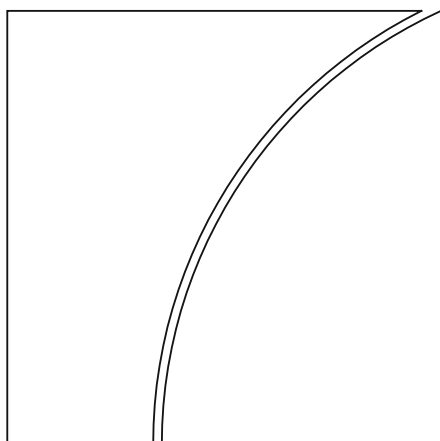




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JEL classification: F30, G2

Keywords: Global Banks, Diversification, Syndicated Loans, Financial Crisis

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Bank Loan Supply during Crises: The Importance of Geographic Diversification*

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Abstract

We classify a large sample of banks according to the geographic diversification of their international syndicated loan portfolio. Our results show that diversified banks maintain higher loan supply during banking crises in borrower countries. The positive loan supply effects lead to higher investment and employment growth for firms. Diversified banks have a stabilizing effect, thanks to their ability to raise additional funding during times of distress, which also shields connected markets from spillovers. Further distinguishing banks by nationality reveals a pecking order: diversified domestic banks are the most stable source of funding, while foreign banks with little diversification are the most fickle. Our findings suggest that the decline in financial integration since the recent crisis increases countries' vulnerability to local shocks.

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1 Introduction

Recent decades have seen a steady increase in the importance of globally active banks. Banking integration peaked around 2007, but declined sharply during the global financial crisis. It has become a key objective for policy makers and academics to better understand the effects of integrated banks on financial stability and the real economy (BCBS, 2013). Several papers provide valuable evidence on the costs and benefits of lending by foreign banks.¹ However, an analysis of the consequences of banks' international portfolio diversification on financial stability is largely absent from the literature.

In this paper we provide the first cross-country evidence on how internationally diversified banks adjust lending during banking crises in borrower countries. We find that diversified banks stabilize loan supply and smooth shocks. On the bank-firm level, their loan supply during crises is 7.6% higher, compared to banks with a concentrated portfolio. Higher loan supply has significant effects on firm performance. Firms at the 75th percentile in terms of loan exposure to diversified banks have 1.5% higher loan growth during banking crises, relative to firms at the 25th percentile. This translates into stronger investment (4.6%) and employment (1.1%) growth. As detailed bank-firm level data allow us to rigorously control for unobservable borrower characteristics through time-varying fixed effects on the firm level, the positive effects of diversification reflect banks' loan supply. Granular fixed effects at the bank-year level ensure that our results are not due to unobservable bank heterogeneity.

To measure the degree of geographic diversification of globally integrated banks, we use disaggregated data on worldwide syndicated lending. For each bank we construct

¹For theoretical papers highlighting the importance of bank diversification, see Morgan, Rime and Strahan (2004), Cetorelli and Goldberg (2011, 2012), Kalemli-Ozcan, Papaioannou and Perri (2013a), Kalemli-Ozcan, Papaioannou and Peydró (2013b). For empirical evidence see De Haas and Van Lelyveld (2010; 2014), Buch and Goldberg (2015); Kerl and Niepmann (2016); Gilje, Loutskina and Strahan (2016); Goetz, Laeven and Levine (2016). Claessens (2017) provides an excellent summary on cross-border lending.

a Herfindahl-Hirschman Index of the geographic diversification of its international loan portfolio across countries, aggregated to the parent bank level. Banks with low portfolio concentration, i.e. those that lend to multiple countries, are classified as diversified. Banks that extend a large share of their loan portfolio to borrowers in just a few countries are classified as concentrated. Our classification of banks by portfolio diversification builds on recent literature that causally shows that geographic diversification reduces exposure to idiosyncratic local shocks (Goetz, Laeven and Levine, 2016). Diversification implies lower risk and thus provides better access to funding, especially during times of crises (Levine, Lin and Xie, 2016; Bord, Ivashina and Taliaferro, 2018). Based on these findings, we argue that banks that are geographically diversified across countries are financially less constrained during local shocks, which is why they are able to extend more credit.

We provide direct evidence in support of the argument that diversified banks can better raise funding, relative to their non-diversified counterparts. We show that diversified banks increase their interbank borrowing on the syndicated loan market when hit by a local financial shock. Furthermore, using data on bank balance sheets from Bankscope, we show that diversified banks increase their overall wholesale deposits during banking crises in borrower countries. In contrast, non-diversified banks see a decline in wholesale deposit growth during episodes of financial distress. These results are in line with the hypothesis that geographic diversification ensures better access to funding.

We provide further indirect evidence that geographically diversified banks have a stabilizing effect, thanks to their ability to raise new funds during times of distress. If banks are financially unconstrained when hit by a local financial shock, they can raise and distribute new funds to sustain loan supply in affected markets, but also in connected non-crisis countries. Banks that face financial constraints must trade off where to allocate existing funds (similar to Stein (1997)). Local shocks will then have spillover effects on

non-crisis countries.² We show that, for highly diversified banks, maintaining loan growth in a crisis country has no spillover effects on unaffected non-crisis countries to which the bank is lending. However, for banks with a concentrated portfolio, loan growth also falls in connected, but unaffected borrower countries. We interpret this as indirect evidence that diversified banks have looser ‘financial constraints’ and can raise new funds to sustain loan supply. Non-diversified banks are financially constrained and must cut back lending in affected and unaffected markets when faced with a shock.

Our results suggest that geographic diversification *across* countries allows for risk-sharing during local (country-specific) systemic banking crises. To further investigate the link between diversification, risk-sharing, and access to funding, we show that the positive effects of diversification on loan supply and spillovers are significantly lower during episodes of global distress, i.e. when a significant share of banks’ global portfolio is subject to shocks. In other words, when several borrower countries experience a crisis at the same time, the risk-sharing benefits of geographic diversification with respect to local idiosyncratic shocks break down and diversified banks also face tighter financial constraints.

Finally, we contrast our categorization by diversification with the common classification in the literature by nationality into foreign and domestic banks. Diversified banks can be foreign or domestic, and foreign banks diversified or non-diversified. We find that classifying banks by diversification instead of nationality uncovers differences in lending behavior. While diversified banks maintain a higher loan supply than concentrated banks during banking crises, foreign banks reduce their loan supply by more than domestic banks. Further analysis reveals the following pecking order: diversified domestic banks are the most stable source of funding, while foreign banks with little diversification are

²For example, during a banking crisis in Canada diversified banks could maintain lending in Canada and Mexico, because they can raise new funds. Constrained banks would have to trade off where to allocate existing funds and cut lending in at least one country.

the most fickle. Foreign, but diversified banks occupy an intermediate position between both extremes. The ordering speaks to findings on the flight home effect ([Giannetti and Laeven, 2012](#)) and behavior of gross capital flows during crises ([Broner, Didier, Erce and Schmukler, 2013](#)).³

For robustness, we address alternative explanations to the argument that diversified banks smooth local shocks through better access to funding. First, we exclude that differences in borrower risk, in terms of volatility of borrower sales growth, explain results. While diversified banks have lower portfolio risk on average, we show that the positive effect of diversification remains stable once we control for portfolio risk. Second, we rule out the possibility that diversified banks extend a lower share of their total loans to countries in crisis. Including the share of loans in crisis shows that, if anything, diversification becomes more important when a larger share of loans is in distress. Third, we create alternative measures of diversification and specialization that capture potentially correlated aspects of banks' business models. We group banks by the share of loans extended to foreign borrowers; by their country and industry specialization; and control for firms' diversification across lenders. Across specifications, bank diversification maintains its positive and significant effect on loan supply.

The key identification issue for cross-country studies using aggregate data is to control for loan demand. If diversified banks lend to a different set of firms than do banks with a concentrated portfolio, any observed differential change in loan volume reflects both demand and supply effects. Disaggregated data allow us to overcome this challenge. Our bank-firm level analysis employs firm*bank and firm*time fixed effects to absorb all time-varying unobservable firm fundamentals.⁴ The combination of both fixed effects

³We find a similar pecking order when we distinguish banks by whether they have a local affiliate in a borrower country or not. This suggests that distance – and local information – matter when making lending decisions during crises ([Degryse and Ongena, 2005](#); [De Haas and Van Lelyveld, 2014](#); [Bolton, Freixas, Gambacorta and Mistrulli, 2016](#)).

⁴See [Khwaja and Mian \(2008\)](#); [Jiménez, Mian, Peydró and Saurina \(2014a\)](#); [Jiménez, Ongena, Peydró and Saurina \(2014b\)](#); [Morais, Peydró and Ruiz \(2019\)](#).

allows shocks to affect each firm at each point in time heterogeneously and accounts for any change in borrower characteristics. For example, time-varying fixed effects on the firm level absorb changes in firm sales, management, or productivity, while bank*firm fixed effects control for distance between borrowers and lenders. On the firm level, we combine firm with country*industry*time fixed effects to control for time-varying industry demand. The identifying assumption is that loan demand by all firms within the same industry and country changes equally. While, in principle, firm demand could exhibit heterogeneity within industries, we run bank-firm level regressions to confirm that this is of second order importance. The positive effect of diversification on credit hence reflects loan supply factors.

Our results increase in magnitude when we include bank*year fixed effects that control for unobservable time-varying bank characteristics, for example bank size, risk-taking, or capital ratios. In essence, we are comparing lending by the same bank to the same firm during a crisis at different levels of diversification — this is, we hold all unobservable bank characteristics constant. The increase in coefficient size suggests that diversification has a stabilizing effect on lending above and beyond other balance sheet characteristics. Additionally, we match a sub-sample of banks in Dealscan with bank balance sheet data in Bankscope. This allows us to directly control for the marginal effects of several bank characteristics on loan supply during local crises. We show that diversification remains an important and significant explanatory variable for loan supply during crises after controlling for bank size (log assets), Tier 1 capital ratio, share of wholesale deposits, leverage ratio, and return on assets.

Our paper contributes to the literature in two ways. First, and to the best of our knowledge, we are the first paper to study the consequences of banks' geographic diversification in a cross-country setting. So far most studies distinguish banks by headquarters

location into foreign and domestic and look at cross-border lending.⁵ While bank nationality has been shown to be an important determinant of loan supply, our approach reflects the related but distinct dimension of banks' integration into the financial system, captured by their portfolio allocation. Note that both categorizations need not be mutually exclusive. Diversified banks can be foreign, but domestic banks also diversified, depending on the country in which the shock originates. We find that grouping banks by diversification instead of nationality uncovers new patterns that complement existing findings in the literature on banking integration and the behavior of foreign and domestic banks.⁶ The global scope of our detailed bank-firm level data allows for clean identification of credit supply effects as well as external validity.

Second, while the effect of shocks to banks' home markets and consequent spillovers are well explored, few papers investigate the role of banks during distress in local markets.⁷ Many crises over the last two decades were shocks to borrower countries and globally integrated banks were usually heavily involved. During the Asian crisis, Japanese and European banks were exposed to markets in Thailand, the Philippines, or South Korea; and during Argentina's woes, American banks had a strong presence in Latin America. As bank lending is a major source of firm financing, it is important to understand how banks react to local shocks in borrower countries. So far, the discussion has mainly highlighted the costs and benefits of cross-border banking and how foreign banks spread home market shocks to connected markets (Claessens, 2017).

⁵See, for example, Peek and Rosengren (1997, 2000); Cetorelli and Goldberg (2011, 2012); Schnabl (2012); Correa, Sapriza and Zlate (2016); De Haas and Van Horen (2013); De Haas and Van Lelyveld (2014); Ongena, Peydró and Van Horen (2015); Bremus and Neugebauer (2018).

⁶For example, Claessens (2017) summarizes that 'long-term debt flows are less volatile and that foreign banks with larger presence, more domestic funding, and closer relationships provide more finance and share risks better'. We also speak to literature analyzing the real effects of financial shocks and highlighting the relevance of syndicated lending for firm performance. See Giannetti and Laeven (2012); Correa, Sapriza and Zlate (2016); De Haas and Van Horen (2013); Hale, Tümer and Minoiu (2016); Jiménez, Mian, Peydró and Saurina (2014a); Popov and Van Horen (2015); Morais, Peydró and Ruiz (2019); Doerr, Raissi and Weber (2018).

⁷For an exception, see De Haas and Van Lelyveld (2006).

Our results speak to the discussion on retrenchment in financial integration since the global financial crisis (Milesi-Ferretti and Tille, 2011). Since the financial crisis, there has been a significant decline in cross-border banking and financial integration.⁸ In addition, we show that banks’ geographic diversification has declined. The verdict on whether this retrenchment enhances or weakens financial stability is still out. While some studies find that foreign banks adversely affect economic conditions in host markets, our results show that integrated banks with a diversified portfolio smooth local financial shocks. Presence in several markets reduces banks’ exposure to local shocks and gives them better access to new funds, which they can allocate towards countries in distress. This not only stabilizes lending in affected countries, but also mitigates contagion. In light of our results the recent decline in global banking is worrisome, as weaker integration into the global financial system, and hence less geographic diversification, has detrimental effects on stability in host markets.

The remainder of the paper proceeds as follows. Section 2 discusses data and empirical strategy. Section 3 presents our main results and evidence on the mechanism. In Section 4 we check the robustness of our findings to alternative explanations. Section 5 concludes.

2 Data & Empirical Strategy

This section describes data and construction of main variables. We then discuss our empirical strategy to identify changes in loan supply by banks during borrower country banking crises, as well as their real effects on firms.

⁸See also Cerutti and Claessens (2016); Bremus and Fratzscher (2015); Claessens and Van Horen (2015); Bussière, Schmidt and Valla (2016); Emter, Schmitz and Tirpák (2018); European Central Bank (2017).

2.1 Data

Laeven and Valencia’s (2013) Systemic Banking Crises Database provides country-year level information on episodes of financial distress.⁹ From 1995 to 2012, it reports 189 banking crisis (BC) observations on the country-year level. The two conditions that define a banking crisis are *i*) significant signs of financial distress in the banking system (such as bank runs, losses in the banking system, and/or bank liquidations); and *ii*) significant banking policy intervention measures in response to the losses in the banking system. In our sample, there is a concentration of financial turmoil around the time of the Asian crisis and from 2008 onward, during the Global Financial Crisis.

