses in trading and securitization lines. Diversification into activities that suffer a big shock do not

enable banks to achieve a more stable stream of earnings. This in turn leads them to contract credit supply relative to banks that had less exposure to those negatively affected activities.

However, having an established insurance subsidiary before the crisis is associated with about 3.25% more lending during the crisis, compared to other banks. This result is similar to the geographical diversification presented in Column 2 of Table IV. The result is robust to allowing for other prominent bank characteristics to explain the change in lending behavior during the crisis period. Panel B of Table IX shows similar effects for real estate and C&I lending. Although geographic diversification and insurance underwriting are different in nature, both types of diversification reduce the correlation of banks' cash flows and enable banks to maintain lending both over time and during the crisis.

The results above provide the first evidence that insurance activities provide similar asset diversification benefits for banks as geographic diversification. This is consistent with previous literature that shows theoretically that insurance activities reduce the earnings volatility of banks (Boyd, Graham, and Hewitt, 1993; Lown, Osler, Sufi, and Strahan, 2000). However, the full extent of the effects of insurance in the banking system are relatively underexplored. Hence, in the next sections, we perform a similar analysis for insurance as the one conducted for the geographical diversification. First, we further explore the impact of insurance activity on different types of lending during the crisis, and show the positive spillover on employment. As bank lending is especially central during crisis period, the fact that banks operating across more business lines maintain more stable credit supply benefits the economy when most needed. Then, to establish a causal effect of business line diversification through insurance on lending, we exploit the Financial Services Modernization Act of 1999 as an exogenous shock to business line diversification of banks.

V.C The effect of diversifying into insurance on lending during the crisis

Given the evidence that insurance diversification led to higher credit supply during the financial crisis, we now extend our analysis to small business loans. Running specifications similar to Equations (4) and (5), Table X present the results.

First, we consider the effect of having an insurance subsidiary at the bank-county level. In this framework, our diversification variable, *Insurance Subsidiary*, takes a value of one if a bank has at least one domestic insurance subsidiary as of 2007. The remaining banks have a value of zero. Similar to our geographic diversification analysis in Section III.B, we fix the explanatory variables as of the end of 2007 and interact them with a post-crisis indicator that includes 2008-2010. The analysis includes bank-county fixed effects and either year or county-year fixed effects.

In Column 1 of Table X, we find that banks with at least one insurance subsidiary maintain about 36% higher small business lending than banks without a subsidiary in the financial crisis period. This effect is while controlling for the bank's size, risk, profitability, small business lending specialization, equity ratios, and deposit ratios. One can therefore interpret the results as allowing for the size and other salient characteristics of the bank to have independent effects on small business lending, as they are independently interacted with the post-crisis indicator. Column 2 runs a similar specification but instead uses county-year fixed effects. In this case, the result has the interpretation of in a given county and year, banks with an insurance subsidiary maintain 35% higher small business lending than otherwise similar banks without a subsidiary. It appears that in the case of the financial crisis, having diversified into insurance allowed banks to maintain higher lending levels.

Next, we consider whether the results aggregate to the overall economy. Specifically, using the amounts of small business lending in the year before the crisis as weights, we aggregate the *Insurance Subsidiary* variable to a county level equivalent, *County Insurance Diversification*. This variable is scaled by its sample standard deviation to provide a marginal effect interpreta-

tion. In Column 3, we find a one standard deviation increase in county insurance diversification is associated with 3.7% more small business lending at a county level. We find similar results if we use state-year rather than year fixed effects (Column 4). In both cases, the estimates are significant at the 1% level. It appears that higher insurance diversification leads to a larger credit supply to small businesses during the crisis.

Finally, in Columns 5-6 of Table X, we consider whether this increased lending affects employment related to small businesses. Here, we find that a one standard deviation higher county-level insurance diversification leads to a statistically significant higher small business employment level of 0.3 to 0.5%, depending on the specification. This implies an elasticity of about 0.15% higher employment for each 1% increase in aggregate small business lending. This estimate is not too dissimilar from the elasticity of 0.25% we estimated in the case of geographic diversification in Section III.D. While the exact magnitudes of the aggregate geographic and insurance diversification effects differ somewhat, it is reassuring that they imply similar relationships between small business lending and employment.

VI Shock to business line diversification

To better isolate the effects of the business line diversification decision from other bank choices, in this section we use changes in bank regulation as an exogenous shock to the establishment or acquisition of an insurance subsidiary. As with geographical diversification, we focus on this shock's impact on small business lending, as we are best able to control for potential confounding demand factors in this setting.

We exploit the Gramm–Leach–Bliley Act of 1999 (a.k.a. the Financial Services Modernization Act) as an exogenous shock to the business segment diversification of banks, as it eliminated restrictions on commercial banks entering into new business activities. Our focus is on banks undertaking insurance underwriting.

VI.A Institutional setting

The Gramm-Leach-Bliley Act (GLBA), passed in November 1999, allowed financial institutions to integrate their operations, invest in each other's businesses, and eliminated restrictions on entering into new business types. These changes applied to commercial banks, insurance companies, and securities firms.

Prior literature that studies GLBA (e.g., Allen, Jagtiani, and Moser, 2001; Geyfman and Yeager, 2009; Filson and Olfati, 2014) or earlier regulatory changes related to Section 20 subsidiaries (e.g., Bhargava and Fraser, 1998; Cornett, Ors, and Tehranian, 2002; Neuhann and Saidi, 2018), typically focus on the effects of diversification on bank performance or risk.[17] However, our focus is on banks' entrance into insurance underwriting.[18] This aspect of GLBA is less explored in the literature, but it is useful in the context of business segment diversification. Insurance activity creates earnings diversification for the bank, as different factors drive the stream of earnings in insurance services versus commercial lending. This combination is anticipated to reduce the earnings volatility of the bank (Boyd, Graham, and Hewitt, 1993; Lown, Osler, Sufi, and Strahan, 2000). Further, the risk associated with a traditional insurance portfolio is typically low. The expansion into insurance activities by banks is also quite common: in our sample, 49% of banks have domestic insurance subsidiaries by 2017. This statistic implies that insurance subsidiaries are present in many small and medium-sized BHCs in addition to the largest ones.

[17] An exception is Neuhann and Saidi (2018), who find that the relaxation of revenue limitations on Section 20 subsidiaries, which perform investment banking activities, lead to increased lending and higher productivity for risky firms. They argue the channel is information related as the commercial and investment banking operations could increasingly share firm-relevant information.

[18] Throughout the 1990s, banks were increasingly able to engage in some insurance activities in the role of an agent. However, insurance underwriting was generally disallowed until the passage of GLBA. For example, a precondition of the Federal Reserve's approval of the Citicorp and Travelers Group merger in 1998 was that Traveler's insurance underwriting business be divested, although with a two-year divestiture period that was mooted by GLBA. See Broome and Markham (2000) and Sinder (2001) for more background on the regulatory and legal background of insurance and banking before and after the passage of GLBA.

VI.B Bank diversification and small business lending

We perform a difference-in-differences specification in which we observe the response of banks' supply of small business lending. The treated banks increased their business line diversification by acquiring or establishing a new domestic insurance subsidiary from 2000 to 2002.[19] From 2000 through 2002, 137 banks acquire an insurance subsidiary. For the analysis, we treat each acquisition year as a separate cohort (so there are three cohorts). This approach allows us to generate an appropriate control group for each cohort of treated banks. Control banks are those banks that do not acquire or establish their first domestic insurance subsidiary until after the end of the cohort's sample period. Our identifying assumption is that the only reason these banks would change small business lending is through the diversifying effect of adding insurance activities into the bank's organizational structure. As the decision to acquire an insurer is endogenous and may correlate with other bank characteristics, we note that the control group banks also acquire insurance subsidiaries. However, these banks have not yet acquired an insurance subsidiary during the period we investigate. We also control for the bank's recent loan growth, size, share of small business lending, and other bank characteristics.[20] The specifications include year or county-year fixed effects to control for any time specific factors that might influence banks to diversify into insurance activities. The sample period runs three years before each cohort's acquisition year, the acquisition year, and two years after.

Figure 3 shows the average small business lending for treatment and control banks for three following the acquisition year compared to the three years prior. While before the insurance subsidiary acquisition, the treated and the control groups have similar small business lending trends, a significant increase in lending for treated banks occurs in the acquisition year and one year after. The differences persist in future years.

For the main analysis, we perform a specification similar to Equation (6). Here we include

[19] We group any banks that acquire a subsidiary in the final quarter of 1999, after the passage of GLBA, in the 2000 cohort.

[20] In unreported analysis, we find further refining the control group by nearest-neighbor matching on these other bank control variables yields quantitatively and statistically similar results.

small business lending in all counties. *Treat* equals one for banks that acquired an insurance subsidiary in each cohort-year and zero if they do not acquire an insurance subsidiary during the sample window. The rest of the bank control variables are the same as in previous analysis and are fixed as of the year before the cohort's acquisition year. Table XI presents the results.

In Column 1, we find a significant positive coefficient for *Treat*×*Post*. The magnitude of the effect remains statistically significant and economically meaningful even when allowing the shock to influence small business lending through other channels, such as bank size or bank specialization in small business lending (Column 2). Banks that were exposed to the deregulatory shock increased their small business lending by 36% relative to control banks (using estimates from Column 2). Our results remain consistent after including bank-county and county-year fixed effects (Columns 3 and 4), confirming that the observed effects are the consequence of banks increasing their lending supply and not differential loan demand.

VI.C The effects of bank diversification on the real economy

To investigate the real effects of business line diversification, we first analyze the effect of diversification on aggregate small business lending in each county. We verify that in this case, as for geographic diversification, the increase in the diversified banks' lending is not just at the expense of the non-diversified banks. To this end, we perform a similar specification as in Equation (7). Here we use all counties and construct the county-level variables using the bank controls from the year prior to the acquisition year. We weight these county-level variables using the share of small business lending by treatment and control banks in that year. Table XII presents the results.

We find a significant positive coefficient for the interaction *County-Level Treat*×*Post*. Following the deregulation, for a one standard deviation increase in county diversification, aggregate lending increases by about 5.7% relative to the control group (using the estimates from Column 2). The rise in lending among the diversified banks is not driven only by reduction in

the loan supply of the less-diversified banks.

Now we turn to the real effects of banks diversifying into insurance underwriting. We use the county-level specification but focus on county-level small business related employment as the outcome variable. Columns 3 and 4 of Table XII present the results.

The coefficient for *County-Level Treat*×*Post* is positive, indicating that diversification enhances county-level employment. In Column 3, we find a 0.9% increase in local small-business-related employment for a one standard deviation increase in county-level diversification. Column 4 has a similar magnitude estimate, although not statistically significant. Consistent with the geographic shock, our results show that the more banks in a county that are exposed to the diversification shock, the higher the positive impact on local employment levels. As banks with a more diversified stream of earnings can lend more freely to risky segments, we document positive real effects from this increase in lending.

VII Conclusions

In this paper, we highlight a few of the key benefits of bank diversification. Analyzing two major types of diversification—geographic expansion of lending activity and expansion of banks into non-bank activities—we show that banks with more diversified assets lend more during crisis periods, when it is critical that banks maintain lending to support economic activity. Using exogenous shocks to the ability to diversify, we isolate the effect of diversification on bank lending separate from other factors. We find these banks increase small business lending, which leads to positive real effects for the broader economy. These benefits of bank diversification, that have not yet been fully explored, are separate from the scale of banks and their potential sources of funding. We believe that the positive benefits that come from asset diversification provide some counterbalance to concerns about the systemic risk implications of bigger banks.

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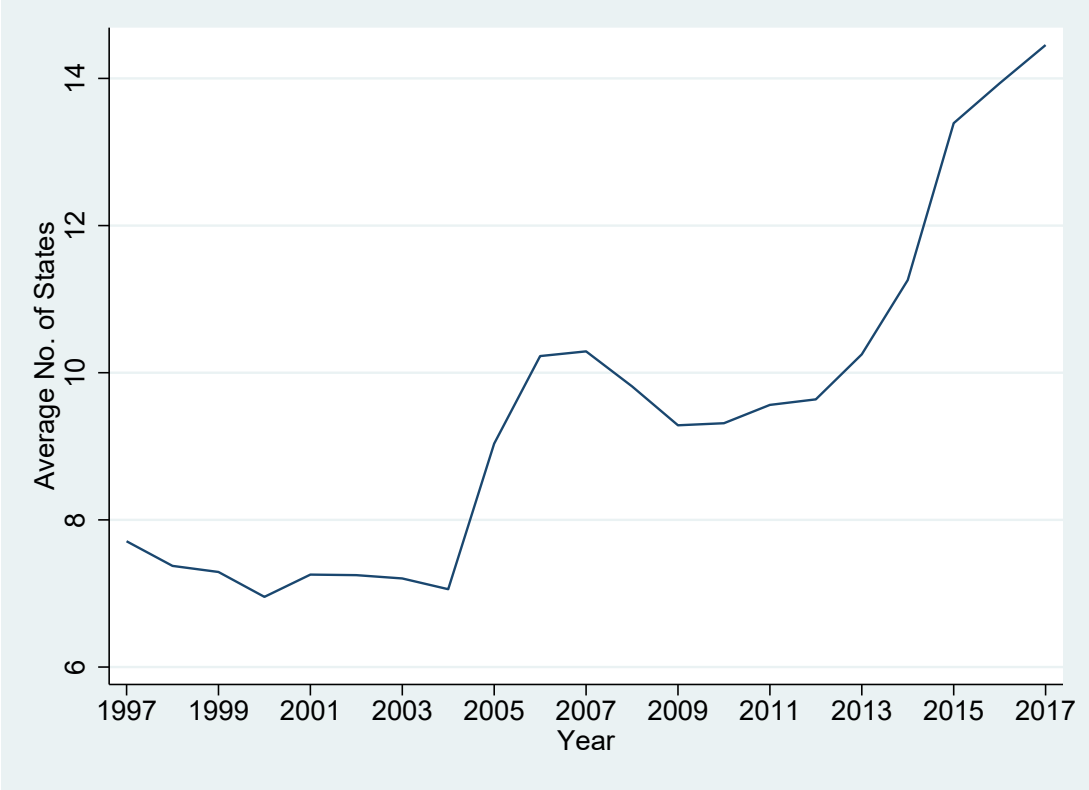

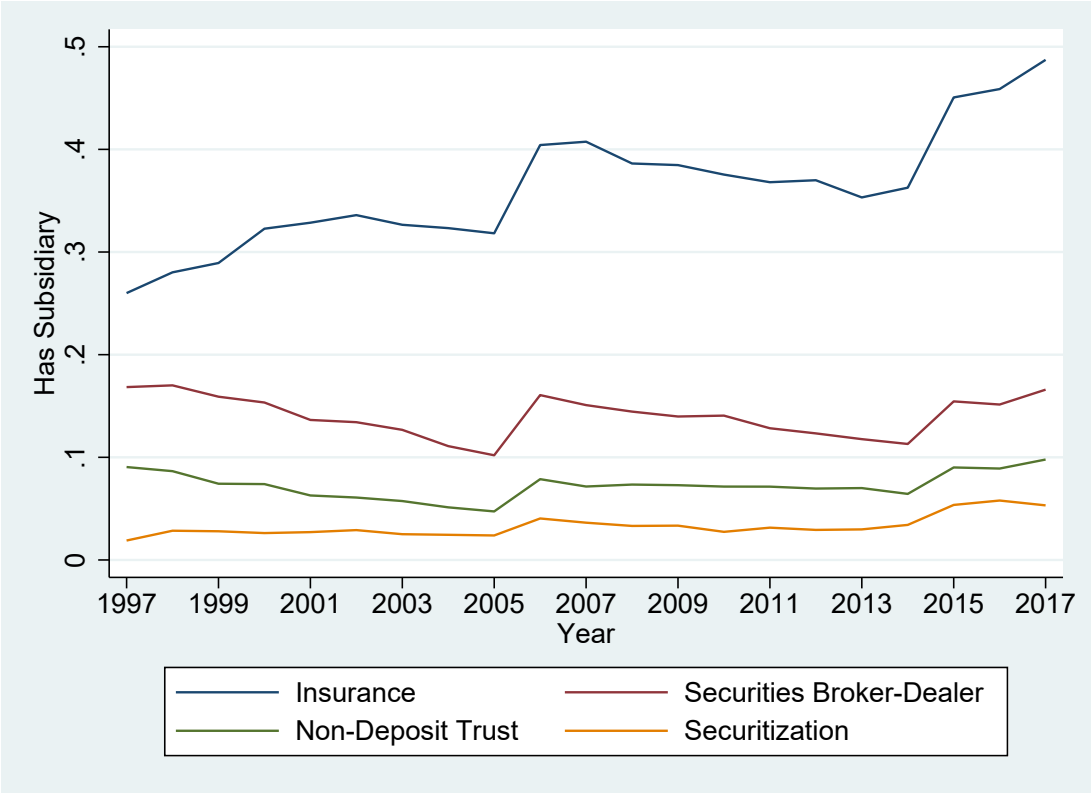

Figure 1: The figure plots the average number of states that banks lend in (top panel) and the percent of banks with at least one subsidiary for insurance, securities broker-dealer, non-deposit trust, or securitization (bottom panel).

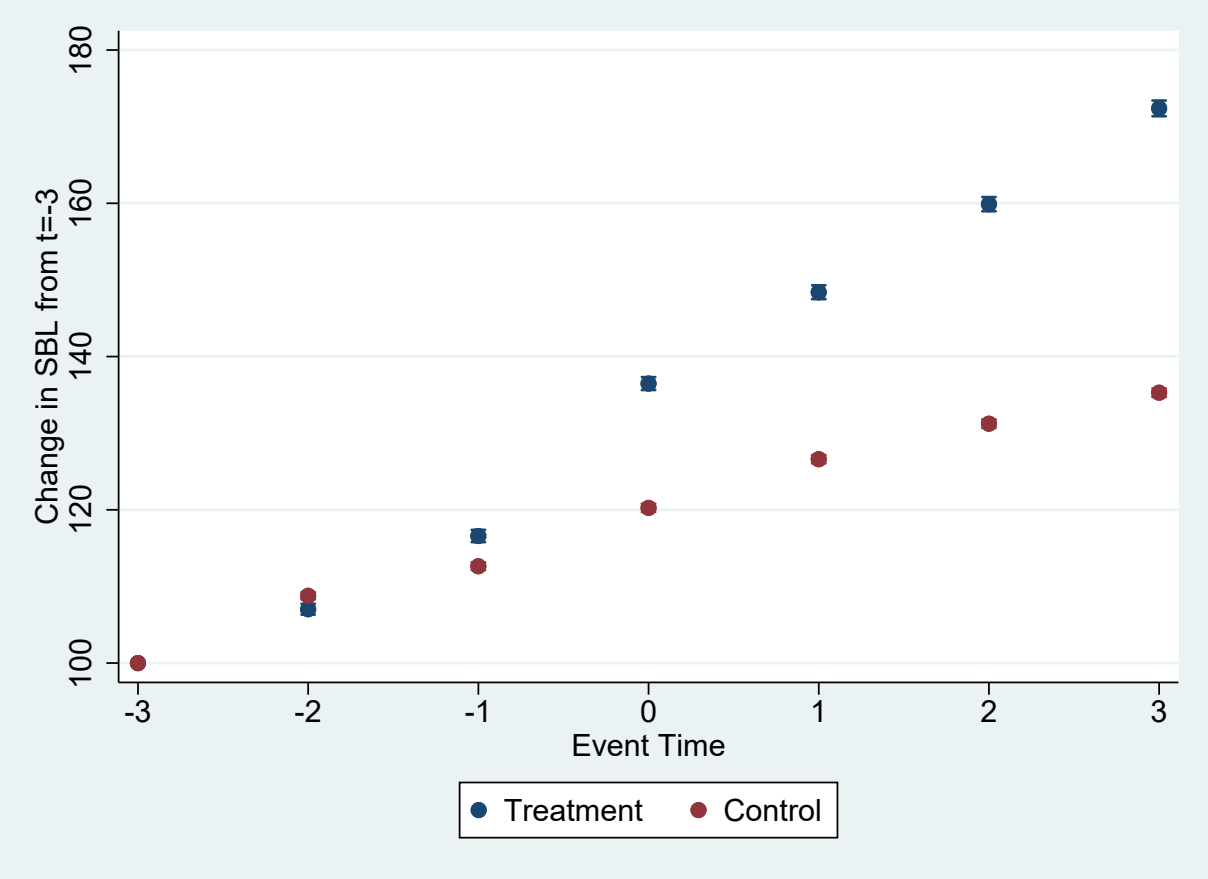

Figure 2: Effect of Geographic Deregulation on Small Business Lending. Figure looks at small business lending for treatment and control banks in counties outside of states that have changed intrastate banking regulations. Treatment banks are actively lending in these affected states before the change while control banks are not. 19 different regulatory changes (cohorts) are used. See Table A.6 for the list of the specific shocks.