For our main analysis and to construct banks’ diversification we use Dealscan data on syndicated loans, provided by Thomson Reuters. Syndicated lending constitutes a significant share of total lending. Around one-third of total international lending is done through the syndicated loan market (Gadanecz and von Kleist, 2002) and it is an important source of financing in both developed and emerging economies (Cerutti, Hale and Minoiu, 2015). Syndicated loans are issued jointly by a group of banks to a single borrower. The lending syndicate includes at least one lead bank (also called lead arranger) and usually further participant banks. Lead banks negotiate terms and conditions of deals, perform due diligence, and organize participants. Therefore, lead arrangers stand in direct contact with the borrower and retain larger loan shares for signalling purposes (Sufi, 2007). Participants are usually not in direct contact with the borrower, but merely supply credit. Compared to other types of bank loan, syndicated loans are on average larger in volume and issued to bigger borrowers.

Dealscan provides extensive information on syndicated loans at origination, including loan amount, maturity, and interest, as well as identity of lenders and borrowers. All data

⁹While there exist different databases on financial crises, Laeven and Valencia is the most comprehensive for banking crises occurring after 1970 (Chaudron and De Haan, 2014).

are aggregated at banks' and firms' parent level. We restrict our analysis to loans by banks to non-financial firms and consider lending only by commercial, savings, cooperative, and investment banks.¹⁰ We keep both lead arrangers and participants in our sample, and do so for two reasons. First, we are interested in banks' loan portfolio allocation across countries and not specific contractual frictions. As the focal point of our analysis is total credit supply, including both lead arrangers and participants provides a comprehensive picture of the syndicated loan market. Second, excluding participants leads to sample-selection bias. Lead arrangers are large banks operating on a global scale. We aim to compare banks along the dimension of their international diversification. Hence, excluding smaller participant banks with a rather concentrated portfolio will change the control group. Instead of comparing diversified with concentrated banks, focusing on lead arrangers only will lead to a selected group of globally active banks in our sample. We would compare banks' diversification within a group of diversified and internationally integrated banks. To avoid this pitfall, we include leaders and participants in our analysis.¹¹

Bank-firm level We decompose syndicated loan deals into loan portions provided by each lender to obtain granular credit level data. Whenever Dealscan provides information on lending shares of each bank, we use this information to split loan volume accordingly (available for 28% of the deals).¹² In cases where lending shares are missing we split loan volume on a pro-rata basis among all banks in a syndicate. Transactions with deal status

¹⁰In Dealscan, we use lender types Commercial Banks, Finance Companies, Investment Banks, Mortgage Banks, Thrift/S&L, and Trust Companies. Investment banks constitute 3% of our sample and excluding them does not change results. Borrower types included are Corporations, Insurance Companies, Law Firms, Leasing Companies and Other. In robustness checks we exclude borrowers in finance, insurance, and real estate industries.

¹¹In the Online Appendix, we show that our results hold when we include lead arrangers only.

¹²See [Giannetti and Laeven \(2012\)](#); [De Haas and Van Horen \(2013\)](#). In the sub-case of partial information on loan shares, we first use the available information to allocate loan shares. Then, we split the remaining amount equally among banks with missing information. If the sum of the allocation rule is larger than 110% we consider this an erroneous entry and treat it as if lending share information was not available in the first place. In robustness checks, we impute loan shares according to i) the role of the lender (leader or participants) and ii) the syndicate size using respective sample means from non-missing loan shares (see Online Appendix).

‘cancelled’, ‘suspended’, or ‘rumour’ are removed and all loan nominations transformed into million U.S. Dollars (USD) using the spot exchange rate at origination, provided by Dealscan. If after this allocation procedure the loan portion is smaller than USD 10,000 we drop the observation to remove erroneously small loans (0.6% of observations). Overall, we split a total of 293,163 deals into loan portions, although the exact number of observations slightly varies across specifications due to the demanding fixed effects structure.

We next use these loan portions to construct each bank’s outstanding loan volume as a stock variable to proxy the loan’s entry on the loan book (Jiménez, Ongena, Peydró and Saurina, 2014b; Morais, Peydró and Ruiz, 2019). Each outstanding loan remains active until it matures.¹³ We disregard all firm-bank links with zero exposure, that is, we drop all inactive loans one period before the origination of the loan and one period after the loan matures. Therefore, our estimation draws only on variation from non-zero lending outcomes. We aggregate all outstanding loan portions between a bank-firm combination to obtain bank b ’s outstanding loan volume to firm f in year t , which we define as a loan observation.¹⁴

To measure geographic diversification, we construct banks’ distribution of cross-border loans by destination country of its borrowers. Essentially, geographic diversification captures the distribution of bank loans across borrower countries. To construct this metric, we proceed in three steps. First, we sum bank b ’s active loans to all borrowers in country

¹³As Dealscan captures information at loan origination only, this construction assumes that loans are not repaid before maturity and that loan shares are not sold by banks on secondary markets as in Morais, Peydró and Ruiz (2019). To test the relevance of loan share sales by participating banks, we employ robustness checks on lead arrangers only, as they are found to retain a larger loan share for signalling purposes (Sufi, 2007). As results hold, this indicates that reselling loan shares on secondary markets is not driving results (see Online Appendix).

¹⁴Note that we treat relationship and transaction borrowers the same. While literature has shown that the distinction matters during crisis times (Bolton, Freixas, Gambacorta and Mistrulli, 2016), the issue is more important to rather opaque segments, such small businesses lending or local mortgage lending. The syndicated loan market is comprised of large borrowers, where relationships are less important and information is public (for example rating).

j at time t , for example all loans by Deutsche Bank to firms in France. Second, we divide bank b 's lending to all borrowers in country j over bank b 's total lending. Thereby, we obtain bank b 's lending share to country j at time t ($s_{b,j,t}$). For example, Citigroup's lending share to the US is 52% out of its total syndicated lending in 2007. Third, we construct *geographic diversification* as a Herfindahl index using lending shares by country as follows:¹⁵

$$DIV_{b,t} = 1 - \underbrace{\sum_{j=1}^{J^b} s_{b,j,t}^2}_{HHI} \in [0, \frac{J^b - 1}{J^b}], \quad (1)$$

where $s_{b,j,t}$ measures the share of a bank b 's outstanding loans to borrowers in country j relative to its total outstanding loans in year t . Each bank is active in J^b distinct countries, i.e. where it has at least one borrower. We invert the scale of the HHI for ease of interpretation. A value of zero ($DIV = 0$) implies no diversification (all credit goes to borrowers from one country, what we will call *concentrated portfolio*), while higher values reflect increasing diversification of banks' loan portfolios across countries. Building on recent literature, we argue that diversification allows banks to access new funding during local shocks, which they allocate towards borrower countries in crisis (Gilje, Loutskina and Strahan, 2016; Cortés and Strahan, 2017; Levine, Lin and Xie, 2016). A mechanism that is especially important during episodes of financial turmoil (Bord, Ivashina and Taliaferro, 2018). We will discuss the mechanism in more detail below. A potential source of endogeneity is that a bank's decision to diversify is correlated with unobservable bank characteristics. We will discuss identification in Section 2.3.

We merge lending banks active in Dealscan with balance sheet data from Bankscope. To link Dealscan with Bankscope, we match the ultimate parent of the parent institution

¹⁵Note that geographic diversification is constructed independently of a bank's nationality as it depends only on the destination countries. In robustness checks, we use an alternative measure based on parent bank nationality by bank headquarters. See Section 4 for a discussion and details on this distinction.

in Dealscan with the bank holding company in Bankscope by hand using name, address, newspaper reports and bank websites as information.¹⁶ We are able to successfully merge 229 institutions. Once we restrict the sample to banks with consistent information on total assets, share of wholesale deposits, Tier 1 capital ratio, leverage ratio, and return on equity, we end up with a sample of 130 banks and 393,760 bank-firm observations; these cover around one-quarter of the total bank-firm level sample.

Firm level To examine effects of credit supply on firm behavior, we merge our data set with firm balance sheet information. We aggregate firm-bank-year data to the firm-year level and then match borrowers in Dealscan with firms in Compustat based on [Chava and Roberts \(2008\)](#). Combining Dealscan with Compustat reduces observations, since information for some firms, especially smaller ones, are missing in Compustat. Overall, we are able to successfully match around 32% of our firm-year observations. We use information on firms' syndicated loan volume, investment, employment, total assets, sales and fixed assets, where we compute growth rates as log differences.

To capture firms' relationships with geographically diversified banks, we construct firm level metric *exposure*. Intuitively, exposure measures whether firms borrow a lot or little from diversified banks. Specifically, we weight firm f 's outstanding loan volume by each bank with the bank's geographic diversification value ($DIV_{b,t}$) in year t . Then, we divide weighted loan volume by firm f 's total outstanding loan volume in year t across all banks:

$$exposure_{f,t} = \frac{\sum_{b=1}^B DIV_{b,t} \cdot loan_{f,b,t}}{\sum_{b=1}^B loan_{f,b,t}} \in [0, max(DIV_{b,t})], \quad (2)$$

where B is the total number of banks with outstanding loans to firm f in year t . Similar to *diversification* on the bank-firm level, $exposure = 0$ implies that a firm borrows exclusively from concentrated banks ($DIV = 0 \forall B$). Higher values of exposure indicate stronger relationships with diversified banks. An overview over all variables and their units of

¹⁶We would like to thank Camelia Minoiu for providing us with a crosswalk file.

measurement is provided in Table B.1.

2.2 Descriptive Statistics

Figures 1 shows the distribution of *diversification* on the bank-firm level (Panel 1a) and *exposure* on the firm level (Panel 1b). About 8% of all loans are extended by banks with no geographic diversification. The remaining banks have at least some diversification, with a bunching around 0.9. Panel 1b shows that more than 97% of firms borrow from at least one bank with non-zero geographic diversification. The median (mean) firm has 4 (8) bank connections in a given year. This suggests that firms accessing the syndicated loan market are potentially able to substitute across lenders during crises. The median (mean) number of outstanding loans by banks per year is 2 (33).¹⁷

[Figure 1 about here]

Our sample covers the years 1995 to 2012 and includes information on 35,510 firms and 6,962 banks forming a total of 1,621,124 firm-bank-year observations, and 194,726 firm-year observations (9,393 firms and 60,953 observations for the matched Compustat sample). There are a total of 2,046 banks with positive diversification and 4,916 banks with zero geographic diversification. The median (mean) value of *diversification* for banks with non-zero diversification is 0.41 (0.40). The group of diversified banks extends around 93% of all loans, which reflects that they are large lenders. Table 1 highlights the geographical distribution of loans, firms, and banks by region. The majority of loans are extended to borrowers located in Europe, East Asia and Pacific, and North America. Moreover, countries in Europe and Asia have the highest number of geographically diver-

¹⁷In the Online Appendix, we show that excluding the smallest and largest banks (in terms of number of loans) does not materially affect results.

sified banks.¹⁸ North American banks are less diversified as they lend mostly to borrowers located in the U.S. or Canada. Finally, the highest incidence of banking crises occurs in Europe, Asia, and, to a lesser extent, in Latin America.

[[Table 1 about here](#)]

Tables 2 and 3 provide summary statistics of main variables. We split the respective samples by diversification or exposure along the yearly median. For the syndicated loan market, Table 2, Panel (a), shows that loans by geographically diversified banks are larger, have lower interest rates, and are issued at longer maturity than loans by banks with geographically more concentrated portfolios. Panel (b) shows that diversified banks are significantly larger, have a higher share of wholesale deposits, and a lower leverage ratio (for the sample of banks we successfully match to Bankscope). The difference in bank characteristics highlights the need to control for observable and unobservable bank characteristics. In Table 3, Panel (a), the average firm with an above median exposure to diversified banks obtains loans with larger volume, lower interest rates and longer maturity compared to firms with fewer relationships with diversified banks. Panel (b) restricts the sample to firms with balance sheet information from Compustat. Borrowers with high exposure to diversified banks tend to grow slower and are larger than their peers borrowing from banks with a geographically concentrated portfolio. Long-term debt as share of total assets is similar across both groups indicating that they are on average comparable in terms of their need for external finance. Similar to the bank level, the difference in firm characteristics highlights the need to control for firm characteristics to isolate the effects of loan supply. For further general descriptive statistics, see Table 6.

[[Tables 2 and 3 about here](#)]

¹⁸We split geographic diversification along the annual median and denote banks with an above median value as diversified.

2.3 Empirical Strategy and Identification

To analyze lending behavior by geographically diversified banks and their effect on firms, we use two aggregation levels. To isolate loan supply from loan demand, we begin on the bank-firm-year level (*bank-firm level*). We then aggregate our data to the firm-year level (*firm level*) to examine substitution across lenders, as well as real effects.

Bank-firm level Our baseline specification tests how geographic diversification (*DIV*) affects loan volume for each firm-bank pair. To see whether diversification has a positive effect on loan supply during financial turmoil in the borrower country, we interact diversification with a banking crisis dummy (*BC*):

$$\log(\text{loan})_{f,b,t} = \beta_1 BC_{c,t} + \beta_2 DIV_{b,t-1} + \beta_3 BC_{c,t} \times DIV_{b,t-1} + \phi_{f,b} + \tau_t + \psi_{b,t} + \varepsilon_{f,b,t}. \quad (3)$$

Dependent variable $\log(\text{loan})$ denotes the log of outstanding loan volume to firm f by bank b in year t . Banking crisis dummy $BC_{c,t}$ varies at the country level and takes value one during a crisis in firm country c in year t . $DIV_{b,t-1}$ is the geographic diversification index on the bank-year level. We lag DIV by one period to avoid contemporaneous effects of the banking crisis on diversification. $\phi_{f,b}$ denote firm*bank fixed effects, τ_t are either firm*year or country*industry*year fixed effects; $\psi_{b,t}$ denote bank*year fixed effects. We cluster standard errors on the firm-country level (i.e. treatment level) to account for serial correlation within the same borrower country across firms and time. The inclusion of firm*bank fixed effects, combined with a dependent variable in levels, implies an interpretation in changes.¹⁹ Regression (3) is thus similar to a difference-in-

¹⁹In constructing our dependent variable, we closely follow Jiménez, Ongena, Peydró and Saurina (2014b) and Morais, Peydró and Ruiz (2019). The general caveat with bank-firm-time level analysis is the low frequency in the nature of drawing loans, which would give rise to many zeros and limited high-frequency variation in a balanced panel. In robustness checks and the Online Appendix, we report extensive tests to show that our results do not hinge on the exact specification. When we use loan growth

difference regression. The coefficient of interest β_3 reflects the change in loan supply by diversified banks minus the change in loan supply by concentrated banks. If diversified banks have better access to funds during crises, their loan supply is higher compared to less diversified banks. This is, we expect $\beta_3 > 0$.