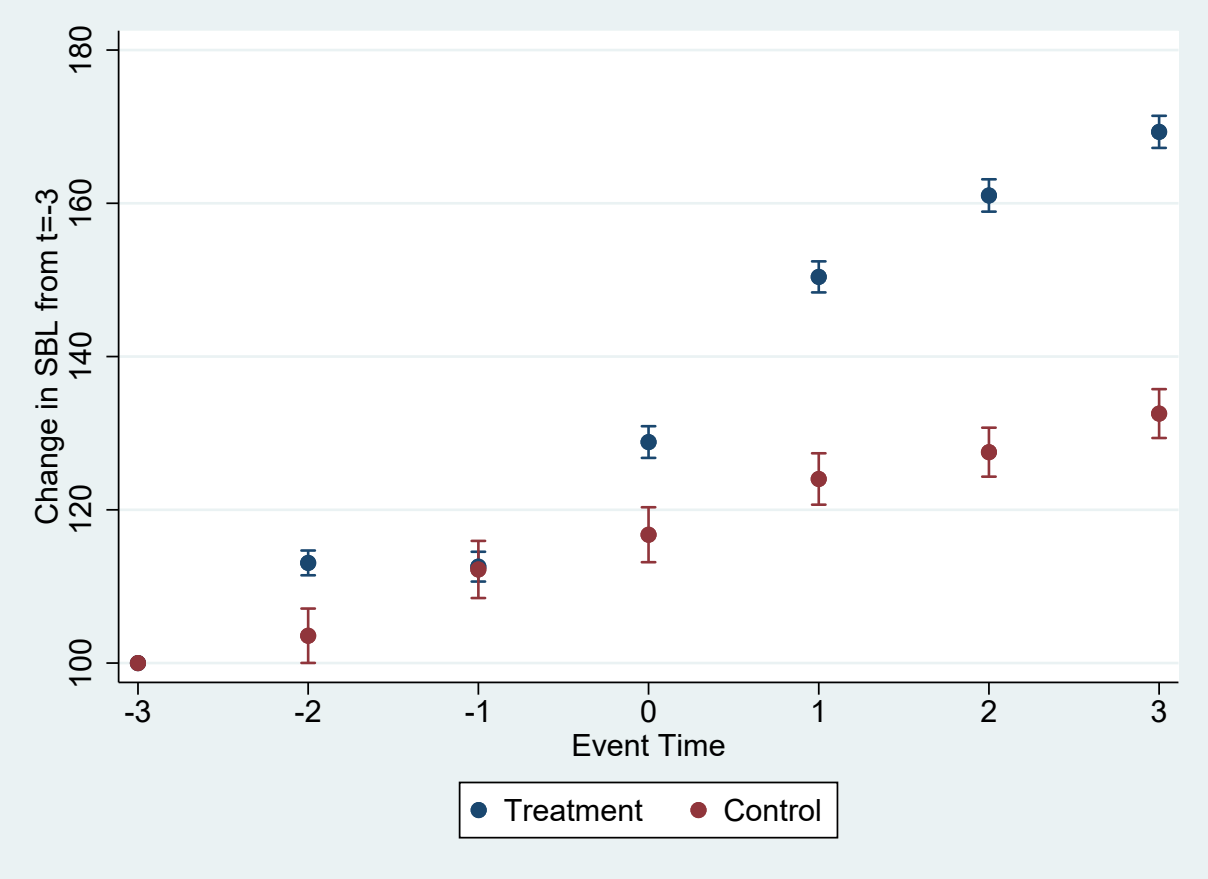

Figure 3: Effect of Insurance Subsidiary Acquisition on Small Business Lending. Figure includes 3 cohorts: banks with first insurance acquisition in 2000, 2001, and 2002. Control group: banks that acquire insurance subsidiary after the event period.

Table I: Summary Statistics

This table presents the summary statistics for our main variables. Our sample is from 1997-2017. *Bank Variables* are constructed at a BHC-level. *Bank-County Variables* are reported at a county-level for each BHC, *County Variables* are at an aggregate county level, and *Macroeconomic Variable* is reported at a national level.

	Mean	Std Dev	25th Pctile	Median	75th Pctile	# Obs.
Bank Variables						
Loans to Assets	0.65	0.13	0.58	0.67	0.74	79,343
Log Loans	13.4	1.48	12.4	13.1	14.0	79,321
Real Estate Loans to Assets	0.46	0.15	0.36	0.47	0.57	79,343
C&I Loans to Assets	0.11	0.070	0.057	0.091	0.14	79,340
Log Assets	13.9	1.49	12.8	13.5	14.4	79,343
Z-Score	61.0	29.0	43.8	59.5	75.7	79,343
Average ROA (%)	0.35	0.25	0.26	0.37	0.48	79,343
Equity to Assets	0.094	0.041	0.075	0.090	0.11	79,343
Deposits to Assets	0.79	0.11	0.75	0.81	0.86	79,343
Loan Growth	0.27	0.30	0.10	0.25	0.42	78,493
SBL to Loans	0.11	0.072	0.054	0.091	0.14	42,745
NPL to Loans Volatility (%)	1.37	1.82	0.35	0.74	1.60	71,643
LLP to Loans Volatility (%)	0.37	0.71	0.051	0.13	0.32	71,639
Interest Income to Loans Volatility (%)	0.37	0.37	0.15	0.26	0.45	57,612
ROA Volatility (%)	0.87	0.93	0.49	0.65	0.88	71,712
Bank Merger	0.017	0.13	0	0	0	79,343
No. of States, Lending	9.34	11.0	3	5	11	42,753
No. of States, Deposits	1.82	2.64	1	1	2	72,915
Lending States to Deposit States	5.08	5.59	2	3.71	6	40,838
Geographic Share, Loans	0.20	0.24	0.019	0.082	0.33	42,753
Non-Interest Income to Assets	0.0079	0.0076	0.0039	0.0062	0.0095	79,326
No. Insurance Subsidiaries	0.94	3.76	0	0	1	78,569
Has Insurance Subsidiary	0.35	0.48	0	0	1	78,569
No. Security Broker-Dealer Subsidiaries	0.27	1.04	0	0	0	78,569
Has Security Broker-Dealer Subsidiary	0.14	0.35	0	0	0	78,569
No. Non-Deposit Trust Subsidiaries	0.12	0.54	0	0	0	78,569
Has Non-Deposit Trust Subsidiary	0.073	0.26	0	0	0	78,569
No. Securitization Subsidiaries	0.14	1.57	0	0	0	78,569
Has Securitization Subsidiary	0.031	0.17	0	0	0	78,569
Trading Income to Assets ($\times$100)	-0.00029	0.11	-0.0057	0	0.0088	78,533
Has Trading Activity	0.79	0.41	1	1	1	78,533
Bank-County Variables						
Log SBL	5.69	2.26	4.06	5.65	7.15	951,144
County Variables						
Log SBL	9.17	2.00	7.86	9.16	10.5	64,123
Log Small Business Employment	7.95	1.44	6.99	7.80	8.75	64,123
County HHI	0.27	0.16	0.16	0.23	0.34	64,123
Macroeconomic Variable						
Log GDP	9.61	0.13	9.51	9.64	9.69	84

Table II: Bank Loans and Diversification

This table measures the sensitivity of quarterly bank lending to aggregate business cycle conditions and the bank's degree of diversification from 1997–2017 at the bank level. *Loans to Assets* is the bank's total loans divided by its total assets. All independent variables are as of the prior quarter. *Log GDP* is the log of the quarterly national real gross domestic product (in billions of chained 2012 dollars, seasonally adjusted). *Log No. States, Loans* is the log of the number of states with reported bank lending activity. *Log No. States, Deposits* is the log of the number of states with reported bank deposits. *Log Assets* is the log of the bank's total assets. *Z-Score* is the bank's Z-Score (divided by 100). *Avg. ROA* is the bank's average quarterly ROA over the past three years (as a percent). *Equity to Assets* is the bank's equity to assets ratio. *Deposits to Assets* is the bank's deposits to assets ratio. Standard errors are clustered by bank.

	Loans to Assets			
	(1)	(2)	(3)	(4)
Log No. States, Loans	0.0193***	0.0163***	0.0244***	0.0225***
	(0.00316)	(0.00304)	(0.00338)	(0.00328)
Log GDP			0.228***	
			(0.0523)	
Log No. States, Loans × Log GDP			-0.0863***	-0.102***
			(0.0210)	(0.0214)
Log No. States, Deposits	-0.00437	-0.00645	0.00700	0.00707
	(0.00967)	(0.00975)	(0.00922)	(0.00924)
Log Assets	0.0121**	0.0112	0.00222	0.0136
	(0.00551)	(0.00894)	(0.00844)	(0.00866)
Z-Score	0.00611	0.0172**	0.00593	0.0175***
	(0.00698)	(0.00678)	(0.00707)	(0.00672)
Average ROA	0.0571***	0.0169*	0.0639***	0.0176*
	(0.00857)	(0.00966)	(0.00827)	(0.00948)
Equity to Assets	-0.222*	0.0566	-0.196	0.128
	(0.129)	(0.131)	(0.128)	(0.128)
Deposits to Assets	0.143***	0.259***	0.159***	0.283***
	(0.0521)	(0.0544)	(0.0509)	(0.0517)
Bank Fixed Effects	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	No	Yes	No	Yes
Observations	37,236	37,236	37,236	37,236
Adjusted R^2	0.768	0.793	0.772	0.797

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table III: Volatility and Diversification

This table measures the sensitivity of different earnings volatility measures on the bank's degree of diversification from 1997–2017 at the BHC level. *NPL to Loans Volatility* is the bank's volatility for non-performing loans (NPL) to loans for the next four quarters (as an annualized percent). *LLP to Loans Volatility* is the bank's volatility for loan loss provisions (LLP) to loans for the next four quarters (as an annualized percent). *Interest Income to Loans Volatility* is the bank's volatility for interest income to loans for the next four quarters (as an annualized percent). *ROA Volatility* is the bank's quarterly ROA volatility for the next four quarters (as an annualized percent). All independent variables are as of the prior quarter. Other control variables (*Log No. States, Deposits*, *Log Assets*, *Z-Score*, *Avg. ROA*, *Equity to Assets*, *Deposits to Assets*) are included in specifications as in Table II. Standard errors are clustered by bank.