The key identification challenge is to absorb loan demand and isolate loan supply. Firms borrowing from diversified banks are on average bigger, so loan demand is likely to be correlated with banks' geographic diversification. Due to the granularity of our data, we can overcome this issue. First, with firm*bank fixed effects we exploit the variation within the same firm-bank combination over time and control for unobservable and time-invariant bank and firm heterogeneity (such as industry or location), as well as for unobservable time-invariant characteristics at the bank-firm level, such as relationship or distance. Second, firm*time fixed effects allow shocks to affect each firm at each point in time heterogeneously. Thereby we control for unobservable time-varying firm fundamentals (such as profitability, risk, and other balance sheet characteristics) to identify credit supply.²⁰ Essentially, we are comparing the same firm borrowing from different banks in a given year, while using only the within variation of each bank-firm combination for estimation (Jiménez, Mian, Peydró and Saurina, 2014a). After absorbing any changes in loan demand our estimates reflect loan supply effects.²¹

Since diversification (DIV) is a choice variable, it raises concerns about endogeneity

(both along intensive and extensive margin) as dependent variable, our results are qualitatively similar. The same holds for aggregate regressions at the bank-country-year level with loan growth as dependent variable. Finally, we collapse our sample to a pre/post-crisis cross-section and show that diversified banks see higher loan growth, compared to concentrated banks. We also show that our results are robust to clustering on different levels of aggregation.

²⁰For each firm-year pair, firm*time fixed effects require at least two observations. On the syndicated loan market, around 97% of all loans satisfy this condition. Sample selection is therefore negligible.

²¹Note that firm*year fixed effects may not fully address demand (Paravisini, Rappoport and Schnabl, 2014), since they control for general changes in firm level characteristics, but not differential demand by firms across banks. With this caveat in mind, generally the Khwaja-Mian approach is a reasonable approximation to firms' loan demand. To mitigate the problem of bank-firm selection, we repeat our analysis on the restricted sample of firms that borrow from both diversified and concentrated banks in each year (Khwaja and Mian, 2008). Coefficients for the reduced sample have the similar sign, size and significance as for the full sample (unreported).

in Equation (3). We do not have a bank level instrument to directly solve the problem. Instead, we undertake indirect attempts to address the issue. First, we include bank*year fixed effects to control for unobservable time-varying bank characteristics, for example bank size, risk-taking, or capital ratios. With bank*year fixed effects, we hold all time-varying unobservable bank characteristics constant and compare lending by the *same* bank to the *same* firm (due to firm*time fixed effects) at different levels of diversification. Second, we directly control for observable determinants of diversification at the bank-year level ($X_{b,t}$), interacted with *banking crisis* ($BC_{c,t}$). Controlling for their interaction allows us to isolate the direct effect of diversification on lending. For example, diversified banks could be larger. If larger banks maintain relatively higher loan supply during local crises, the coefficient on diversification would be biased if we do not control for bank size. To this end, we match a sub-sample of banks in Dealscan with bank balance sheet data in Bankscope. As predictors of diversification we include bank size (log assets), Tier 1 capital ratio, the share of wholesale deposits over total deposits, leverage ratio, and return on equity.

Before reporting estimation results for regression equation (3), we investigate the relationship between bank diversification and other bank characteristics. In Table 4 we estimate regressions with diversification as dependent variable and bank covariates as explanatory variables.

[Table 4 about here]

We find that bank size and share of wholesale deposits are statistically and economically significant explanatory variables of diversification. We use two dependent variables, diversification as continuous variable (defined in Equation (1)) and as a dummy with value one for banks with diversification above the yearly median. Columns (1) and (2) compare levels of diversification across banks. $\log(\text{assets})$ and *share wholesale deposits* have

positive coefficients, significant at the 1% level, indicating that diversified banks differ in terms of size and funding structure from concentrated banks. Since our baseline regression (Equation (3)) includes bank*firm fixed effects, it exploits *within*-bank variation. Hence, columns (3) and (4) replicate columns (1) and (2), but add bank fixed effects. Only size remains a significant predictor for diversification in column (3).²² As we will show below, in both specifications – with bank*year fixed effects and bank characteristics interacted with the crisis dummy – main estimates remain similar in terms of sign and significance, with only modest changes in magnitude. These findings alleviate concerns about omitted variable bias.

Firm level On the bank-firm level we observe whether bank diversification matters for loan supply. However, the analysis neglects potential substitution effects and remains silent about the real effects of loan supply on firms. If firms can easily substitute syndicated loans from banks that reduce loan supply with loans by banks that increase loan supply, the substitution offsets the credit contraction of individual banks. In this case, firm exposure to geographically diversified banks is irrelevant for firms’ aggregate syndicated loan growth. Firms may also be able to substitute a fall in syndicated lending through other debt instruments, for example non-syndicated credit or corporate bonds. Such a substitution would imply that we do not find any effect of bank diversification on firms’ total debt or investment, *even if* we find an effect on firms’ syndicated loan growth. Loan supply will only have real effects on firm performance if firms can at most partially substitute the fall in credit.

To test for substitution and real effects, we run the following firm level regression:

²²Note the strong increase in R^2 when adding bank fixed effects, suggesting that most of the variation of diversification within banks is explained by bank characteristics that are constant over time. In other words, diversification is stable over time. In the Online Appendix, we estimate within-bank regressions of bank diversification at the end of our sample on bank diversification at the beginning of the sample. This yields a significant coefficient of 0.64 and R^2 of 0.38, confirming that within-bank diversification is highly correlated over time.

$$\Delta y_{f,t} = \gamma_1 BC_{c,t} + \gamma_2 exposure_{f,t-1} + \gamma_3 BC_{c,t} \times exposure_{f,t-1} + \phi_f + \tau_{c,i,t} + u_{f,t}. \quad (4)$$

In the baseline specification, the dependent variable $\Delta y_{f,t}$ is the log difference of outstanding syndicated loan volume of firm f across *all* its lenders in year t . In further regressions, we use the log difference of total long-term debt to test for substitution into non-syndicated debt instruments. To analyze real effects, we also use investment and employment growth in log differences as dependent variable. Banking crisis dummy ($BC_{c,t}$) varies at the country level and equals one during banking crisis years in firm country c . $exposure_{f,t-1}$ denotes the share of firm f 's outstanding credit by diversified banks as defined in Equation (2), lagged by one period. ϕ_f denote firm fixed effects, and $\tau_{c,i,t}$ denote time-varying country*industry*year fixed effects, where c and i denote firm f 's country and industry. For our Compustat sample we additionally control for time-varying firm demand by including return on assets, leverage, and log of assets. We cluster standard errors on the firm level.

Our main coefficient of interest, γ_3 , is on the interaction term ($BC \times exposure$). γ_3 is the firm level counterpart of β_3 , which is the estimated interaction coefficient ($BC \times DIV$) in bank-firm level Equation (3). γ_3 indicates the change in loan growth for high exposure firms minus the change in loan growth for low exposure firms. If firms can perfectly substitute a fall in lending by one bank with other forms of financing, then $\gamma_3 = 0$. In turn, $\gamma_3 > 0$ suggests imperfect substitution, as higher exposure to diversified banks leads to higher loan growth during crises.

To isolate loan supply, we employ country*industry*time fixed effects to absorb time-varying demand changes for each industry in each country. The identifying assumption is that all firms within one industry of one country change their loan demand equally. How reasonable is it to assume no heterogeneity in firm demand within industries? If there is

differential loan demand within industries, our coefficient is biased and does not reflect supply effects. We test the validity of this identifying assumption on the bank-firm level, in which we compare estimates using country*industry*time fixed effects with estimates employing the more rigorous firm*time fixed effects. As we will show, coefficients are close, but somewhat larger under country*industry*time fixed effects, so we interpret our firm level estimates as an upper bound of the true effect.

3 Results

In Section 3.1 we first establish on the bank-firm level that diversified banks smooth local financial shocks, relative to non-diversified banks. Time-varying borrower fixed effects control for changes in firm demand to isolate supply effects. To examine real effects, we then aggregate to the firm level and show that firms with higher exposure to diversified banks have stronger loan, investment, and employment growth during banking crises. Section 3.2 sheds light on the underlying mechanism and shows that geographically diversified banks raise new funding during crises.

Before moving to the regression analysis, Figure 2 shows the stabilizing effect of diversified banks in a non-parametric way. Panel 2a plots log loan volume in the four years prior, during, and after a banking crisis. We split our sample along the yearly median of *diversification* into loans by diversified (blue solid line) and non-diversified (dashed black line) banks. Loan volume follows a similar trend for diversified and non-diversified banks in the years preceding a crisis. However, it diverges sharply during the crisis. Both types of banks see a sharp and persistent contraction in loan volume, but the decline is almost twice as strong for non-diversified banks. The divergence in loan volume across diversified and concentrated banks corresponds to coefficient β_3 in regression (3). Panel 2a hence suggests that diversified banks provide more credit, relative to concentrated banks. We

now investigate this pattern in greater detail.

3.1 Main Results

Bank-firm level Table 7 reports results for regression Equation (3) and shows that diversified banks maintain higher loan growth during banking crises, relative to non-diversified banks. Column (1) looks at variation within each firm-bank connection and uses fixed effects on the firm*bank level. Diversified banks extend loans with higher volume in general, as indicated by the positive coefficient on *diversification*. The coefficient of interest (β_3) on the interaction term ($DIV \times BC$) is highly significant and positive. During banking crises, increasing diversification by one standard deviation increases loan volume by $(0.31 \times 0.287 =) 8.9\%$. To ensure that the positive effect is due to supply effects, column (2) adds firm*time fixed effects to absorb any time-varying changes in firm demand. The coefficient on banking crisis is now absorbed by firm*year fixed effects. Borrowing from a diversified bank is now not statistically different to borrowing from a non-diversified bank during non-crisis times. The positive effect of diversified banks during banking crises remains significant: increasing diversification by one standard deviation during a banking crisis increases loan volume by 4.9%. Comparing columns (1) and (2), we see that absorbing demand effects reduces the size of the coefficient on the interaction term by around 40%. The change in size suggests that diversified banks lend to borrowers of higher resilience and better quality during crises, highlighting the necessity of absorbing loan demand in our estimation. However, after controlling for loan demand, there remains a positive and significant loan supply effect associated with higher geographic diversification.

[[Table 7 about here](#)]

Figure 2, Panel 2b, plots log loan volume after removing loan demand effects through

firm*time fixed effects.²³ Comparing it to Panel 2a, we see that demand effects explain a large part of the overall decline in loan volume. Strikingly, after removing demand effects, diversified banks maintain their loan supply during the crisis and increase it in the following years. Non-diversified banks reduce loan volume persistently. As in Panel 2a, loan supply follows a similar trend for both bank types prior to the crisis. After absorbing any changes in firm loan demand, Panel 2b illustrates the stabilizing effect of geographic diversification on loan supply.

On the firm level we can no longer control for credit demand through firm*time fixed effects. Instead, we use country*industry*year fixed effects and implicitly assume that firms within the same country-industry-year pair change demand across lenders similarly. To verify this assumption, column (3) estimates bank-firm level regressions with country*industry*year fixed effects. Comparing coefficients with column (2), the coefficient of interest has the same sign and significance, but is larger in magnitude in column (3). Controlling for time-varying industry demand leads to an overestimation of the effect by about 25%. The increase in the coefficient size suggests that within four-digit industries there is heterogeneity in loan demand. We therefore interpret our firm level results as an upper bound of the true effect.

Firm*year fixed effects control for loan demand. However, it could still be that diversified banks fundamentally differ from concentrated banks. Table 2 Panel (b) shows that diversified banks are larger and rely more on wholesale funding. To account for observable and unobservable differences across banks that could be related to diversification, in columns (4)-(6) we include bank balance sheet items and bank*year fixed effects. In column (4), we estimate our baseline regression on the reduced sample of banks that we matched to Bankscope. Although the decline in sample size is sizeable, the estimated

²³We plot the residual of a regression of $\log(\text{loan volume})$ on firm*time fixed effects that absorb any unobservable change in firms' loan demand. After absorbing demand effects the residual reflects banks' credit supply.

coefficients in column (4) are similar in sign, size, and significance to the full sample in column (2). In column (5) we include bank*year fixed effects in addition to bank*firm and firm*year fixed effects to control for unobservable time-varying bank characteristics, for example bank size, risk-taking, capital, or bank nationality. Column (5) thus compares lending by the *same* bank to the *same* firm during a crisis at different levels of diversification – we hold all unobservable bank characteristics constant. Compared to column (4), the coefficient of interest increases in magnitude (the coefficient on diversification is now absorbed by fixed effects). Increasing diversification by one standard deviation during a banking crisis increases firms’ loan volume by 7.6%, suggesting that the positive effect of diversification is not explained by unobservable bank characteristics.

While the positive and significant coefficient on $DIV \times BC$ suggests that bank diversification has a positive effect on loan supply conditional on bank covariates, it could still be that bank characteristics have a differential *marginal* effect during crises. We thus include bank balance sheet items interacted with the banking crisis dummy BC in column (6). The coefficient on $DIV \times BC$ remains positive and significant, but declines in magnitude compared to column (5). While banks with a higher share of wholesale deposits also exhibit significantly higher loan supply during local crises, diversification maintains its statistically and economically significant effect. We thus conclude from column (1)-(6) that the stabilizing effect of diversified banks is due neither to borrower loan demand effects, nor explained by time-varying unobservable bank characteristics, and robust to controlling for the marginal effect of major bank balance sheet variables during local banking crises.