	One-Year Volatility			
	NPL to Loans	LLP to Loans	Interest Income to Loans	ROA
	(1)	(2)	(3)	(4)
Log No. States, Loans	-0.180***	-0.0435*	-0.0262**	-0.0707**
	(0.0630)	(0.0261)	(0.0116)	(0.0351)
Control Variables	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes
Observations	28,826	28,826	28,826	28,826
Adjusted R^2	0.480	0.450	0.495	0.361

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table IV: Bank Diversification and the Financial Crisis

This table presents the results of the specification in Equation (3) for the effect of bank diversification on lending around the crisis. The sample is from 2005 through 2010. The outcome variables (total loans, real estate loans, and C&I loans) are scaled by the bank's total assets as of 2007Q4. *Post-Crisis* is an indicator variable for the crisis period, which begins in 2008Q1. *High Geographic Diversification* is an indicator variable that equals one for banks in the top quartile of the number of states in which they operated in 2007Q4 and zero for banks in the bottom quartile. *Log No. States, Deposits* is the log of the number of states with reported bank deposits. *Log Assets* is the log of the bank's total assets. *Z-Score* is the bank's Z-Score (divided by 100). *Avg. ROA* is the bank's average quarterly ROA over the past three years (as a percent). *Equity to Assets* is the bank's equity to assets ratio. *Deposits to Assets* is the bank's deposits to assets ratio. The control variables are fixed at their 2007Q4 values and interacted with *Post-Crisis*. Standard errors are clustered by bank.

	Loans to Pre-Crisis Assets		Real Est. Loans to Pre-Crisis Assets		C&I Loans to Assets Pre-Crisis Assets	
	(1)	(2)	(3)	(4)	(5)	(6)
High Geo. Div. × Post-Crisis	0.0460**	0.0581**	0.0168	0.0341*	0.0217***	0.0201***
	(0.0182)	(0.0227)	(0.0145)	(0.0185)	(0.00452)	(0.00712)
Log No. States, Deposits × Post-Crisis		-0.0318		-0.0238		0.00286
		(0.0262)		(0.0213)		(0.00688)
Log Assets × Post-Crisis		0.00885		0.00323		0.000442
		(0.0118)		(0.00946)		(0.00313)
Z-Score × Post-Crisis		0.103*		0.0806*		0.00968
		(0.0614)		(0.0473)		(0.0110)
Average ROA × Post-Crisis		0.0255		-0.00839		-0.00187
		(0.0900)		(0.0731)		(0.0154)
Equity to Assets × Post-Crisis		-0.376		-0.333		0.0109
		(0.519)		(0.392)		(0.118)
Deposits to Assets × Post-Crisis		0.0762		0.0536		0.0239
		(0.0899)		(0.0710)		(0.0230)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,222	5,222	5,222	5,222	5,222	5,222
Adjusted R^2	0.705	0.710	0.825	0.829	0.905	0.905

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table V: Diversification, the Financial Crisis, and Small Business Lending

This table presents the results for the effect of bank diversification on small business lending around the financial crisis. The sample is from 2005 through 2010. Observations in Columns 1–2 are at a bank-county level and observations in Columns 3–6 are at a county level. *Log SBL, Bank-County Level* is the log amount of the small business loans originated annually by a bank in a county. *Log SBL, County Level* is the log amount of the small business loans originated annually by all banks in a county. *Log Small Business Employment* is the log number of jobs related to small businesses in a county. *Post-Crisis* is an indicator variable for the crisis period, which begins in 2008. *High Geographic Diversification* is an indicator variable that equals one for banks in the top quartile of the number of states in which they operated in 2007 and zero for banks in the bottom quartile. *County Geographic Diversification* is the weighted average of the log number of states that banks in the county are active in. The control variables are fixed at their 2007 values and interacted with the *Post-Crisis* indicator. For Columns 3–6, the control variables are county-level weighted averages. *Control Variables* refer to the non-interacted treatment and control variables. *LMA Fixed Effects* refer to labor market areas as defined by the BLS. Standard errors are clustered by bank (Columns 1–2) or by county (Columns 3–6).

	Log SBL, Bank-County Level		Log SBL, County Level		Log Small Business Employment	
	(1)	(2)	(3)	(4)	(5)	(6)
High Geo. Div. × Post-Crisis	1.201***	1.318***				
	(0.325)	(0.315)				
County Geo. Div. × Post-Crisis			0.0282**	0.0348**	0.0111***	0.00872***
			(0.0122)	(0.0162)	(0.00213)	(0.00242)
Log No. States, Deposits × Post-Crisis	0.259**	0.268**	0.0446*	0.0456	-0.0102**	-0.00511
	(0.111)	(0.115)	(0.0256)	(0.0320)	(0.00437)	(0.00532)
Log Assets × Post-Crisis	-0.317***	-0.314***	-0.0429***	-0.0362***	-0.00348**	-0.00420***
	(0.0697)	(0.0669)	(0.0149)	(0.0130)	(0.00139)	(0.00150)
SBL to Loans × Post-Crisis	-0.921*	-0.335	0.135	1.150**	0.192**	0.0314
	(0.526)	(0.536)	(0.398)	(0.467)	(0.0771)	(0.0722)
Loan Growth × Post-Crisis	-0.250	-0.173	-0.0907	0.0892	0.115***	0.00386
	(0.163)	(0.175)	(0.0952)	(0.107)	(0.0191)	(0.0204)
Z-Score × Post-Crisis	0.398**	0.295*	-0.0285	-0.161*	-0.0304*	-0.0178
	(0.161)	(0.171)	(0.0861)	(0.0954)	(0.0175)	(0.0169)
Avg. ROA × Post-Crisis	1.201***	1.276***	0.492***	0.415***	0.0654***	0.0546***
	(0.254)	(0.262)	(0.109)	(0.118)	(0.0215)	(0.0210)
Equity to Assets × Post-Crisis	2.934	3.694**	-1.511*	0.587	0.167	0.416**
	(1.812)	(1.842)	(0.911)	(1.067)	(0.182)	(0.177)
Deposits to Assets × Post-Crisis	0.934*	1.003**	1.127***	0.920***	-0.0379	-0.0119
	(0.520)	(0.470)	(0.276)	(0.325)	(0.0309)	(0.0309)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Bank-County Fixed Effects	Yes	Yes	No	No	No	No
Year Fixed Effects	Yes	No	Yes	No	Yes	No
County-Year Fixed Effects	No	Yes	No	No	No	No
LMA Fixed Effects	No	No	Yes	Yes	Yes	Yes
State-Year Fixed Effects	No	No	No	Yes	No	Yes
Observations	123,081	122,927	18,701	18,695	18,202	18,196
Adjusted R^2	0.856	0.851	0.662	0.667	0.620	0.627

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table VI: Geographic Deregulation and Small Business Lending

This table presents the results of the specification in Equation (6) for the effect of diversification on small business lending following deregulation. *Log SBL, Bank-County Level* is the log amount of the small business loans originated annually by a bank in a county. *Treat* is a dummy variable that equals one for banks that operated in a state with a change in deregulation and zero otherwise. This sample uses a six-year window around 19 different deregulatory shocks. *Cohort* refers to the treatment and control banks associated with each shock. See Table A.6 for the list of the specific shocks. *Post* is an indicator variable that equals one for the diversification year and the following years and zero for the pre-diversification period. All control variables are as of year before the shock and interacted with *Post*. Standard errors are clustered by bank.

	Log SBL, Bank-County Level			
	(1)	(2)	(3)	(4)
Treat × Post	0.213**	0.128***	0.226**	0.159***
	(0.104)	(0.0493)	(0.0999)	(0.0509)
Log No. States, Deposits × Post		-0.257***		-0.270***
		(0.0826)		(0.0941)
Log Assets × Post		0.0773***		0.0621**
		(0.0267)		(0.0285)
SBL to Loans × Post		-1.155***		-1.177***
		(0.253)		(0.308)
Loan Growth × Post		-0.0713		-0.0732
		(0.140)		(0.137)
Z-Score × Post		-0.0357		-0.00989
		(0.104)		(0.0960)
Avg. ROA × Post		-0.00375		-0.00778
		(0.170)		(0.165)
Equity to Assets × Post		-0.480		-0.594
		(1.214)		(1.160)
Deposits to Assets × Post		-0.245		-0.500
		(0.356)		(0.418)
Cohort by Bank-County Fixed Effects	Yes	Yes	Yes	Yes
Cohort by Year Fixed Effects	Yes	Yes	No	No
Cohort by County-Year Fixed Effects	No	No	Yes	Yes
Observations	1,265,600	1,099,790	1,170,927	1,001,401
Adjusted R^2	0.780	0.783	0.778	0.780

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table VII: County-Level Effects of Geographic Deregulation

This table presents the results for the effect of diversification on county-level aggregate small business lending and small business employment following deregulation. *Log SBL, County Level* is the log amount of the small business loans originated annually at the county level. *Log Small Business Employment* is the log number of jobs related to small businesses in a county. *County-Level Treat* is the county-level average of banks that operated in a state with a change in deregulation, scaled by the measure's sample standard deviation. This sample uses six-year windows around 19 different deregulatory shocks. *Cohort* refers to the treatment and control banks associated with each shock. See Table A.6 for the list of the specific shocks. *County-Level Treat* and all other control variables are aggregated at the county level as of the year before the shock. Each bank is weighted by its county-level loans from the year before the diversification shock. *Post* is an indicator variable equals one for the diversification year and the two years after and zero for the pre-diversification period. *Control Variables* refer to the non-interacted treatment and control variables. *LMA Fixed Effects* refer to labor market areas as defined by the BLS. Standard errors are clustered by county.