Finally, columns (7) and (8) repeat the estimation in columns (5) and (6), but use the growth rate in lending as dependent variable. We find a strong and significant positive effect of bank diversification on bank loan growth in both specifications.²⁴ All in all

²⁴To account for the extensive margin, i.e. the beginning and end of bank-firm relationships, we standardize the change in lending by its respective mid-points $\Delta vol_{b,f,t} = \frac{vol_{b,f,t} - vol_{b,f,t-1}}{vol_{b,f,t} + vol_{b,f,t-1}} \times 2$. This

results in Table 7 show that diversified banks sustain higher loan supply during crisis times, relative to banks with a concentrated loan portfolio.

Firm level Loan level regressions identify changes in individual firm-bank connections. If firms can substitute between bank types during banking crises, changes in individual loans need not affect firms. To examine whether credit supply shocks have real effects, we aggregate to the firm-year level. Tables 8 and 9 show results for regression Equation (4). Firms with higher exposure to diversified banks fare better during banking crises, relative to firms with low exposure.

[[Tables 8 and 9 about here](#)]

In Table 8, column (1) controls for unobservable time-invariant firm characteristics through firm fixed effects. The dependent variable is loan growth $\Delta loan_{f,t}$. In line with expectations, the coefficient on *exposure* is negative, because diversified banks lend predominately to larger firms in developed economies, which have lower average growth rates. The negative coefficient on banking crisis implies that borrowers' credit growth declines by 14.2% during banking crises when they have no connections to diversified banks (*exposure*= 0). Higher exposure to diversified banks attenuates the negative effect. The coefficient on the interaction term of exposure and banking crisis (*exposure* \times *BC*) is positive and statistically significant at the 1 % level. Increasing exposure from the 25th to 75th percentile increases loan growth during a crisis by $(0.39 \times 0.055 =)$ 2.1%. To remove time-varying demand shocks, column (2) absorbs shocks on the country*year level, column (3) on the more granular country*industry*year level. In both specifications, coefficients are of similar sign, magnitude, and significance. In our preferred specification in column (3), moving a firm from the 25th to 75th percentile in terms of exposure to

definition bounds growth rates to lie in $[-2, 2]$, where -2 implies that a bank terminated a relationship with a borrower, and 2 that it formed a new one. We find that our results are qualitatively similar, but decline in magnitude, when we focus on changes along the intensive margin (unreported).

diversified banks leads to 1.5% higher loan growth. Average loan growth equals 3.6%, so the positive effect of borrowing from diversified banks is sizeable. The effect on the firm level is similar in size to effects on the bank-firm level. This suggests that frictions keep firms from switching across lenders during recessions, a common finding in the literature (Ongena and Smith, 2001; Chodorow-Reich, 2014).

In Table 9 we restrict our sample to firms for which we have balance sheet information. We use long-term debt, employment, and investment as dependent variables (all in log differences). For each dependent variable, we run a parsimonious specification with firm fixed effects, as well as one enriched with time-varying firm controls and time-varying fixed effects at the country*year level.²⁵ We consistently find that firms borrowing from diversified banks have significantly higher growth rates during crises. Moving borrowers from the 25th to 75th percentile in terms of exposure to diversified banks leads to higher long-term debt (4.1%, column (2)), employment (1.1%, column (4)), and investment growth (4.6%, column (6)) during crises. Similar to loan growth in Table 8, growth rates are lower for high-exposure borrowers in normal times and fall during banking crises. Controlling for common time-varying shocks on the country level as well as time-varying firm controls in general reduces the magnitude and significance of the effect.

Our loan and firm level findings show that firms can at most imperfectly substitute declines in syndicated lending with other forms of funding. Otherwise, exposure in previous periods would not affect loan growth in Table 8. The positive effects of exposure in Table 9 on long-term debt, as well as investment and employment, additionally indicate that firms cannot substitute from syndicated into non-syndicated lending. In sum, Tables 7–9 establish that changes on the syndicated loan market have economic consequences that cannot be undone through other forms of credit. Borrowing from diversified banks significantly increases firms’ loan growth during times of local financial distress.

²⁵Unfortunately, the low number of observations per industry leads to a large loss of observations when we use country*industry*year fixed effects.

3.2 Mechanism

We argue that geographic diversification across countries gives banks better access to new funding, for example to wholesale deposits, during local shocks in one of their borrower countries. Our argument is based on recent literature that causally shows that diversified banks have lower risk, because geographic expansion reduces exposure to idiosyncratic local shocks (Goetz, Laeven and Levine, 2016). Better diversification and lower risk improve access to funding, especially during crises times (Levine, Lin and Xie, 2016; Bord, Ivashina and Taliaferro, 2018).²⁶ In this section we provide evidence that banks that are geographically diversified across countries are financially less constrained during local shocks. We first show direct evidence for the subset of banks that borrow on the syndicated loan market, as well as for banks for which we have balance sheet data. We then report indirect evidence for the full sample of banks that lend in our syndicated loan market sample.

To shed light on banks' liability side, we analyze bank *borrowing* on the syndicated loan market. First, for all financial institutions (SIC codes 6000-6199, 35,876 loans) that borrow on the syndicated loan market, we construct the yearly log-change in banks' syndicated borrowing in a given year.²⁷ This provides us with a sample of 351 banks and 2,964 bank-year observations across 53 countries. Second, we use our matched Dealscan-Bankscope sample of 130 banks and use the change in absolute (or share over total) wholesale deposits as dependent variable (704 bank-year observations, 23 countries). To see whether host country shocks lead to an increase in deposits for diversified banks, we then regress banks' interbank borrowing or wholesale deposit growth on their diversifica-

²⁶Related papers show that banks use their internal capital market to distribute resources among affiliates to smooth local shocks. See for example Morgan, Rime and Strahan (2004); Goldberg (2009); Cetorelli and Goldberg (2012); Buch and Goldberg (2015); Coleman, Correa, Feler and Goldrosen (2017); Cortés and Strahan (2017).

²⁷We compute bank b 's syndicated (interbank) borrowing from lenders $l \in L$ in year t as $interbank_{b,t} = \sum_{l=1}^L loan_{b,l,t}$.

tion (*DIV*), interacted with a dummy equals one if at least one borrower country is in crisis (*loans in crisis*):

$$\begin{aligned} \Delta y_{b,t} = & \gamma_1 \text{loans in crisis}_{b,t} + \gamma_2 \text{diversification}_{b,t-1} \\ & + \gamma_3 \text{loans in crisis}_{b,t} \times \text{diversification}_{b,t-1} + \phi_b + \tau_t + u_{b,t}. \end{aligned} \tag{5}$$

Regressions include bank and bank country*year fixed effects. We include the latter to control for changes in economic conditions in banks' home countries, since we want to isolate the effect of host country financial shocks. We additionally control for bank size, Tier 1 capital ratio, and return on equity in Bankscope regressions. If diversified banks can tap new funds during times of distress, we expect a positive effect of diversification on interbank borrowing and wholesale deposits ($\gamma_3 > 0$). We cluster standard errors on the bank level.

[[Table 10 about here](#)]

Table 10 shows that diversified banks see a relative increase in interbank borrowing if there is a crisis in a borrower country. For the Dealscan sample, column (1) shows that for the average bank, interbank (syndicated) borrowing falls during crises. This could reflect that depositors question liquidity or solvency of the bank when parts of its loans are in distress. Looking at interaction terms, we find that diversified banks strongly increase their borrowing during crises. Increasing diversification by one standard deviation leads to an increase in syndicated borrowing of 5.9%. Thus, diversified banks raise new funds in the interbank market when faced with a shock in borrowing countries. The same is true when we replace the dependent variable with a dummy that takes on value one if a bank sees an increase in total bank-borrowing in a given year (column (2)). To control for unobservable bank characteristics and unobservable shocks to banks' home countries, each regression in

columns (1)-(4) includes bank and bank country*year fixed effects. Since Dealscan does not provide balance sheet data, we strengthen identification in columns (3)-(4) by adding fixed effects at the bank size*year level (where bank size is defined as quintiles of total bank loan volume in a given year), to better control for unobservable differences across banks of different size. Results narrow slightly in magnitude, but coefficients of interest remain significant at the 5% level.

For the Bankscope sub-sample, columns (5) and (7) use the change in total bank wholesale deposits as dependent variable, columns (6) and (8) the change in the share of wholesale deposits (over total deposits). All specifications use bank and bank country*year fixed effects, columns (7)-(8) add bank controls. Across specifications, diversification has a positive effect on wholesale funding during crises. In column (5), a one-standard deviation increase in diversification raises wholesale deposit growth by around 4%. The strong positive effect of diversification on deposit growth supports the hypothesis that diversified banks can raise new funds during times of distress. All in all, Table 10 provides evidence that diversified banks can raise new funds in the interbank market to maintain lending during local shocks.

Table 10 uses data for a subset of banks to provide direct support for the mechanism. We now use data on the universe of banks extending loans (to non-financial borrowers) in the syndicated loan market to further investigate the importance of geographic diversification for access to funding. If banks are financially constrained, they cannot raise new funds when facing a negative shock (Stein, 1997). Instead, they must trade off where to allocate existing liquidity within their bank network. Any reallocation of funds towards crisis countries will then lead to negative spillover effects to borrower markets that are connected to the bank. This is not the case if unconstrained banks can raise new funds – as suggested by results in Table 10. By analyzing changes in loan supply in connected countries, we can provide indirect evidence on banks’ access to new funds for *all* banks

in our sample.

For illustration, suppose there is a negative financial shock in Germany. Will a bank that is active in Germany and France move funds from France to Germany and reduce lending in France to prop up German affiliates? Or can it raise new funds to stabilize lending in Germany while maintaining loan supply in France? The answer to the question has important implications, as the former implies spillover effects to unaffected markets, while the latter does not. To measure spillover effects we aggregate the data to the bank-borrower country-year level. We define the dummy variable $connected_{b,k,t}$ that equals one for all non-crisis countries k ($\neq j$) in year t , to which bank b is lending in t , if at least one other borrower country j of bank b experiences a banking crisis in t . The coefficient on $connected$ shows how bank b , in response to a crisis in j , changes its lending to all *connected countries* k that do not experience a crisis themselves (in the spirit of Giroud and Mueller (2015, 2017)).²⁸ We run regressions of the following form:

$$\begin{aligned} \Delta loan_{b,j,t} = & \phi_{b,j} + \tau_t + \rho_1 BC_{j,t} + \rho_2 connected_{b,k,t} + \rho_3 DIV_{b,t-1} \\ & + \rho_4 DIV_{b,t-1} \times BC_{j,t} + \rho_5 DIV_{b,t-1} \times connected_{b,k,t} + u_{b,j,t}, \end{aligned} \quad (6)$$

where the dependent variable is loan growth by bank b to all borrowers in country j at t in log differences. DIV is our diversification metric on the bank level. We use bank-borrower country ($\phi_{b,j}$) and time (τ_t) fixed effects to analyze changes within a bank-borrower country connection and absorb common trends. We expect banking crises to affect loan growth negatively, so $\rho_1 < 0$. If there are spillover effects, connected markets see a fall in loan growth and $\rho_2 < 0$.²⁹ From our previous results, we expect that diversified banks stabilize loan growth in host country j , so $\rho_4 > 0$. If diversified banks are financially

²⁸For example, for a bank that lends to Germany, France, and Italy, where only Germany experiences a crisis in 2005, $connected$ takes value one for France and Italy in 2005, and zero otherwise.

²⁹Since our data are a bank-country-year panel, note that for connected countries k , coefficients ρ_2 and ρ_5 reflect the effect on changes in loans by bank b to country k , so $\Delta loan_{b,k,t}$.

unconstrained, they mitigate spillover effects and the coefficient on the interaction term ($DIV \times connected$) is positive ($\rho_5 > 0$). In other words, if $\rho_5 > 0$ we conclude that diversified banks have better access to new financing during host market shocks. We cluster standard errors on the borrower country (treatment) level to account for cross-sectional dependence across borrowers.

Table 11 shows that globally diversified banks have higher loan growth in crisis countries, and shield connected countries from spillovers. Column (1) reports a negative and significant coefficient on *banking crisis* (BC) which implies that banks reduce lending by 12.3% in affected countries. The negative coefficient on *connected* shows that banks reduce lending by 7% in unaffected countries when another borrowing country experiences a banking crisis. The spillover effect is about two-thirds the size of the coefficient on banking crisis. The positive and highly significant coefficients on $DIV \times BC$ and $DIV \times connected$ show that diversified banks stabilize loan supply in their host country, and reduce contagion effects. Moving a bank from the 25th to the 75th percentile reduces spillover effects from -7% to almost zero. Fully diversified banks are thus able to offset the crisis-induced decline in loan supply both in affected and connected countries. When we control for unobservable characteristics on the borrower country level by including borrower country*year fixed effects in column (2), coefficients decline somewhat in magnitude, but remain qualitatively close to column (1). Effects remain highly significant.³⁰

[Table 11 about here]

Our argument rests on the assumption that a diversified loan portfolio insures against local crises, so that diversified banks are financially less constrained. To provide further evidence on the mechanism, columns (3)-(6) show that diversification is no longer stabilizing when a significant share of banks' total loan portfolio is in distress. For each

³⁰Note that BC is now absorbed by fixed effects. We cannot include bank*year fixed effects, because $DIV \times connected$ varies on the bank-year level and would then be absorbed.

bank, we first compute its yearly share of loans extended to borrowers in countries with a banking crisis. We then define *low distress* as bank-year observations for which the share is below the yearly median (i.e. only a low share of banks' total loan portfolio is in distress), and *high distress* those for which it is above (i.e. a significant share of banks' asset side is subject to a shock). Results show that diversified banks stabilize lending in crisis and connected countries during periods of low distress – when they are expected to be financially unconstrained (column (3)). During high distress in column (4), there is no stabilizing effect, in line with the hypothesis that financial constraints bind also for diversified banks during ‘global shocks’.³¹ As an alternative, we split the sample by the yearly median according to the share of banks' borrower countries in crisis (out of total bank borrower countries). *few (many) crises* denotes bank-year observations for which a small (large) fraction of borrower countries experiences a crisis.³² Results in columns (5)-(6) are similar to those in columns (3)-(4). Diversification is stabilizing during ‘local crises’, but no longer provides benefits during crises that affect a significant share of banks' borrower countries.