	Log SBL, County Level		Log Small Business Employment	
	(1)	(2)	(3)	(4)
County-Level Treat × Post	0.0840***	0.0843***	0.0194***	0.0288***
	(0.00757)	(0.00931)	(0.00387)	(0.00505)
Log No. States, Deposits × Post	-0.121***	-0.193***	-0.0323***	-0.0395***
	(0.0344)	(0.0424)	(0.0113)	(0.0138)
Log Assets × Post	-0.0906***	-0.0794***	0.00299	-0.00142
	(0.00826)	(0.00977)	(0.00243)	(0.00295)
SBL to Loans × Post	-1.146***	-1.891***	-0.161**	-0.0583
	(0.241)	(0.281)	(0.0680)	(0.0803)
Loan Growth × Post	0.281***	0.240***	-0.0112	-0.0242
	(0.0678)	(0.0735)	(0.0195)	(0.0222)
Z-Score × Post	0.0563	0.142	-0.0529*	-0.0160
	(0.101)	(0.104)	(0.0271)	(0.0300)
Average ROA × Post	0.377***	0.159	0.0733**	0.0550
	(0.127)	(0.130)	(0.0368)	(0.0396)
Equity to Assets × Post	3.819***	3.661***	0.0527	-0.0346
	(0.920)	(0.989)	(0.261)	(0.288)
Deposits to Assets × Post	0.143*	0.183*	-0.00313	0.0507
	(0.0833)	(0.103)	(0.0280)	(0.0320)
Control Variables	Yes	Yes	Yes	Yes
Cohort by LMA Fixed Effects	Yes	Yes	Yes	Yes
Cohort by Year Fixed Effects	Yes	No	Yes	No
Cohort by State-Year Fixed Effects	No	Yes	No	Yes
Observations	273,024	272,646	273,024	272,646
Adjusted R^2	0.504	0.516	0.570	0.574

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table VIII: Bank Loans and Business Line Diversification

This table measures the sensitivity of quarterly bank lending to aggregate business cycle conditions and the bank's degree of business line diversification from 1997–2017 at the bank level. *Loans to Assets* is the bank's total loans divided by its total assets. All independent variables are as of the prior quarter. *Log GDP* is the log of the quarterly national real gross domestic product (in billions of chanied 2012 dollars, seasonally adjusted). *Non-Interest Income to Assets* is the ratio of the bank's non-interest income over the last 4 quarters divided by total assets. *Log No. Insurance Subsidiaries* is the log of the number of domestic insurance subsidiaries in the bank's organizational structure. *Log No. Security Broker-Dealer Subsidiaries* is the log of the number of domestic investment banking or security broker-dealer subsidiaries in the bank's organizational structure. *Log No. Non-Deposit Trust Subsidiaries* is the log of the number of domestic non-deposit trust subsidiaries in the bank's organizational structure. *Log No. Securitization Subsidiaries* is the log of the number of securitization-related subsidiaries in the bank's organizational structure. *Trading Income* is the ratio of the bank's trading income over the last 4 quarters divided by total assets. *Additional Controls* include *Log Assets*, *Z-Score*, *Avg. ROA*, *Equity to Assets*, and *Deposits to Assets*. Standard errors are clustered by bank.

	Loans to Assets					
	(1)	(2)	(3)	(4)	(5)	(6)
Non-Interest Income to Assets	0.923***					
	(0.301)					
Non-Interest Inc. × Log GDP	-6.720***					
	(1.733)					
Log No. Insurance Subsids.		0.0139***				
		(0.00461)				
Log No. Insurance Subsids. × Log GDP		-0.0721***				
		(0.0200)				
Log No. Sec. B-D Subsids.			0.00911			
			(0.00792)			
Log No. Sec. B-D Subsids. × Log GDP			-0.136***			
			(0.0347)			
Log No. Non-Dep. Trust Subsids.				0.0175**		
				(0.00853)		
Log No. ND Trust Subsids. × Log GDP				-0.188***		
				(0.0521)		
Log No. Securit. Subsids.					0.00982	
					(0.00677)	
Log No. Securit. Subsids. × Log GDP					-0.125***	
					(0.0343)	
Trading Income						3.636**
						(1.786)
Trading Income × Log GDP						-26.24**
						(12.67)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	74,903	74,903	74,903	74,903	74,903	74,188
Adjusted R^2	0.823	0.823	0.823	0.823	0.822	0.822

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table IX: Business Line Diversification and the Financial Crisis

This table presents the results for the effect of business line diversification on lending around the crisis. The sample is from 2005 through 2010. Panel A presents the effects of different business lines on total lending. Panel B presents the effects of insurance diversification on different lending segments. *Loans to Pre-Crisis Assets* is total loans scaled by the bank's total assets as of 2007Q4. *Post-Crisis* is an indicator variable for the crisis period, which begins in 2008Q1. *Non-Interest Income* is non-interest income for the last four quarters scaled by assets before 2008. *Insurance Subsidiary* indicates a bank started or acquired its first insurance subsidiary before 2008. *Security Broker-Dealer Subsidiary* indicates a bank started or acquired its first investment banking or security broker-dealer subsidiary before 2008. *Non-Deposit Trust Subsidiary* indicates a bank started or acquired its non-deposit trust subsidiary before 2008. *Securitization Subsidiary* indicates a bank started or acquired its first securitization-related subsidiary before 2008. *Trading Activity* indicates a bank reported non-zero trading income before 2008. *Controls* $\times$ *Post-Crisis* includes *Log Assets*, *Loan Growth*, *Avg. ROA*, *Z-Score*, *Equity to Assets*, and *Deposits to Assets*. The control variables are fixed at their 2007Q4 values interacted with *Post-Crisis*. Standard errors are clustered by bank.

Panel A: Lending and Business Line Diversification

	Loans to Pre-Crisis Assets					
	(1)	(2)	(3)	(4)	(5)	(6)
Non-Interest Income $\times$ Post-Crisis	-0.0715					
	(0.779)					
Ins. Subsid. $\times$ Post-Crisis		0.0325**				
		(0.0152)				
Sec. B-D Subsid. $\times$ Post-Crisis			0.0131			
			(0.0286)			
Non-Dep. Trust $\times$ Post-Crisis				-0.00647		
				(0.0159)		
Securitization Subsid. $\times$ Post-Crisis					-0.0334	
					(0.0290)	
Trading Activity $\times$ Post-Crisis						-0.0473***
						(0.0154)
Controls $\times$ Post-Crisis	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,059	20,059	20,059	20,059	20,059	20,059
Adjusted R^2	0.644	0.645	0.644	0.644	0.644	0.645

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table IX–*Continued*

Panel B: Lending Segments and Insurance Diversification				
	Real Est. Loans to Pre-Crisis Assets		C&I Loans to Assets Pre-Crisis Assets	
	(1)	(2)	(3)	(4)
Insur. Subsid. × Post-Crisis	0.0143*	0.0213**	0.00522*	0.00278
	(0.00863)	(0.00952)	(0.00299)	(0.00321)
Log Assets × Post-Crisis		-0.00376		0.00368**
		(0.00418)		(0.00144)
Z-Score × Post-Crisis		0.0785***		0.0130**
		(0.0215)		(0.00572)
Average ROA × Post-Crisis		-0.00377		0.00381
		(0.0328)		(0.00821)
Equity to Assets × Post-Crisis		-0.0823		-0.0292
		(0.102)		(0.0310)
Deposits to Assets × Post-Crisis		0.0996**		0.0238*
		(0.0386)		(0.0137)
Bank Fixed Effects	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes
Observations	20,059	20,059	20,059	20,059
Adjusted R^2	0.786	0.790	0.846	0.847

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table X: Insurance Diversification, the Financial Crisis, and Small Business Lending

This table presents the results for the effect of insurance diversification on small business lending during and after the crisis. The sample uses a window from 2005 through 2010. Observations in Columns 1–2 are at a bank-county level and observations in Columns 3–6 are at a county level. *Log SBL, Bank-County Level* is the log amount of the small business loans originated annually by a bank in a county. *Log SBL, County Level* is the log amount of the small business loans originated annually by all banks in a county. *Log Small Business Employment* is the log number of jobs related to small businesses in a county. *Post-Crisis* is an indicator variable for the crisis period, which begins in 2008. *Insurance Subsidiary* indicates a bank started or acquired its first insurance subsidiary before 2008. *County Insurance Diversification* is the weighted average of the number of banks in a county with an insurance subsidiary before 2008. The control variables are fixed at their 2007 values and interacted with the *Post-Crisis* indicator. For Columns 3–6, the control variables are county-level weighted averages. *Control Variables* refer to the non-interacted treatment and control variables. *LMA Fixed Effects* refer to labor market areas as defined by the BLS. Standard errors are clustered by bank (Columns 1–2) or by county (Columns 3–6).

	Log SBL, Bank-County Level		Log SBL, County Level		Log Small Business Employment	
	(1)	(2)	(3)	(4)	(5)	(6)
Insur. Subsid. × Post-Crisis	0.308**	0.300**				
	(0.131)	(0.137)				
County Insur. Div. × Post-Crisis			0.0362***	0.0229***	0.00547***	0.00330**
			(0.00744)	(0.00835)	(0.00128)	(0.00138)
Log Assets × Post-Crisis	-0.0236	-0.00978	-0.0276*	-0.0165	-0.00184*	-0.00233**
	(0.0346)	(0.0337)	(0.0142)	(0.0151)	(0.00102)	(0.000943)
SBL to Loans × Post-Crisis	-1.001	-0.668	0.336	1.218**	0.249***	0.0568
	(0.757)	(0.743)	(0.403)	(0.473)	(0.0763)	(0.0718)
Loan Growth × Post-Crisis	-0.0224	0.0103	-0.0470	0.116	0.121***	0.00968
	(0.227)	(0.234)	(0.0966)	(0.109)	(0.0191)	(0.0205)
Z-Score × Post-Crisis	0.00117	0.00113	-0.000852	-0.00232**	-0.000431**	-0.000270
	(0.00320)	(0.00321)	(0.000884)	(0.000937)	(0.000180)	(0.000172)
Avg. ROA × Post-Crisis	115.3	119.7	50.82***	41.56***	6.202***	4.964**
	(70.77)	(74.74)	(10.90)	(11.60)	(2.097)	(2.060)
Equity to Assets × Post-Crisis	3.803	3.554	-1.333	1.181	0.160	0.456**
	(2.901)	(2.868)	(0.915)	(1.047)	(0.182)	(0.177)
Deposits to Assets × Post-Crisis	1.878**	1.917**	0.990***	0.751**	-0.0273	-0.0135
	(0.772)	(0.788)	(0.291)	(0.299)	(0.0267)	(0.0246)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Bank-County Fixed Effects	Yes	Yes	No	No	No	No
Year Fixed Effects	Yes	No	Yes	No	Yes	No
County-Year Fixed Effects	No	Yes	No	No	No	No
LMA Fixed Effects	No	No	Yes	Yes	Yes	Yes
State-Year Fixed Effects	No	No	No	Yes	No	Yes
Observations	239,879	239,815	18,701	18,695	18,202	18,196
Adjusted R^2	0.839	0.836	0.647	0.652	0.610	0.617

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table XI: Business Line Deregulation and Small Business Lending

This table presents the results for the effect of insurance diversification on small business lending following deregulation. The sample uses 3 cohorts of data, classifying treatment banks as those that acquire or establish an insurance subsidiary in 2000, 2001, and 2002. The sample period spans 3 years before the cohort year, the cohort year, and 2 years after (6 years total). Control banks are those banks that do not acquire an insurance subsidiary during the sample period. *Log SBL, Bank-County Level* is the log amount of the small business loans originated annually by a bank in a county. *Treat* indicates that the bank acquired or established an insurance subsidiary in its cohort year. *Post* is an indicator variable that equals one for the cohort year and the two years after and zero for the pre-period. All control variables are from the year prior to the insurance acquisition cohort year. Standard errors are clustered by bank.

	Log SBL, Bank-County Level			
	(1)	(2)	(3)	(4)
Treat × Post	0.194*	0.305**	0.230*	0.333**
	(0.106)	(0.135)	(0.128)	(0.141)
Log Assets × Post		0.0440		0.0742
		(0.0390)		(0.0524)
SBL to Loans × Post		-0.711		-0.558
		(0.825)		(0.981)
Loan Growth × Post		-0.390*		-0.436*
		(0.225)		(0.236)
Z-Score × Post		0.469		0.787
		(0.381)		(0.493)
Avg. ROA × Post		1.265**		1.925***
		(0.619)		(0.724)
Equity to Assets × Post		0.125		-2.800
		(4.044)		(4.360)
Deposits to Assets × Post		2.231**		3.147**
		(1.098)		(1.430)
Cohort by Bank-County Fixed Effects	Yes	Yes	Yes	Yes
Cohort by Year Fixed Effects	Yes	Yes	No	No
Cohort by County-Year Fixed Effects	No	No	Yes	Yes
Observations	145,831	142,428	129,326	125,721
Adjusted R^2	0.773	0.774	0.761	0.763

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table XII: County-Level Effects of Business Line Deregulation

This table presents the results for the effect of insurance diversification on county-level aggregate small business lending and small business employment following deregulation. The sample uses 3 cohorts of data, classifying treatment banks as those that acquire or establish an insurance subsidiary in 2000, 2001, and 2002. The sample period spans 3 years before the cohort year, the cohort year, and 2 years after (6 years total). Control banks are those banks that do not acquire an insurance subsidiary during the sample period. *Log SBL, County Level* is the log amount of the small business loans originated annually by treatment and control banks. *Log Small Business Employment* is the log number of jobs related to small businesses in a county. *County-Level Treat* indicates the share of banks that acquired or established an insurance subsidiary in its cohort year and is scaled by the measure's sample standard deviation. *Post* is an indicator variable that equals one for the cohort year and the two years after and zero for the pre-period. All control variables are from the year prior to the cohort year and are aggregated to a county level by using each bank's county-level loan share from the year prior to the cohort year. *Control Variables* refer to the non-interacted treatment and control variables. *LMA Fixed Effects* refer to labor market areas as defined by the BLS. Standard errors are clustered by county.

	Log SBL, County Level		Log Small Business Employment	
	(1)	(2)	(3)	(4)
County-Level Treat × Post	0.0400**	0.0559**	0.00942**	0.00711
	(0.0203)	(0.0267)	(0.00443)	(0.00594)
Log Assets × Post	-0.0471***	-0.0185	0.00316	0.00423*
	(0.00900)	(0.0120)	(0.00204)	(0.00249)
SBL to Loans × Post	-1.205**	-2.391***	-0.161	-0.391***
	(0.468)	(0.642)	(0.102)	(0.144)
Loan Growth × Post	-0.0128	-0.235**	-0.0723***	-0.0967***
	(0.0765)	(0.0987)	(0.0136)	(0.0201)
Z-Score × Post	-0.0487	-0.603**	-0.0370	0.106*
	(0.181)	(0.268)	(0.0447)	(0.0625)
Avg. ROA × Post	-0.409*	-0.00808	-0.0832	-0.0454
	(0.230)	(0.315)	(0.0508)	(0.0745)
Equity to Assets × Post	9.880***	8.851***	0.201	-0.309
	(1.570)	(2.270)	(0.334)	(0.493)
Deposits to Assets × Post	-0.797***	-0.678***	0.000362	-0.0554
	(0.146)	(0.189)	(0.0294)	(0.0391)
Control Variables	Yes	Yes	Yes	Yes
Cohort by LMA Fixed Effects	Yes	Yes	Yes	Yes
Cohort by Year Fixed Effects	Yes	No	Yes	No
Cohort by State-Year Fixed Effects	No	Yes	No	Yes
Observations	41,787	41,763	41,787	41,763
Adjusted R^2	0.536	0.562	0.613	0.619

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Appendix

A Classification of business lines

For our analysis, we classify different subsidiaries from the NIC's bank organizational structure data by the type of business line. As our focus is on domestic lending activity, we focus only on those subsidiaries that are reported as domiciled in the United States. We categorize domestic insurance subsidiaries as those with a charter code of 550, which covers insurance brokers, agents, underwriters, or insurance companies. For securities broker-dealers, we categorize domestic subsidiaries as those domiciled in the United States with a reported entity type code of "SBD," the vast majority of which also report a charter code of 700 (for securities broker and/or dealer, including securities underwriting). For non-deposit trust subsidiaries, we require the subsidiary to report a charter code of 250, "Non-deposit Trust Company."

Unlike the other subsidiary types, securitization-related subsidiaries cannot be identified only from a charter code or entity code. Instead we use a two-stage approach. First, we identify all remaining non-deposit subsidiaries with a charter code of 720 (Other Non-Depository Institution) that are reported as a controlled entity, do not have a bank analysis code (0 for non-applicable), and have an entity type code of "DEO" for domestic entity other. Within this group, we search for the following keywords in the entity name: SPV, Securitized, and some type of Receivables/Loan/Issuance/Funding/Asset/Mortgage or other similar "Trust." We go back and manually remove any false positives (such as a bank that uses "Trust" in its name generally). These subsidiaries are the specific entities in which the securitized assets are placed and we use their existence as evidence that the bank has outstanding securitization activity.

For trading activity, we are not aware of a common subsidiary structure that is identifiable from the NIC data. We therefore rely on the BHC level reporting of trading income to determine whether a bank has trading activity.

B The relationship between idiosyncratic and systematic risk

As diversification reduces idiosyncratic risk, one may wonder why diversification had a meaningful effect on banks during a systematic shock, such as the financial crisis. Consequently, we explore whether during the crisis a rise in idiosyncratic risk occurred in addition to the increase in systematic risk (e.g., Campbell, Lettau, Malkiel, and Xu, 2001).

We use a standard market-model-style regression to estimate each risk type to explore the association between the systematic and idiosyncratic risk of banks. Since our sample consists of public and private banks, we extract these risks using the quarterly accounting returns (ROEs) instead of stock returns. Specifically, using quarterly data, we estimate for each bank in our sample the following model:

$$R_{it} = \alpha_i + \beta_i \mathrm{R}_{Mt} + \varepsilon_{it}, \tag{8}$$

where R_{it} is bank i's ROE in quarter t. R_{Mt} is the equivalent of the market portfolio return calculated as the weighted average by size (total assets) of the ROEs of all the banks in quarter t. Our estimate of idiosyncratic risk of bank i is the (annualized) standard deviation of the regression residual ε_{it} over a rolling window of the past three years, and our estimate of market risk of bank i is β_i times the (annualized) standard deviation of R_{Mt}.

We plot our results in Figure A.1. The spikes in the systematic and the idiosyncratic risk start at the beginning of the crisis. While the systematic risk decreases to pre-crisis levels towards the end of 2010, idiosyncratic risk declines more slowly. Focusing on the crisis period, we find a correlation coefficient of 0.61 between the systematic and the idiosyncratic risk. Further, we explore the relationship between our two types of diversification (geographic and business segment) and the systematic versus idiosyncratic risk during the financial crisis. We measure geographic diversification as the natural logarithm of the number of states in which the bank operated as of the prior quarter. Business segment diversification is estimated using the natural

logarithm of the number of domestic insurance subsidiaries the bank reports as of the prior quarter. We also include bank fixed effects to control for any time-invariant bank characteristics. We cluster standard errors by bank. In this specification, the sample period is from 2008Q1 through 2010Q4. Table A.5 presents the results.

As expected, we find a negative relationship between diversification and idiosyncratic risk (Columns 2 and 4) and a positive association with systematic risk (Columns 1 and 3). These results confirm the intuition that diversification lowers a bank's exposure to idiosyncratic risk. As the idiosyncratic risk co-moves strongly with systematic risk during the crisis, diversification plays an important role for banks during this period.

C Geographic banking deregulation: historical background and related literature

C.1 Historical background

The regulatory landscape for banking in the United States has gone through various phases. The ability of banks to operate across state lines has shifted several times, such as around the Civil War and in the early 1900s (Johnson and Rice, 2008). Beginning in the 1970s, the United States banking system began its most recent regulatory transformation. As discussed in Amel (1993), Jayaratne and Strahan (1996, 1998), and Johnson and Rice (2008), there were historically restrictions on bank expansion within states (intrastate banking and branching) and bank expansion between states (interstate banking and branching). Here the distinction between "banking" and "branching" is whether the expansion is through a banking company acquiring or establishing a separate bank charter (banking) or through acquiring or establishing a branch office that is not separately chartered and capitalized (branching).