Table 11 suggest that there is a difference between *within* and *across* country diversification. We analyze systemic banking crises, i.e. crises that affect a whole country. Diversification *within* one country provides insurance against idiosyncratic local shocks in a given country; it does not provide insurance against a country-wide (systemic) shock. Instead, diversification *across* countries provides insurance even during local systemic crises, as long as only a modest share of banks' host markets is hit by shocks. However, the larger the fraction of borrower markets in distress, the lower the benefits of diversification across countries. We interpret our results in Tables 10 and 11 as evidence that being geographically diversified allows banks to tap into new funds during crises, which

³¹Note that in column (4), we restrict the sample to banks with at least some loans under distress. Hence, banking crisis always has value one and connected value zero, so the coefficients on *diversification*, *BC*, and *connected* are no longer separately identified.

³²The correlation between our *distress* and *crisis* dummies is 0.73.

reduces the need to withdraw capital from other markets. The ability to raise new funds stabilizes banks' loan growth in the crisis country, but also shields connected markets from negative spillovers.

4 Extensions & Robustness

In this section, we highlight the importance of banks' nationality and address potential alternative explanations for our findings. To ensure identification of supply effects, we run variants of loan level regression Equation (3). In all regressions, firm*bank and firm*time fixed effects absorb credit demand.

Foreign banks and local affiliates Diversified banks lend a significant share of their loans to foreign markets. A large literature finds that foreign and domestic banks differ during crisis episodes, which raises the concern that our classification by portfolio allocation reflects banks' nationality (Claessens, 2017). Table 12 shows that a categorization of banks by diversification is different from a categorization by nationality. We include a foreign bank dummy that takes on value one if a banks' home country is not equal to its host country.³³ Column (1) shows that foreign banks reduce lending by 1.6% more than domestic banks during banking crises, but the effect is insignificant. Once we include our diversification metric in column (2), a non-diversified foreign bank significantly reduces loan supply by 4.4%. Diversified banks, on the other hand, are still stabilizing. The coefficient on $DIV \times BC$ remains positive and significant at the 1% level once we control for banks' nationality. This suggests that domestic banks with a diversified portfolio are the most stabilizing source of funding. We confirm this finding in column (3), where we interact the foreign dummy with diversification. The triple-interaction effect

³³As nationality is constant within firm-bank connections, the coefficient on foreign bank is absorbed by fixed effects.

between diversification and foreign bank during banking crises is significant and negative. The coefficient on interaction term $DIV \times BC$ (*foreign bank* $\times BC$) remains positive (negative) and significant at the 1% (10%) level. In terms of economic significance, effects differ extensively across bank types. During banking crises, non-diversified foreign banks reduce lending by 1.7%. Domestic banks that are diversified increase their relative loan supply by 7.9%. The intermediate group of diversified foreign banks increases loan supply by 2.2%. Results in columns (1)-(3) confirm the following pecking order: diversified domestic banks ($DIV = 1$, foreign bank = 0) are the most stable source of funding, while foreign banks with little diversification ($DIV = 0$, foreign bank = 1) are the most fickle. Foreign diversified banks lie in the middle. The ordering ties with findings on the flight home effect ([Giannetti and Laeven, 2012](#)) and behavior of gross capital flows during crises ([Broner, Didier, Erce and Schmukler, 2013](#)): Literature has shown that banks and domestic agents often protect their home markets during times of distress.

To further shed light on the role of distance and nationality, columns (4)-(6) repeat the same regressions, but replace the *foreign bank* dummy with the dummy *local affiliate*. *local affiliate* takes on value one if a bank operates an affiliate or subsidiary in the borrower country, and value zero otherwise.³⁴ Literature has shown that local presence and distance to borrowers matter for lending decisions, especially during crisis times ([Degryse and Ongena, 2005](#); [De Haas and Van Lelyveld, 2014](#); [Bolton, Freixas, Gambacorta and Mistrulli, 2016](#)). When we include *local affiliate*, we find that banks with local affiliates behave similar to domestic banks: Column (4) shows that banks with local affiliates stabilize lending during host market shocks, relative to banks without local affiliate. Including our diversification measure in a horse race in column (5), we find that diversification still matters for loan supply above and beyond having a local affiliate. Finally, column (6) presents a similar picture as column (3). Diversified banks are stabilizing, especially if they have a local affiliate in the crisis country.

³⁴We use data on subsidiaries from Dealscan.

[[Table 12 about here](#)]

Portfolio risk Banks differ in terms of borrower risk (Neuhann and Saidi, 2018; Levine, Lin and Xie, 2016). If diversified banks extend loans to less risky borrowers, they are less exposed to the negative effects of a crisis. To address this issue, for each bank we compute portfolio risk by taking the standard deviation of sales growth for each firm in non-crisis years. We consider non-crisis years only, as the stabilizing role of diversified banks during crises could lead to a downward bias in measured volatility. Table 5 shows that firms with low exposure to diversified banks are riskier in terms of volatility of investment, employment, asset, and sales growth. Firms are assigned into top and bottom tercile according to their exposure for each year.³⁵ In Table 13, column (1), we control for banks' portfolio risk, interacted with the banking crisis dummy, in column (2) we interacted portfolio risk with diversification and the crisis dummy. Diversified banks still have significantly higher loan supply. Once we include portfolio risk (interacted with banking crisis) in column (1), we see that higher portfolio risk reduces loan supply during a banking crisis.³⁶ However, the main coefficient of interest on $DIV \times BC$ remains positive and significant. Including a triple interaction effect in column (2) keeps the main coefficient stable. We also see that higher portfolio risk reduces loan supply for non-diversified banks. The insignificant triple interaction term indicates that portfolio risk has no differential effect through diversification. Since we absorb borrower characteristics through firm*year fixed effects, this is to be expected. We interpret this as evidence that portfolio risk is not responsible for the stabilizing effect we find, but that banks' diversification still leads to significantly higher loan supply during crises.

[[Tables 5 and 13 about here](#)]

³⁵We restrict the analysis to observations for which we have balance sheet data, which reduces the number of loan level observations by around 60%.

³⁶Portfolio risk is constant for banks and thus absorbed by fixed effects.

Alternative measures of diversification The fact that banks extend international loans could itself reflect a different business model, regardless of diversification, and be responsible for our main findings. To take into account the international allocation of banks’ loan portfolio, analogous to our diversification metric in Equation (1) we define banks’ international portfolio as the ratio of international loans to total loans.³⁷ Column (3) in Table 13 shows that diversification, not internationality, leads to positive loan supply effects. Banks with a fully international portfolio reduce loan supply by 1.6% during crises, but the coefficient is insignificant. The positive stabilizing role of diversified banks remains. Columns (4)-(6) control for additional bank specialization metrics. Column (4) introduces banks’ *country share*, i.e. the share of loans by bank b to country c in a given year t , out of bank b ’s total loans in year t . Similarly, column (5) adds banks’ *industry share*, i.e. the share of loans by bank b to industry i in a given year t . These columns address the fact that banks might have superior knowledge in certain geographies or industries (De Jonghe, Dewachter, Mulier, Ongena and Schepens, 2019). We find that bank diversification still significantly increases loan supply during crises. Column (6) investigates whether *firm* diversification matters. For each borrower, we construct a (1-Herfindahl index) of its loans (analogous to bank diversification in equation (1)). Firms that borrow from multiple banks to a similar extent receive a higher value. We define dummy *firm DIV* that takes on value one if a firm is in the top tercile of borrower diversification in a given year. If diversified firms borrow from diversified firms, our diversification metric reflects that borrowers can switch among lenders. When we interact *DIV* with *firm DIV* and the banking crisis dummy, we find this not to be the case: The coefficient on the triple interaction term is insignificant and close to zero, while the

³⁷International portfolio is defined as $INT_{b,t} = \frac{intl. \text{ syndicated loan volume}_{b,t}}{total \text{ syndicated loan volume}_{b,t}} \in [0, 1]$. *Intl. syndicated loan volume* $_{b,t}$ is the sum of all loans by bank b in year t to firms located in a different country than the bank’s parent entity. *Total syndicated loan volume* $_{b,t}$ is total lending in year t to all firms, domestic and foreign. We call banks with a low value of *INT* ‘national’, those with a high value ‘international’.

coefficient on $DIV \times BC$ remains positive and highly significant.³⁸

Finally, columns (7)-(8) show a horse race of diversification (DIV) vs. alternative metrics. Column (7) uses bank*firm and firm*year fixed effects, column (8) adds bank*year fixed effects. The interaction term $DIV \times BC$ maintains its positive and significant coefficient across specifications. Controlling for other potential bank specialization measures increases the size of the coefficient on $DIV \times BC$. We conclude that diversification, not banks' portfolio risk, lending to foreign borrowers, industry, or country specialization explain the positive effects on loan supply during host country banking crises.

Online Appendix The Online Appendix presents extensions and further robustness checks of our baseline findings. We show that effects are stronger for financially constrained firms; and that, following a crisis, there is a shift in firms' portfolios towards lending by diversified banks. We also show that our results are robust to excluding FIRE industries, as well as smallest and largest banks; including lead arrangers only; excluding loans with on lender, credit lines and term loans; and when we split loan shares based on imputation instead of pro-rata. We further show that, while diversification affects loan supply, its effect on interest rates and maturity is negligible once we control for lender and borrower characteristics through time-varying fixed effects. Finally, we show that the significance of our results is insensitive to different levels of clustering.

5 Conclusion

We develop a metric to categorize banks according to the geographic diversification of their international loan portfolio. For a large sample of international syndicated loans,

³⁸Note that our regressions include bank*firm fixed effects and firm*year fixed effects. We thus compare changes in lending within the same firm-bank combination and account for unobservable borrower characteristics that vary over time (including firm diversification). Hence, the insignificant coefficient likely reflects the fact that we are controlling for firms' funding structure.

we find that diversified banks are a resilient source of financing for firms that experience a countrywide financial crisis. Borrowing from diversified banks increases loan, investment, and employment growth. Detailed bank-firm level data ensure identification of supply effects, as we absorb changes in unobservable borrower characteristics through time-varying fixed effects on the firm level. Our results show that diversification allows banks to raise new funds during times of distress. This not only stabilizes loan supply in affected countries, but also reduces spillover effects to connected markets.

When we contrast our measure with the standard classification by nationality, we find that diversified domestic banks are the most resilient source of financing, while foreign banks provide no insurance. The negative effect of foreign banks increases with the concentration of their portfolio. We also exclude candidate explanations other than diversification. Geographic diversification remains a significant factor contributing to higher stability in lending even after we control for banks' international orientation, industry specialization, and portfolio risk.

This paper contributes to the debate on the costs and benefits of financial integration. Figure 3 shows that bank diversification declined during the Global Financial Crisis and remained depressed thereafter. Our results suggest that the recent retrenchment in financial integration following the Global Financial Crisis is worrisome (Milesi-Ferretti and Tille, 2011; Cerutti and Claessens, 2016; Claessens and Van Horen, 2015). While cross-border lending constitutes a potential source of contagion, we show that internationally active and geographically diversified banks have better access to funds during banking crises in their borrower countries and increase resilience to local shocks.

References

- Abadie, Alberto, Susan Athey, Guido W. Imbens, and Jeffrey M. Wooldridge (2017) “When Should You Adjust Standard Errors for Clustering?”, *NBER Working Paper* (24003).
- Almeida, Heitor and Murillo Campello (2007) “Financial Constraints, Asset Tangibility, and Corporate Investment”, *Review of Financial Studies*, 20 (5), pp. 1429–1460.
- BCBS (2013) “Global systemically important banks: updated assessment methodology and the higher loss”, *Bank for International Settlements*, July.
- Bolton, Patrick, Xavier Freixas, Leonardo Gambacorta, and Paolo Emilio Mistrali (2016) “Relationship and Transaction Lending in a Crisis”, *Review of Financial Studies*, 29 (10), pp. 2643–2676.
- Bord, Vitaly M., Victoria Ivashina, and Ryan D. Taliaferro (2018) “Large Banks and Small Firm Lending”, *NBER Working Paper* (25184).
- Bremus, Franziska and Marcel Fratzscher (2015) “Drivers of structural change in cross-border banking since the global financial crisis”, *Journal of International Money and Finance*, 52, pp. 32–59.
- Bremus, Franziska and Katja Neugebauer (2018) “Reduced cross-border lending and financing costs of SMEs”, *Journal of International Money and Finance*, 80, pp. 35–58.
- Broner, Fernando A., Tatiana Didier, Aitor Erce, and Sergio L. Schmukler (2013) “Gross capital flows: Dynamics and crises”, *Journal of Monetary Economics*, 60 (1), pp. 113–133.
- Buch, Claudia M. and Linda S. Goldberg (2015) “International Banking and Liquidity Risk Transmission: Lessons from across Countries”, *IMF Economic Review*, 63 (3), pp. 377–410.
- Bussière, Matthieu, Julia Schmidt, and Natacha Valla (2016) “International Financial Flows in the New Normal: Key Patterns (and Why We Should Care)”, *EIB Working Papers*, 2016/02.
- Cerutti, Eugenio and Stijn Claessens (2016) “The Great Cross-Border Bank Deleveraging: Supply Constraints and Intra-Group Frictions”, *Review of Finance*, 21 (1), pp. 201–236.
- Cerutti, Eugenio, Galina Hale, and Camelia Minoiu (2015) “Financial crises and the composition of cross-border lending”, *Journal of International Money and Finance*, 52, pp. 60–81.

- Cetorelli, Nicola and Linda S. Goldberg** (2011) “Global Banks and International Shock Transmission: Evidence from the Crisis”, *IMF Economic Review*, 59 (1), pp. 41–76.
- Cetorelli, Nicola and Linda S. Goldberg** (2012) “Liquidity management of U.S. global banks: Internal capital markets in the great recession”, *Journal of International Economics*, 88 (2), pp. 299–311.
- Chaney, Thomas, David Sraer, and David Thesmar** (2012) “The Collateral Channel: How Real Estate Shock Affect Corporate Investment”, *American Economic Review*, 102 (6), pp. 2381–2409.
- Chaudron, Raymond and Jakob De Haan** (2014) “Identifying and dating systemic banking crises using incidence and size of bank failures”, *DNB Working Paper*, 406.
- Chava, Sudheer and Michael R. Roberts** (2008) “How does financing impact investment? the role of debt covenants”, *Journal of Finance*, 63 (5), pp. 2085–2121.
- Chodorow-Reich, Gabriel** (2014) “The Employment Effects of Credit Market Disruptions: Firm-level Evidence from the 2008-09 Financial Crisis”, *Quarterly Journal of Economics*, 129 (1), pp. 1–59.
- Claessens, Stijn** (2017) “Global Banking: Recent Developments and Insights from Research”, *Review of Finance*, 21 (4), pp. 1513–1555.
- Claessens, Stijn and Neeltje Van Horen** (2015) “The Impact of the Global Financial Crisis on Banking Globalization”, *IMF Economic Review*, 63 (4).
- Coleman, Nicholas, Ricardo Correa, Leo Feler, and Jason Goldrosen** (2017) “Internal Liquidity Management and Local Credit Provision”, *FRB International Finance Discussion Paper* (1204).
- Correa, Ricardo, Horacio Saprizza, and Andrei Zlate** (2016) “Liquidity Shocks, Dollar Funding Costs, and the Bank Lending Channel during the European Sovereign Crisis”, *Supervisory Research and Analysis Working Papers*, 16 (4).
- Cortés, Kristle Romero and Philip E. Strahan** (2017) “Tracing out Capital Flows: How Financially Integrated Banks respond to Natural Disasters”, *Journal of Financial Economics*, 125 (1), pp. 182–199.
- De Haas, Ralph and Neeltje Van Horen** (2013) “Running for the exit? International bank lending during a financial crisis”, *Review of Financial Studies*, 26 (1), pp. 244–285.
- De Haas, Ralph and Iman Van Lelyveld** (2006) “Foreign banks and credit stability in Central and Eastern Europe. A panel data analysis”, *Journal of Banking and Finance*, 30 (7), pp. 1927–1952.

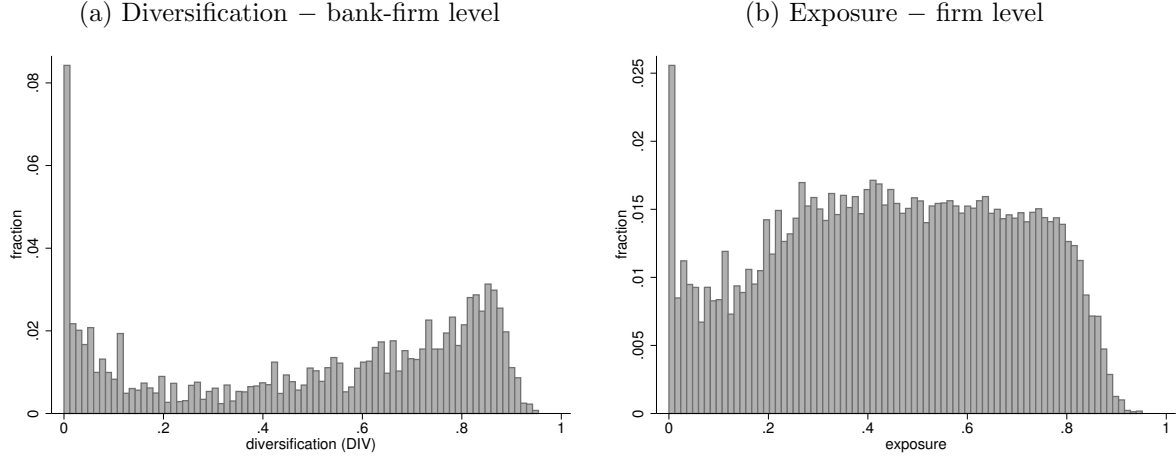
- De Haas, Ralph and Iman Van Lelyveld** (2010) “Internal capital markets and lending by multinational bank subsidiaries”, *Journal of Financial Intermediation*, 19 (1), pp. 1–25.
- De Haas, Ralph and Iman Van Lelyveld** (2014) “Multinational banks and the global financial crisis: Weathering the perfect storm?”, *Journal of Money, Credit and Banking*, 46 (1), pp. 333–364.
- De Jonghe, Olivier, Hans Dewachter, Klaas Mulier, Steven Ongena, and Glenn Schepens** (2019) “Some Borrowers are More Equal than Others: Bank Funding Shocks and Credit Reallocation”, *Review of Finance* (forthcoming).
- Degryse, Hans and Steven Ongena** (2005) “Distance, Lending Relationships, and Competition”, *Journal of Finance*, 40 (1), pp. 231–266.
- Doerr, Sebastian, Mehdi Raissi, and Anke Weber** (2018) “Credit-Supply Shocks and Firm Productivity in Italy”, *Journal of International Money and Finance*, October (87), pp. 155–171.
- Emter, Lorenz, Martin Schmitz, and Marcel Tirpák** (2018) “Cross-border banking in the EU since the crisis: what is driving the great retrenchment?”, *ECB Working Paper Series* (2130).
- European Central Bank** (2017) “Financial Integration in Europe”, *Annual Report on Financial Integration in Europe*.
- Gadanecz, Blaise and Karsten von Kleist** (2002) “Do syndicated credits anticipate BIS consolidated banking data?”, *BIS Quarterly Review* (March), pp. 65–74.
- Giannetti, Mariassunta and Luc Laeven** (2012) “The flight home effect: Evidence from the syndicated loan market during financial crises”, *Journal of Financial Economics*, 104 (1), pp. 23–43.
- Gilje, Erik P., Elena Loutskina, and Philip E. Strahan** (2016) “Exporting Liquidity: Branch Banking and Financial Integration”, *Journal of Finance*, 71 (3), pp. 1159–1184.
- Giroud, Xavier and Holger Mueller** (2017) “Firms’ Internal Networks and Local Economic Shocks”, *NBER Working Paper* (23176).
- Giroud, Xavier and Holger M. Mueller** (2015) “Capital and Labor Reallocation within Firms”, *Journal of Finance*, 70 (4), pp. 1767–1804.
- Goetz, Martin R., Luc Laeven, and Ross Levine** (2016) “Does the geographic expansion of banks reduce risk?”, *Journal of Financial Economics*, 120 (2), pp. 346–362.
- Goldberg, Linda S.** (2009) “Understanding Banking Sector Globalization”, *IMF Staff Papers*, 56 (1), pp. 171–197.

- Hale, Galina, Kapan Tümer, and Camelia Minoiu** (2016) “Crisis Transmission in the Global Banking Network”, *IMF Working Paper*, 16 (91).
- Jiménez, Gabriel, Atif Mian, José-Luis Peydró, and Jesús Saurina** (2014a) “The Real Effects of the Bank Lending Channel”, *Working Paper*.
- Jiménez, Gabriel, Steven Ongena, José-Luis Peydró, and Jesús Saurina** (2014b) “Hazardous Times for Monetary Policy: What do Twenty-Three Million Bank Loans Say About the Effects of Monetary Policy on Credit Risk Taking?”, *Econometrica*, 82 (2), pp. 463–505.
- Kalemli-Ozcan, Sebnem, Elias Papaioannou, and Fabrizio Perri** (2013a) “Global banks and crisis transmission”, *Journal of International Economics*, 89 (2), pp. 495–510.
- Kalemli-Ozcan, Sebnem, Elias Papaioannou, and José-Luis Peydró** (2013b) “Financial Regulation, Financial Globalization, and the Synchronization of Economic Activity”, *Journal of Finance*, 68 (3), pp. 1179–1228.
- Kerl, Cornelia and Friederike Niepmann** (2016) “What determines the composition of international bank flows?”, *International Finance Discussion Papers* (1170).
- Khwaja, Asim Ijaz and Atif Mian** (2008) “Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market”, *American Economic Review*, 98 (4), pp. 1413–1442.
- Laeven, Luc and Fabián Valencia** (2013) “Systemic Banking Crises Database”, *IMF Economic Review*, 61 (2), pp. 225–270.
- Levine, Ross, Chen Lin, and Wensi Xie** (2016) “Geographic Diversification and Banks’ Funding Costs”, *NBER Working Paper* (22544).
- Milesi-Ferretti, Gian Maria and Cédric Tille** (2011) “The Great Retrenchment: International Capital Flows During the Global Financial Crisis”, *Economic Policy*, 26 (66), pp. 289–346.
- Morais, Bernardo, José-Luis Peydró, and Claudia Ruiz** (2019) “The International Bank Lending Channel of Monetary Policy Rates and QE: Credit Supply, Reach-for-Yield, and Real Effects”, *Journal of Finance*, 74 (1), pp. 55–90.
- Morgan, Donald P., Bertrand Rime, and Philip E. Strahan** (2004) “Bank Integration and State Business Cycles”, *Quarterly Journal of Economics*, 119 (4), pp. 1555–1584.
- Neuhann, Daniel and Farzad Saidi** (2018) “Do universal banks finance riskier but more productive firms?”, *Journal of Financial Economics*, 128 (1), pp. 66–85.

- Ongena, Steven, José-Luis Peydró, and Neeltje Van Horen** (2015) “Shocks Abroad, Pain at Home? Bank-Firm Level Evidence on the International Transmission of Financial Shocks”, *IMF Economic Review*, 63 (4), pp. 698–750.
- Ongena, Steven and David C. Smith** (2001) “The Duration of Bank Relationships”, *Journal of Financial Economics*, 61, pp. 449–475.
- Paravisini, Daniel, Veronica Rappoport, and Philipp Schnabl** (2014) “Dissecting the Effect of Credit Supply on Trade: Evidence from Matched Credit-Export Data”, *Review of Economic Studies*, 82 (1), pp. 333–359.
- Peek, Joe and Eric S. Rosengren** (1997) “The International Transmission of Financial Shocks: The Case of Japan”, *American Economic Review*, 87 (4), pp. 495–505.
- Peek, Joe and Eric S. Rosengren** (2000) “Implications of the globalization of the banking sector: the Latin American experience”, *New England Economic Review*, pp. 45–62.
- Popov, Alexander and Neeltje Van Horen** (2015) “Exporting sovereign stress: Evidence from syndicated bank lending during the euro area sovereign debt crisis”, *Review of Finance*, 19 (5), pp. 1825–1866.
- Schnabl, Philipp** (2012) “The International Transmission of Bank Liquidity Shocks: Evidence from an Emerging Market”, *Journal of Finance*, 67 (3), pp. 897–932.
- Stein, Jeremy C.** (1997) “Internal Capital Markets and the Competition for Corporate Resources”, *Journal of Finance*, 52 (1), pp. 111–133.
- Sufi, Amir** (2007) “Information Asymmetry and Financing Decisions: Evidence from Syndicated Loans”, *Journal of Finance*, 62 (2), pp. 629–668.

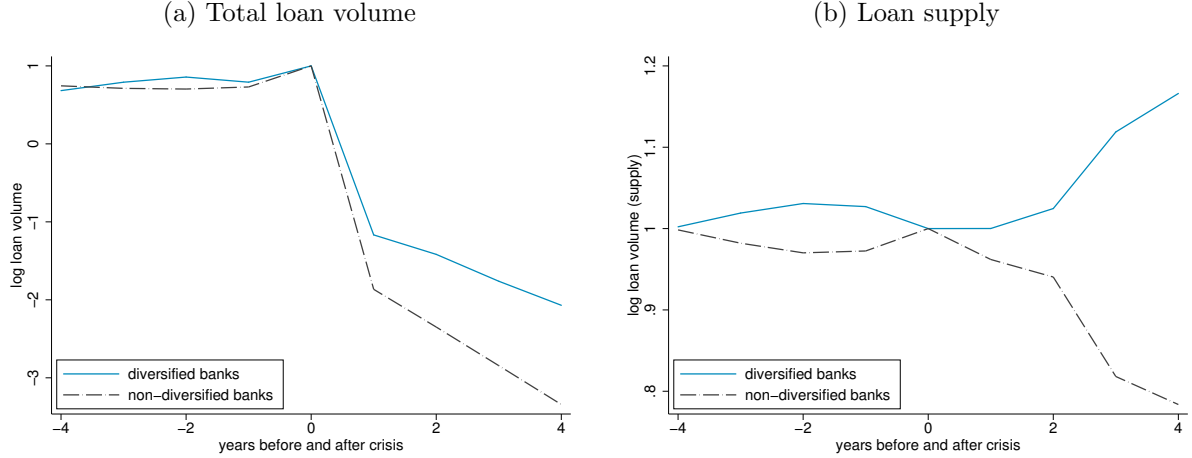
A Tables and Figures

Figure 1: Bank diversification and firm exposure



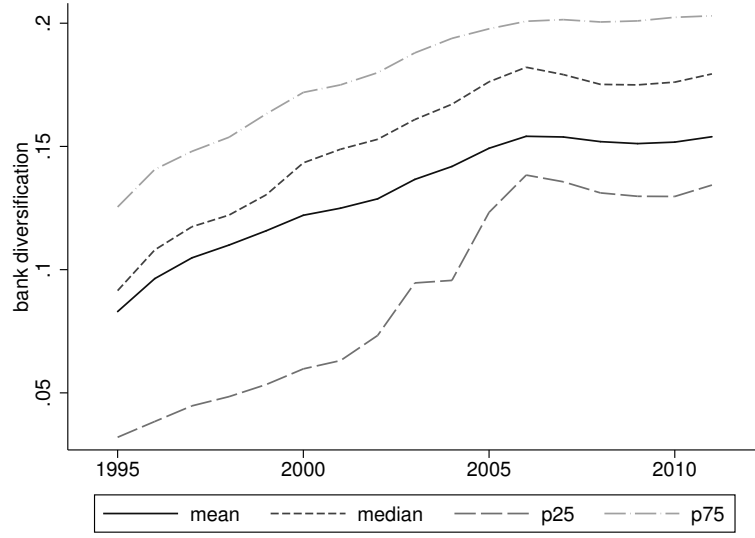
Note: Figure 1a shows the loan level distribution of bank diversification, Figure 1b the firm level distribution of firm exposure. The mass of observations shifts from the right tail towards the middle, indicating that most firms borrow from both diversified and concentrated banks. For detailed variable definitions see Table B.1 and text.