Since these regulations are under the control of individual states, different elements of these regulations changed at different times. However, most states first relaxed restrictions on in-

trastate bank expansion, both via acquiring banks and forming multibank holding companies (MBHCs) and by allowing new branches. Second, many states allowed interstate expansion through MBHCs, often with a requirement of reciprocity. By 1992, all states except Hawaii had some interstate banking agreements in place (Jayaratne and Strahan, 1998), but only eight states permitted interstate branch expansion (Amel, 1993).[21]

Against this backdrop, the Riegel-Neal Interstate Banking and Branching Efficiency Act of 1994 (IBBEA) was passed at a federal level. It removed any remaining federal interstate banking and branching barriers, but allowed individual states to decide on many of the specific rules to allow interstate branching. For branching, it provided five regulatory dimensions for states to control: (1) the minimum age of an in-state bank that can be acquired and merged into an out-of-state bank, (2) whether out-of-state banks are permitted to establish de novo branches, (3) whether out-of-state banks can acquire individual bank branches, (4) whether banks are subject to a statewide deposit cap, and (5) whether reciprocity conditions for (1)–(3) are required with the bank's home state.[22] The branching regulations went into effect in 1997 unless the state chose to establish them earlier or decided to opt out of the act.[23]

Since the passage of the IBBEA in 1994 and its first state-level implementations through 1997, there has been a flurry of expansion. Although banks could cross state lines before the IBBEA, the ability of banks to establish multi-state branch networks under one charter and governance and capitalization structure is highly valued. Indeed, many banks with a MBHC structure converted the subsidiary banks into branches of the BHC's principal bank (Jayaratne and Strahan, 1998). The number of out-of-state branches had grown from 62 in 1994 to 24,728 or 37.28% of all domestic branches by 2005 (Johnson and Rice, 2008). Along with this ex-

[21]The specific states are Alaska, Massachusetts, New York, Oregon, Rhode Island, Nevada, North Carolina, and Utah. Only Nevada and Utah allowed nonreciprocal branching in some form.

[22]The IBBEA did establish some guidelines for these restrictions. The age requirement for target banks cannot be more than five years. The statewide deposit cap is initially set at 30%, although states are allowed to set an alternative cap. For the de novo branching and individual bank branch regulations, states needed to explicitly opt-in to allow these actions. The majority of states did not opt-in to one or both of these clauses or only did so with reciprocity conditions.

[23]Initially, Texas and Montana chose to opt-out of the IBBEA, but they opted-in in 1999 and 2001, respectively.

pansionist trend, many states have progressively loosened the IBBEA-related rules over time through legislation. In our setting, we utilize 19 distinct state-level regulatory changes as our source of variation. The changes are listed in Table A.6.

C.2 Related literature

Different elements of this intrastate and interstate banking and branching regulatory has been investigated by prior literature. For the first intrastate banking and branching reforms, Jayaratne and Strahan (1996) find evidence of increased state-level growth following deregulation. Kroszner and Strahan (1999) focus on the political strength of relevant constituencies (i.e., large banks versus small banks) and what role they played in the timing of these state-level reforms. Morgan, Rime, and Strahan (2004) find that across-state integration of banks before the IBBEA lead to more similar state-level macroeconomic fluctuations. Jayaratne and Strahan (1998) and Stiroh and Strahan (2003) document increase profitability and healthier competitive landscapes following intrastate and interstate deregulation. Bisetti, Karolyi, and Lewellen (2020) focus on the interbank banking regulatory changes mainly before the IBBEA passage. They focus on the reciprocal nature of the early interstate banking laws and how banks reacted to the increased competition from the entrance of out-of-state banks and the increased opportunities from being able to expand into new states.

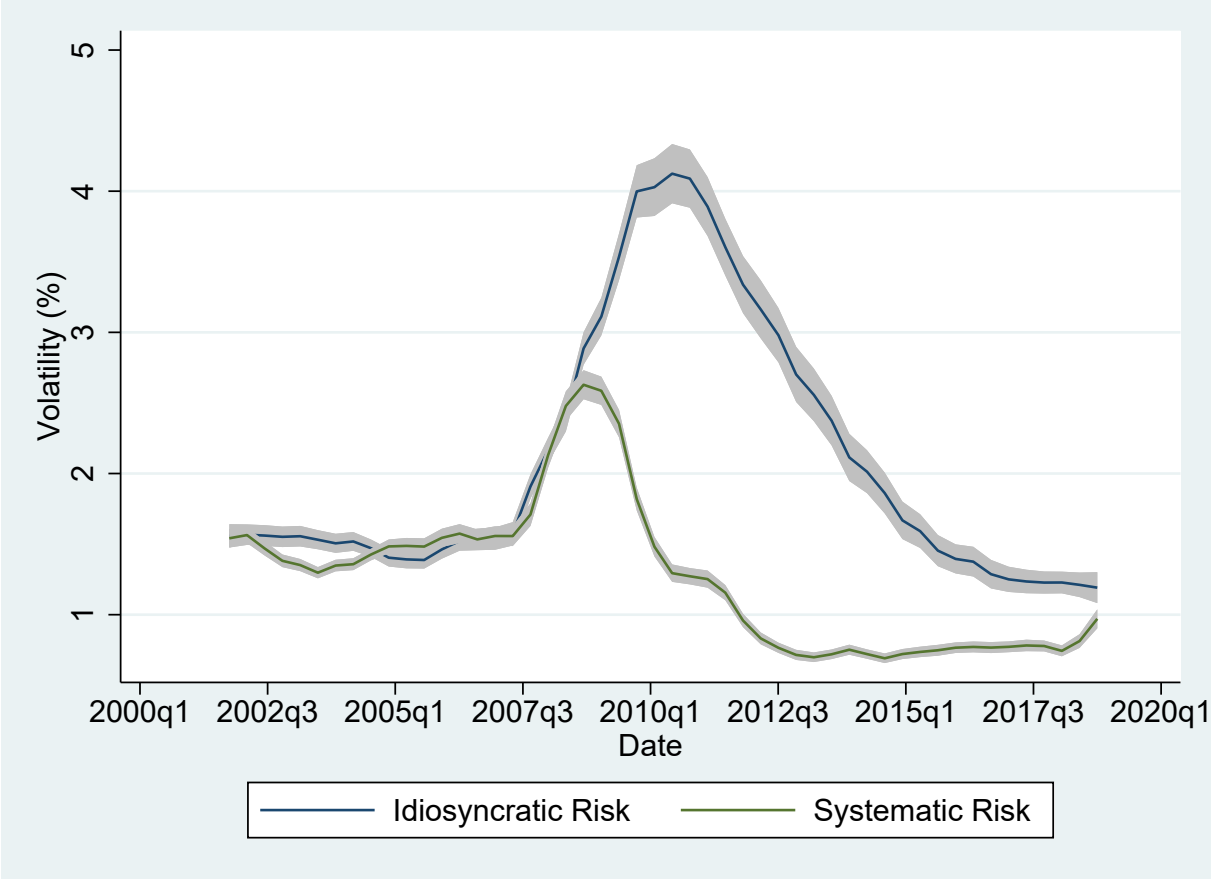

Figure A.1: The figure plots the average idiosyncratic risk and systematic risk of banks over time, with 95% confidence intervals. Correlation between idiosyncratic and systematic risk during 2008 and 2009 is 0.61.

Table A.1: Different Aspects of Diversification

List of 40 largest BHCs in 2007, sorted by total assets.

Rank	Bank Name	Total Assets ($ Bil.)	No. States, Lending	No. States, Deposits	No. Domestic Insurance Subsid.
1	CITIGROUP	2188	54	18	60
2	BANK OF AMERICA	1721	54	31	31
3	JPMORGAN CHASE & CO.	1562	51	24	8
4	WACHOVIA	782.9	51	22	23
5	WELLS FARGO & COMPANY	575.4	52	23	64
6	U.S. BANCORP	237.6	52	26	9
7	BANK OF NEW YORK MELLON	197.8	29	1	6
8	SUNTRUST BANKS	179.6	51	12	6
9	CAPITAL ONE FINANCIAL	150.6	22	6	5
10	NATIONAL CITY	150.4	46	8	16
11	REGIONS FINANCIAL	141.0	48	16	23
12	PNC FINANCIAL SERVICES GROUP	139.0	44	10	3
13	TRUIST FINANCIAL	132.6	42	12	26
14	FIFTH THIRD BANCORP	111.0	35	10	3
15	KEYCORP	99.57	44	14	8
16	NORTHERN TRUST	67.61	20	17	1
17	M&T BANK	64.88	26	8	4
18	COMERICA INCORPORATED	62.76	45	5	3
19	MARSHALL & ILSLEY	59.86	46	9	3
20	HUNTINGTON BANCSHARES	54.63	35	6	8
21	ZIONS BANCORPORATION	52.95	45	10	3
22	COMMERCE BANCORP	49.37	25	9	1
23	POPULAR	44.41	44	8	4
24	FIRST HORIZON	37.02	43	17	10
25	SYNOVUS FINANCIAL	33.02	37	5	5
26	NEW YORK COMMUNITY BANCORP	30.60	49	2	4
27	COLONIAL BANCGROUP	25.97	27	5	4
28	ASSOCIATED BANC-CORP	21.59	28	3	4
29	BOK FINANCIAL	20.90	33	8	3
30	W HOLDING COMPANY	17.93	1	1	1
31	WEBSTER FINANCIAL	17.21	9	4	3
32	FIRST BANCORP	17.19	2	3	2
33	FIRST CITIZES BANCSHARES	16.23	22	14	1
34	COMMERCE BANCSHARES	16.21	50	5	2
35	TCF FINANCIAL	16.07	13	7	3
36	FIRST NATIONAL OF NEBRASKA	16.02	52	8	4
37	FULTON FINANCIAL	15.92	14	5	2
38	CITY NATIONAL	15.89	25	3	1
39	FBOP CORPORATION	14.97	29	4	1
40	NEW YORK PRIVATE BANK & TRUST	14.36	11	2	2

Table A.2: BHC Loans and Diversification

This table measures the sensitivity of quarterly bank lending to aggregate business cycle conditions and the bank's degree of diversification from 1997–2017 at the bank level. *Loans to Assets* is the bank's total loans divided by its total assets. All independent variables are as of the prior quarter. *Log GDP* is the log of the quarterly national real gross domestic product (in billions of chained 2012 dollars, seasonally adjusted). *Log No. Counties, Loans* is the log of the number of counties where a bank reports small business lending. *Geographic Share, Loans* is one minus the Herfindahl index of a bank's lending across states. Other control variables (*Log No. States, Deposits*, *Log Assets*, *Z-Score*, *Avg. ROA*, *Equity to Assets*, *Deposits to Assets*) are included in specifications as in Table II. Standard errors are clustered by bank.