Figure 2: Loan volume during a crisis



Note: Both panels show the evolution of $\log(\text{loan volume})$ in the four years prior, during, and the four years after a banking crisis. A value of 0 on the x-axis denotes the year of the banking crisis. We split the sample by the yearly median for banks with high and low values of diversification. Loan volume is normalized to 1 in year 0. Panel 2a shows the unconditional average across all banks. Both diversified and concentrated banks see a decline in outstanding loan volume during the crisis and the following years, but concentrated banks see a stronger fall. Panel 2b plots the residual of a regression of $\log(\text{loan volume})$ on firm*time fixed effects that absorb unobservable change in loan demand. After absorbing demand effects, both lines reflect changes in loan supply. Diversified banks do not reduce loan supply during the crisis and increase it in the following years, while concentrated banks reduce loan volume during and after the crisis. For detailed variable definitions see Table B.1 and text.

Figure 3: Banks' diversification over time



Note: This figure shows the change in bank diversification over time. Diversification is computed according to equation (1). It plots mean, median, 25th, and 75th percentile from 1995 to 2012. Diversification increased steadily until around 2006, but decreased during the recent global financial crisis and remains depressed since. Lower percentiles decline stronger. For detailed variable definitions see Table B.1 and text.

Table 1: **Summary statistics – by region**

	loans	firms	banks	DIV	BC
East Asia and Pacific	344'024	8'767	1642	266	28
Europe and Central Asia	379'177	6'033	1118	269	128
Latin America and Caribbean	396'22	626	126	21	24
Middle East and North Africa	30'164	334	176	54	0
North America	800'634	19'176	3'711	74	6
South Asia	20'379	458	116	8	0
Sub-Saharan Africa	7'124	116	73	14	3
Total	1'621'124	35'510	6'962	706	189

Note: This table reports the geographic breakdown of our sample. *loans* denotes the number of firm-bank-year observations, *firms* and *banks* the number of individual firms and banks. *DIV* stands for diversification and denotes the number of banks with non-zero geographic diversification. Finally, *BC* stands for banking crisis and denotes the number of country-year observations with banking crises. For detailed variable definitions see Table B.1 and text.

Table 2: **Summary statistics – bank-firm and bank level**

Panel (a): Bank-firm level (Dealscan)

	diversified		concentrated		mean diff.
	mean	sd	mean	sd	t
Δ loan volume	0.03	(0.36)	0.01	(0.34)	-23.95
loan volume (m)	105.98	(304.67)	76.75	(237.82)	-68.21
loan spread (bp)	134.21	(105.80)	187.96	(127.72)	259.99
maturity (months)	75.43	(47.77)	70.82	(41.13)	-65.91
Observations	797132		823992		1621124

Panel (b): Bank level (Bankscope)

	diversified		concentrated		mean diff.
	mean	sd	mean	sd	t
diversification (DIV)	0.72	(0.21)	0.16	(0.20)	-62.52
log(assets)	12.29	(1.65)	10.76	(1.64)	-17.76
Tier 1 capital ratio	10.17	(5.42)	10.62	(3.70)	1.14
share wholesale deposits	0.32	(0.23)	0.29	(0.31)	-2.82
leverage ratio	4.72	(2.80)	7.10	(2.99)	11.86
return on equity	12.28	(25.08)	12.84	(27.48)	1.49
Observations	697		706		1403

Note: Panel (a) shows descriptive statistics on the bank-firm-year (loan) level, Panel (b) on the bank-year level for the smaller sample matched to Bankscope. The sample is split by the yearly median according to bank diversification. Above median observations are denoted *diversified*, those below as *concentrated*. *mean* denotes the mean, *sd* the standard deviation, and *mean diff.* the t-value for the difference in means across both groups. For detailed variable definitions see Table B.1 and text.

Table 3: **Summary statistics – firm level**

Panel (a): Dealscan

	high exposure		low exposure		mean diff.
	mean	sd	mean	sd	t
Δ loan volume	0.04	(0.39)	0.03	(0.39)	-2.34
loan volume (m)	763.80	(1982.62)	323.47	(723.77)	-65.52
loan spread (bp)	169.81	(130.74)	235.06	(137.16)	92.05
maturity (months)	83.62	(64.15)	64.91	(42.38)	-76.95
Observations	99948		99986		199934

Panel (b): Compustat

	high exposure		low exposure		mean diff.
	mean	sd	mean	sd	t
Δ employment	0.03	(0.17)	0.03	(0.20)	2.96
Δ investment	0.03	(0.59)	0.04	(0.64)	2.66
Δ sales	0.07	(0.32)	0.09	(0.22)	6.66
investment ratio	0.22	(1.39)	0.23	(0.26)	1.71
return on assets	0.06	(0.08)	0.06	(0.11)	-4.76
employment (th)	17.04	(37.40)	6.48	(15.09)	-45.22
log total assets	8.51	(2.30)	6.48	(2.06)	-115.61
market to book ratio	1.58	(1.01)	1.61	(1.11)	2.06
long-term debt ratio	0.25	(0.20)	0.24	(0.22)	-7.53
Observations	29613		33168		62781

Note: Panel (a) shows descriptive statistics for the full sample of Dealscan firms. Panel (b) shows descriptive statistics for the smaller sample of matched Compustat firms. The samples are split by the yearly median according to firm exposure. Above median observations are denoted *high exposure*, those below as *low exposure*. *mean* denotes the mean, *sd* the standard deviation, and *mean diff.* the t-value for the difference in means across both groups. For detailed variable definitions see Table B.1 and text.

Table 4: **Determinants of bank diversification**

VARIABLES	(1) DIV (cont)	(2) DIV (median)	(3) DIV (cont)	(4) DIV (median)
log(assets)	0.080*** (0.017)	0.113*** (0.031)	0.072* (0.038)	0.042 (0.045)
Tier 1 capital ratio	-0.000 (0.004)	-0.004 (0.008)	-0.001 (0.001)	-0.001 (0.001)
share wholesale deposits	0.437*** (0.102)	0.602*** (0.146)	-0.064 (0.048)	-0.219** (0.108)
leverage ratio	-0.014 (0.011)	-0.024 (0.018)	0.009 (0.007)	-0.017 (0.015)
return on equity	0.001* (0.001)	0.002 (0.001)	0.000 (0.000)	0.000 (0.000)
Observations	761	761	756	756
R-squared	0.336	0.282	0.956	0.890
Bank FE	-	-	Yes	Yes

Note: This table shows determinants of bank diversification, as defined in equation (1). Dependent variable is *diversification* or a dummy with value one if diversification is above the yearly median, and zero if below. Bank balance sheet data are from Bankscope. For detailed variable definitions see Table B.1 and text. All standard errors are clustered on the bank level. *** p<0.01, ** p<0.05, * p<0.1

Table 5: **Risk – firm level**

	high exposure		low exposure		mean diff.
	mean	sd	mean	sd	t
investment growth sd	0.53	(0.32)	0.61	(0.36)	9.49
employment growth sd	0.14	(0.10)	0.16	(0.11)	7.73
assets growth sd	0.18	(0.15)	0.19	(0.16)	3.65
sales growth sd	0.18	(0.14)	0.17	(0.12)	-2.20
Observations	3805		3963		7768

Note: This table shows descriptive statistics on the firm-year (firm) level for the sample of matched Compustat firms. *Risk* is defined as firms' standard deviation of investment/employment/asset/sales growth in non-crisis times. The sample is split by the yearly median according to firm exposure. High exposure firms are denoted *high exposure*, those with low exposure as *low exposure*. *mean* denotes the mean, *sd* the standard deviation, and *mean diff.* the t-value for the difference in means across both groups. For detailed variable definitions see Table B.1 and text.

Table 6: **General descriptive statistics**

	mean	sd	min	max	count
<i>Panel (a): Bank-firm</i>					
log(loan vol)	2.95	2.29	-4.31	6.88	1621124
diversification (DIV)	0.49	0.31	0.00	0.95	1621124
Δ vol (int)	0.01	0.31	-1.39	1.61	395989
Δ vol	0.01	0.88	-2.00	2.00	485107
<i>Panel (a): Bank</i>					
log(assets)	12.04	1.57	6.87	15.08	654
Tier 1 capital ratio	0.11	0.06	0.00	1.09	654
wholesale deposits	0.27	0.23	0.00	1.00	654
leverage ratio	0.05	0.03	0.00	0.29	654
return on equity	0.06	0.21	-1.00	1.00	654
<i>Panel (b): Firm</i>					
Δ loan volume	0.04	0.39	-7.87	9.94	196446
exposure	0.44	0.24	0.00	0.95	196446
Δ long-term debt	0.04	0.64	-3.38	3.38	54515
Δ employment	0.03	0.19	-0.98	0.99	52295
Δ investment	0.03	0.62	-2.94	2.43	55377
log total assets	7.43	2.38	1.81	15.27	52809
return on assets	0.06	0.09	-0.93	0.34	52809
leverage	0.31	0.21	0.00	1.67	52809

Note: This table shows descriptive statistics for main variables. For detailed variable definitions see Table B.1 and text.

Table 7: Diversified banks have higher loan supply during local crises

VARIABLES	(1) log(loan vol)	(2) log(loan vol)	(3) log(loan vol)	(4) log(loan vol)	(5) log(loan vol)	(6) log(loan vol)	(7) Δ vol	(8) Δ vol
banking crisis (BC)	0.011 (0.011)							
diversification (DIV)	0.321* (0.191)	-0.021 (0.062)	-0.020 (0.070)	0.059 (0.101)				
DIV \times BC	0.287*** (0.025)	0.158*** (0.016)	0.223*** (0.017)	0.187*** (0.053)	0.247*** (0.073)	0.176** (0.086)	0.295*** (0.082)	0.275*** (0.082)
log(assets) \times BC						0.018 (0.011)		0.000 (0.011)
WS deposits \times BC						0.133*** (0.043)		0.039 (0.046)
Tier 1 capital ratio \times BC						0.001 (0.001)		0.000 (0.002)
leverage ratio \times BC						0.007 (0.006)		-0.001 (0.007)
return on equity \times BC						-0.000 (0.000)		0.000 (0.000)
Observations	1,621,124	1,621,124	1,621,124	393,763	393,760	393,760	485,107	485,107
R-squared	0.955	0.977	0.966	0.979	0.979	0.979	0.851	0.851
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Year FE	-	Yes	-	Yes	Yes	Yes	Yes	Yes
Country*Industry*Year FE	-	-	Yes	-	-	-	-	-
Bank*Year FE	-	-	-	-	Yes	Yes	Yes	Yes

Note: This table shows regressions on the bank-firm-year (loan) level. Dependent variable is log of total outstanding loan volume in columns (1)-(6); and loan growth along the extensive margin in columns (7)-(8). This definition bounds growth rates to lie in $[-2, 2]$, where -2 implies that a bank terminated a relationship with a borrower, and 2 that it formed a new one. We find that our results are qualitatively similar, but decline in magnitude, when we focus on changes along the intensive margin (unreported). *banking crisis (BC)* is a dummy with value one during banking crises in the firm country, as defined in [Laeven and Valencia \(2013\)](#); *diversification (DIV)* is banks' geographic diversification. For detailed variable definitions see Table B.1 and text. Standard errors are clustered on the firm country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 8: **Firms borrowing from diversified banks have higher loan growth in crises**

VARIABLES	(1) Δ loan volume	(2) Δ loan volume	(3) Δ loan volume
banking crisis	-0.142*** (0.006)		
exposure	-0.475*** (0.019)	-0.185*** (0.021)	-0.182*** (0.022)
exposure \times BC	0.055*** (0.014)	0.050*** (0.017)	0.039** (0.019)
Observations	196,337	196,337	196,038
R-squared	0.138	0.172	0.317
Firm FE	Yes	Yes	Yes
Country*Year FE	-	Yes	-
Country*Industry*Year FE	-	-	Yes

Note: This table shows regressions on the firm-year (firm) level. Dependent variable is log difference of firms' total outstanding loan volume; *banking crisis (BC)* is a dummy with value one during banking crises in the firm country, as defined in [Laeven and Valencia \(2013\)](#); *exposure* is firms' exposure to diversified banks. For detailed variable definitions see Table B.1 and text. Standard errors are clustered on the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 9: **Firms borrowing from diversified banks: real effects**

VARIABLES	(1) Δ long-term debt	(2) Δ long-term debt	(3) Δ employment	(4) Δ employment	(5) Δ investment	(6) Δ investment
banking crisis	-0.084*** (0.023)		-0.064*** (0.006)		-0.131*** (0.017)	
exposure	-0.269*** (0.037)	-0.261*** (0.049)	-0.155*** (0.013)	-0.074*** (0.014)	-0.242*** (0.032)	-0.163*** (0.038)
exposure \times BC	0.131*** (0.043)	0.105* (0.057)	0.071*** (0.012)	0.029** (0.014)	0.123*** (0.034)	0.119*** (0.042)
Observations	53,574	49,340	51,445	47,496	54,638	51,845
R-squared	0.172	0.233	0.279	0.349	0.137	0.231
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country*Year FE	-	Yes	-	Yes	-	Yes
Controls	-	Yes	-	Yes	-	Yes

Note: This table shows regressions on the firm-year (firm) level. Dependent variables are log difference of firms' long-term debt, employment, and investment; *banking crisis (BC)* is a dummy with value one during banking crises in the firm country, as defined in [Laeven and Valencia \(2013\)](#); *exposure* is firms' exposure to diversified banks. Regression include *log total assets*, *return on assets*, and *leverage* as firm level controls. For detailed variable definitions see Table B.1 and text. Standard errors are clustered on the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 10: Diversified banks can raise new funding during crises