	Loans to Assets			
	(1)	(2)	(3)	(4)
Log No. Counties, Loans	0.0244***	0.0291***		
	(0.00331)	(0.00342)		
Log No. Counties, Loans × Log GDP		-0.0700***		
		(0.0136)		
Geographic Share, Loans			0.0419**	0.0746***
			(0.0169)	(0.0189)
Geo. Share, Loans × Log GDP				-0.273***
				(0.0757)
Additional Controls	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes
Observations	37,236	37,236	37,236	37,236
Adjusted R^2	0.796	0.800	0.792	0.794

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table A.3: Bank Subsamples and Diversification

This table measures the sensitivity of quarterly bank lending on aggregate business cycle conditions and the bank's degree of diversification from 1997–2017 at the BHC level, divided into subsamples. The *Bank Size Subsamples* divide banks into below and above median by total assets. The *Bank Diversification Subsamples* divide banks into below and above median by number of states with reported small business lending. The *Bank Equity Subsamples* divide banks into below and above median by equity to assets. The *Bank Risk Subsamples* divide banks into below and above median by Z-score. *Loans to Assets* is the bank's total loans divided by its total assets. All independent variables are as of the prior quarter. *Log GDP* is the log of the quarterly national real gross domestic product (in billions of chanied 2012 dollars, seasonally adjusted). *Log No. States, Loans* is the log of the number of states with reported bank lending activity. All independent variables are as of the prior quarter. Other control variables (*Log No. States, Deposits*, *Log Assets*, *Z-Score*, *Avg. ROA*, *Equity to Assets*, *Deposits to Assets*) are included in specifications as in Table II. Standard errors are clustered by bank.

	Loans to Assets							
	Bank Size Subsamples		Bank Diversification Subsamples		Bank Equity Subsamples		Bank Risk Subsamples	
	Below Median	Above Median	Below Median	Above Median	Below Median	Above Median	Below Median	Above Median
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log No. States, Loans	0.0141***	0.0283***	0.0147***	0.0300***	0.0221***	0.0166***	0.0234***	0.0151***
	(0.00371)	(0.00525)	(0.00558)	(0.00627)	(0.00371)	(0.00440)	(0.00411)	(0.00426)
Log No. States, Loans × Log GDP	-0.0665**	-0.0949***	-0.0849	-0.0988***	-0.0945***	-0.0540**	-0.0952***	-0.0821***
	(0.0307)	(0.0326)	(0.0566)	(0.0337)	(0.0239)	(0.0261)	(0.0285)	(0.0271)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18,609	18,608	19,153	18,073	18,586	18,573	18,576	18,561
Adjusted R^2	0.848	0.809	0.809	0.814	0.843	0.824	0.815	0.837

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table A.4: The Financial Crisis and Small Business Lending, Alternative Explanations

This table presents the results for the effect of bank diversification on small business lending around the financial crisis. The sample is from 2005 through 2010. Observations in Columns 1–2 are at a bank-county level and observations in Columns 3–6 are at a county level. *Log SBL, Bank-County Level* is the log amount of the small business loans originated annually by a bank in a county. *Log SBL, County Level* is the log amount of the small business loans originated annually by all banks in a county. *Log Small Business Employment* is the log number of jobs related to small businesses in a county. *Post-Crisis* is an indicator variable for the crisis period, which begins in 2008. *High Geographic Diversification* is an indicator variable that equals one for banks in the top quartile of the number of states in which they operated in 2007 and zero for banks in the bottom quartile. *County Geographic Diversification* is the weighted average of the log number of states that banks in the county are active in. *Bank Merger* is an indicator that a bank reported a merger in 2007. *County HHI* is the Herfindahl-Hirschman index for the county-level SBL in 2007. All the other control variables are included as in Table V. The control variables are fixed at their 2007 values and interacted with the *Post-Crisis* indicator. For Columns 3–6, the control variables are county-level weighted averages. *Control Variables* refer to the non-interacted treatment and control variables. *LMA Fixed Effects* refer to labor market areas as defined by the BLS. Standard errors are clustered by bank (Columns 1–2) or by county (Columns 3–6).

	Log SBL, Bank-County Level		Log SBL, County Level		Log Small Business Employment	
	(1)	(2)	(3)	(4)	(5)	(6)
High Geo. Div. × Post-Crisis	1.128***	1.226***				
	(0.280)	(0.255)				
County Geo. Div. × Post-Crisis			0.0307**	0.0384**	0.0108***	0.00793***
			(0.0127)	(0.0170)	(0.00215)	(0.00245)
Bank Merger × Post-Crisis	0.222***	0.230***	-0.0733*	0.0685	-0.0129*	-0.0129*
	(0.0717)	(0.0660)	(0.0394)	(0.0492)	(0.00681)	(0.00753)
County HHI × Post-Crisis	-0.472***		-0.329***	-0.332***	-0.00228	-0.0301**
	(0.123)		(0.0767)	(0.0749)	(0.0128)	(0.0125)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Bank-County Fixed Effects	Yes	Yes	No	No	No	No
Year Fixed Effects	Yes	No	Yes	No	Yes	No
County-Year Fixed Effects	No	Yes	No	No	No	No
LMA Fixed Effects	No	No	Yes	Yes	Yes	Yes
State-Year Fixed Effects	No	No	No	Yes	No	Yes
Observations	123,079	122,927	18,701	18,695	18,202	18,196
Adjusted R^2	0.857	0.852	0.683	0.686	0.655	0.658

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table A.5: Idiosyncratic Risk and the Financial Crisis

This table presents the effect of bank diversification on the idiosyncratic and systematic risk during and after the crisis. The sample is from 2008 through 2010. *Idiosyncratic Risk* and *Systematic Risk* are annualized standard deviations (as a %) and estimated based on specification in Equation (8). *Log No. States, Loans* is the log of the number of states with reported bank lending activity. *Log No. Insurance Subsidiaries* is the log of the number of domestic insurance subsidiaries in the bank's organizational structure. Standard errors are clustered by bank.

	Systematic Risk (1)	Idiosyncratic Risk (2)	Systematic Risk (3)	Idiosyncratic Risk (4)
Log No. States, Loans	0.325***	-0.644***		
	(0.0893)	(0.241)		
Log No. Insurance Subsids.			0.332**	-1.139**
			(0.163)	(0.548)
Bank Fixed Effects	Yes	Yes	Yes	Yes
Observations	4170	3889	3928	3924
Adjusted R^2	0.860	0.668	0.857	0.668

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table A.6: Geographic Diversification Shocks

This table presents the 19 different geographic shocks used in Section IV. *Age Restriction Change* indicates that a state lowered the age restriction for banks that can be acquired. *Individual Branch Change* indicates that a state loosened restrictions on acquiring individual bank branches. *De Novo Branching Change* indicates that a state loosened restrictions on the opening of new branches. See Johnson and Rice (2008) for a more detailed discussion of the specific regulations.

State	Year	Age Restriction Change	Individual Branch Acquisition Change	De Novo Branching Change
Alabama	2007	No	Yes	No
Arizona	2001	No	Yes	No
Georgia	2002	Yes	No	No
Hawaii	2001	Yes	Yes	Yes
Illinois	2004	Yes	Yes	Yes
Kentucky	2000	Yes	No	No
Montana	2001	Yes	Yes	Yes
New Hampshire	2000	No	Yes	Yes
New Hampshire	2002	Yes	No	No
New York	2008	No	No	Yes
North Dakota	2003	Yes	Yes	Yes
Oklahoma	2000	Yes	Yes	Yes
Tennessee	1998	No	Yes	No
Tennessee	2001	No	No	Yes
Tennessee	2003	Yes	No	No
Texas	1999	Yes	Yes	Yes
Utah	2001	No	No	Yes
Vermont	2001	Yes	No	Yes
Washington	2005	No	Yes	Yes

Table A.7: Geographic Deregulation and Small Business Lending, Robustness Checks

The table presents some alternative specifications related to Equation (6) for the effect of diversification on small business lending following deregulation. Panel A excludes states that geographically border the shocked state from the analysis. Panel B uses the alternative difference-in-differences estimator proposed by Callaway and Sant'Anna (2021). *Log(SBL), Bank-County Level* is the log amount of the small business loans originated annually. *Treat* is a dummy variable equals one for banks that operated in a state with a change in deregulation and zero otherwise. This sample uses a six-year window around 19 different deregulatory shocks. See Table A.6 for the list of the specific shocks. *Post* is an indicator variable equals one for years following the diversification year and zero for the pre-diversification period. *Log SBL, Bank-County Level* is the log amount of the small business loans originated annually. All control variables are as of year before the shock and interacted with *Post*.

Panel A: Excluding Bordering States				
	Log SBL, Bank-County Level			
	(1)	(2)	(3)	(4)
Treat × Post	0.200*	0.129*	0.210**	0.144**
	(0.105)	(0.0688)	(0.103)	(0.0710)
Additional Controls	No	Yes	No	Yes
Cohort by Bank-County Fixed Effects	Yes	Yes	Yes	Yes
Cohort by Year Fixed Effects	Yes	Yes	No	No
Cohort by County-Year Fixed Effects	No	No	Yes	Yes
Observations	1,245,789	1,093,311	1,199,396	1,041,745
Adjusted R^2	0.800	0.802	0.796	0.798

Panel B: Alternative DiD Estimator		
	Log SBL, Bank-County Level	
	(1)	(2)
ATT	0.195***	0.205***
	(0.0658)	(0.0733)
Additional Controls	No	Yes
Observations	354,658	304,833

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01