VARIABLES	(1) DS Δ loan vol	(2) DS P(increase)	(3) DS Δ loan vol	(4) DS P(increase)	(5) BS Δ WS dep	(6) BS Δ WS dep (share)	(7) BS Δ WS dep	(8) BS Δ WS dep (share)
loans in crisis (dummy)	-0.145** (0.065)	-0.151 (0.109)	-0.103 (0.074)	-0.134 (0.109)	-0.268** (0.115)	-0.141 (0.172)	-0.274*** (0.102)	-0.149 (0.163)
Diversification (DIV)	-0.298 (0.219)	-0.140 (0.251)	-0.373* (0.225)	-0.219 (0.258)	-0.478*** (0.157)	-0.361 (0.236)	-0.402*** (0.140)	-0.279 (0.223)
DIV \times loans in crisis (dummy)	0.337*** (0.121)	0.420** (0.181)	0.271** (0.132)	0.408** (0.185)	0.402*** (0.088)	0.202 (0.132)	0.425*** (0.079)	0.232* (0.126)
Observations	2,694	2,694	2,694	2,694	704	704	704	704
R-squared	0.567	0.628	0.589	0.638	0.459	0.378	0.573	0.447
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size*Year FE	-	-	Yes	Yes	-	-	-	-
Bank Controls	-	-	-	-	-	-	Yes	Yes

Note: This table shows regressions on the bank-year level for Dealscan (DS) and Bankscope (BS) data. The dependent variables are log differences in bank-to-bank syndicated loans in columns (1) and (3) and a dummy with value one if banks see an increase in loan volume in columns (2) and (4); and the change in wholesale deposits (absolute or as share of total deposits) in columns (5)-(8). *loans in crisis* is a dummy if banks have a positive share of loans extended to countries with a banking crisis, as defined in [Laeven and Valencia \(2013\)](#); *diversification (DIV)* is banks' geographic diversification. Regressions in columns (5)-(8) include *log(assets)*, *tier 1 capital ratio*, and *return on equity* as bank controls. For detailed variable definitions see Table B.1 and text. Standard errors are clustered on the bank level. *** p<0.01, ** p<0.05, * p<0.1

Table 11: Diversified banks mitigate spillover effects

VARIABLES	(1) Δ loan vol.	(2) Δ loan vol.	(3) low distress Δ loan vol.	(4) high distress Δ loan vol.	(5) few crises Δ loan vol.	(6) many crises Δ loan vol.
banking crisis (BC)	-0.123*** (0.025)					
connected	-0.070*** (0.016)	-0.039*** (0.013)	0.012 (0.011)		0.006 (0.014)	
diversification (DIV)	-0.093*** (0.020)	-0.091*** (0.017)	-0.054*** (0.014)		-0.034** (0.014)	
DIV \times BC	0.113*** (0.038)	0.039 (0.030)	0.035* (0.020)	-0.077** (0.038)	0.055* (0.030)	-0.072** (0.030)
DIV \times connected	0.073*** (0.023)	0.053*** (0.019)	0.040** (0.017)	-0.047 (0.042)	0.034* (0.020)	-0.065* (0.034)
Observations	180,115	180,115	108,545	70,603	108,935	70,180
R-squared	0.120	0.200	0.201	0.310	0.210	0.293
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	-	-	-	-	-
Borrower Country*Year FE	-	Yes	Yes	Yes	Yes	Yes

Note: This table shows regressions on the bank-firm country-year (bank) level. Dependent variable is the log difference of total outstanding loan volume by bank b to all borrowers in country j ; *banking crisis (BC)* is a dummy with value one during banking crises in the firm country, as defined in [Laeven and Valencia \(2013\)](#); *diversification (DIV)* is banks' geographic diversification. *connected* is a dummy with value one for all countries k connected to bank b that have no contemporaneous banking crisis when j has a crisis. *low distress* denotes bank-year observations for which banks' share of loans (out of total bank loans) extended to borrowers in crisis countries is below the yearly median, *high distress* those for which it is above. *few (many) crises* denotes bank-year observations for for which banks' share of borrower countries in crisis (out of total bank borrower countries) is below (above) the yearly median. For detailed variable definitions see Table B.1 and text. Standard errors are clustered on the borrower-country-year level. *** p<0.01, ** p<0.05, * p<0.1

Table 12: Foreign banks and local affiliates

VARIABLES	(1) foreign log(loan vol)	(2) foreign log(loan vol)	(3) foreign log(loan vol)	(4) affiliate log(loan vol)	(5) affiliate log(loan vol)	(6) affiliate log(loan vol)
diversification (DIV)		-0.005 (0.053)	0.001 (0.046)		0.001 (0.052)	-0.020 (0.044)
DIV \times BC		0.082*** (0.029)	0.079*** (0.016)		0.043** (0.017)	0.057 (0.040)
foreign bank \times BC	-0.016 (0.017)	-0.044** (0.020)	-0.017* (0.009)			
DIV \times foreign bank			0.006 (0.019)			
DIV \times foreign bank \times BC			-0.047*** (0.011)			
local affiliate \times BC				0.054*** (0.014)	0.056*** (0.014)	0.067** (0.031)
DIV \times local affiliate						0.028 (0.066)
DIV \times local affiliate \times BC						-0.017 (0.036)
Observations	1,656,881	1,656,881	1,656,881	1,656,881	1,656,881	1,656,881
R-squared	0.976	0.976	0.976	0.976	0.976	0.976
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table shows regressions on the bank-firm-year (loan) level. Dependent variable is the log of total outstanding loan volume; *banking crisis (BC)* is a dummy with value one during banking crises in the firm country, as defined in [Laeven and Valencia \(2013\)](#); *diversification (DIV)* is banks' geographic diversification. *foreign bank* is a dummy with value one if bank country and firm country differ. *local affiliate* is a dummy with value one if a bank has an affiliate in the borrower country. For detailed variable definitions see Table B.1 and text. Standard errors are clustered on the firm country level. *** p<0.01, ** p<0.05, * p<0.1

Table 13: Crisis loans and portfolio risk

VARIABLES	(1) risk log(loan vol)	(2) risk log(loan vol)	(3) GBP log(loan vol)	(4) country share log(loan vol)	(5) industry share log(loan vol)	(6) firm DIV log(loan vol)	(7) horse race log(loan vol)	(8) horse race log(loan vol)
diversification (DIV)	-0.045 (0.064)	-0.043 (0.060)	-0.032 (0.076)	0.056 (0.045)	0.009 (0.066)	-0.032 (0.061)	-0.012 (0.049)	
DIV \times BC	0.165*** (0.011)	0.168*** (0.015)	0.177*** (0.025)	0.182*** (0.041)	0.148*** (0.015)	0.151*** (0.018)	0.201*** (0.048)	0.147*** (0.054)
portfolio risk (sales) \times BC	-0.015*** (0.005)	-0.035*** (0.010)					-0.013** (0.006)	0.007 (0.009)
DIV \times portfolio risk (sales) \times BC		0.046 (0.032)						
int. portfolio (INT)			0.031 (0.040)				0.056** (0.026)	
INT \times BC			-0.016 (0.015)				-0.009 (0.017)	-0.058 (0.047)
country share				0.278*** (0.064)			0.233*** (0.068)	0.560*** (0.053)
BC \times country share				0.008 (0.046)			0.030 (0.064)	0.030 (0.024)
industry share					0.426*** (0.066)		0.441*** (0.081)	1.824*** (0.089)
BC \times industry share					-0.096*** (0.035)		-0.149*** (0.026)	-0.072 (0.120)
DIV \times firm DIV						0.038 (0.024)	0.047** (0.020)	0.017 (0.021)
DIV \times BC \times firm DIV						0.010 (0.024)		
Observations	1,548,327	1,548,327	1,642,260	1,642,260	1,642,260	1,642,260	1,548,327	1,540,841
R-squared	0.975	0.975	0.977	0.977	0.977	0.977	0.975	0.977
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank*Year FE	-	-	-	-	-	-	-	Yes

Note: This table shows regressions on the bank-firm-year (loan) level. Dependent variable is log of total outstanding loan volume; *banking crisis (BC)* is a dummy with value one during banking crises in the firm country, as defined in [Laeven and Valencia \(2013\)](#); *diversification (DIV)* is banks' geographic diversification. *portfolio risk (sales)* is banks' portfolio risk, measured as the average standard deviation of borrowers' sales growth in non-crisis times. *int. portfolio (INT)* is banks' portfolio share that is extended to foreign borrowers. *country share* denotes the share of loans by bank b to country c , *industry share* the share of loans by bank b to industry i . *firm DIV* denotes firm diversification across lenders. For detailed variable definitions see Table B.1 and text. Standard errors are clustered on the firm country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

B Variable Definitions

Table B.1: Variable definitions

variable	description/item	unit/comment
loan volume	outstanding syndicated loans	million
loan spread	interest spread over LIBOR	basis points
maturity	loan maturity	months
banking crisis (BC)	banking crisis in borrower country	dummy
connected	connected countries with no contemporaneous banking crisis	dummy
diversification (DIV)	diversification index	[0,1-1/J], bank level
exposure	firm exposure to diversified banks	[0,1-1/J], firm level
(bank) assets	Total Assets (data11350, BS)	million
(bank) Tier 1 capital ratio	Tier 1 Ratio (data2130,BS)	%
(bank) whole sale deposit share	Deposits from Banks to Total Deposits (data2185/data11580, BS)	%
(bank) leverage ratio	Total Assets to Tier 1 Capital (data11350/data2140, BS)	%
(bank) return on equity (ROE)	Return On Avg Equity (data4025, BS)	%
(firm) investment ratio	capx/ppent _{t-1} (CS)	%
(firm) long-term debt ratio	dltt/at (CS)	%
(firm) employment	emp (CS)	thousand
(firm) sales	sale (CS)	million
(firm) assets	at (CS)	million
(firm) return on assets (ROA)	(opid - depam)/at (CS)	%
(firm) sales growth	ln(sale _t) - ln(sale _{t-1}) (CS)	%
(firm) payout ratio	(dvt + prstk)/oibdp (CS)	%
(firm) fixed assets	ppe (CS)	million
(firm) capital-labor ratio	ppe/emp (CS)	%
foreign bank (FB)	borrower country \neq lender country	dummy, bank level
international portfolio (INT)	int. loan volume to total loan volume	[0,1], bank level
great financial crisis (GFC)	years 2008-2010	dummy
regional BC	regional banking crisis for Asia, Latin America, Europe, and US	dummy
home BC	banking crisis in lender country	dummy, bank level
share of loans in crisis	share of syndicated loans extended to crisis countries in year t	%
portfolio risk (sales)	standard deviation of borrower sales growth in non-crisis times	

Note: CS stands for Compustat, BS for Bankscope.

C Online Appendix

Diversification and international portfolio Figure C.2 plots both metrics against each other, where international portfolio (INT) is on the x-axis, and banks' geographic diversification (DIV) on the y-axis (the blue line represents the quadratic fit). The humped shaped relationship that fans out for higher values of INT reflects the conceptual differences underlying each metric: banks that only lend domestically are in the bottom left corner (local on both metrics). Banks that lend exclusively to one foreign country are in the bottom right corner. They are globally integrated by our second definition (INT), but concentrated by our first (DIV), as they lend internationally but are not diversified.³⁹ The dispersion in diversification for a given level of 'internationality' indicates that banks lending internationally differ widely in the geographic allocation of their portfolio – being international does not automatically imply diversification. That being said, the correlation between both metrics is high (0.81).

Financial constraints, maturity, and interest rates We split firms into financially constrained and unconstrained. As constrained firms rely more on external credit to finance employment and investment, higher exposure to diversified banks should have stronger effects. For each year we group firms into bottom and top tercile according to their payout ratio (*payout*) and size (*size*). We classify firms as financially constrained if they are in the bottom tercile, and unconstrained if they are in the top tercile (Almeida and Campello, 2007; Chaney, Sraer and Thesmar, 2012). In Table C.1, columns (1)-(4) use employment growth as dependent variable, columns (5)-(8) investment growth. All regressions include baseline controls, as well as firm and country*year fixed effects. For both dependent variables, the positive effect of exposure to diversified banks during crises is significantly stronger for constrained (*cons.*) than unconstrained (*uncons.*) firms. Note that our Compustat sample covers large and listed firms. The stronger effects for financially constrained firms reassure us that effects would extend to a sample covering small firms as well. In general, small firms are found to be more bank dependent and also more credit constrained and therefore loan supply decisions matter more.

Beside changes in loan amount, banks can alter maturity or the interest rate of loans. To test whether banks use these margins to restrict or expand loan supply, we rerun firm level regression Equation (4), but replace the dependent variable by *maturity* (in months), and *interest spread* over LIBOR (in basis points). Table C.2 shows that borrowing from diversified banks leads to a higher spread and longer maturity during crises. While the effect on maturity is quantitatively negligible and insignificant, a one standard deviation increase in exposure increases the spread by around 7 basis points. We interpret this as evidence that diversified banks are willing to extend loans during crises, but compensate higher risk through higher interest rates. Columns (3)-(5) further examine the robustness of our results. The dependent variable is loan growth. Column (3) excludes the global cri-

³⁹The lower bound of the arch reflects the minimum level of diversification for each bank, given that it lends to more than one country. The upper bound, in turn, shows banks that lend to more than one country, but have a diversified (read: not geographically concentrated) portfolio.

sis and restricts the sample to years 1995–2008. Column (4) introduces a global financial crisis (GFC) dummy with value one during banking crises in years 2008, 2009, and 2010. In both columns, our main effect remains positive and significant. The recent financial crisis does not drive our results. Column (5) introduces a regional crisis dummy.⁴⁰ The negative coefficient on $exposure \times regional\ BC$ suggests that during crises affecting several countries at once, the positive effect of diversification is weakened. Yet, our baseline effect remains stable. Finally, column (6) excludes firms with $exposure = 0$, and column (7) replaces continuous exposure with a dummy with value one if exposure is above its yearly median.

Substitution effects While we showed above that diversified banks sustain higher loan supply and credit growth to firms during crises, we now investigate how the differing behavior of diversified and concentrated banks changes the structure of the economy. First, we look at substitution effects on the firm level. While firms cannot perfectly offset changes in loan supply by switching across banks, Table C.3 shows that there is nonetheless an increase in reliance on diversified lenders. We run a regression of firms’ exposure (i.e. the share of loans coming from diversified banks) on the banking crisis dummy. Columns (1)-(4) use firm and region*year fixed effects, and look at within firm changes, while controlling for common regional shocks. There is a significant and positive effect of banking crisis on firms’ exposure. The average firm sees an increase in its exposure to diversified lenders by 0.7% during the year of the crisis. Effects are highly persistent even three years after the crisis. Besides a shift in exposure within firms, there could also be a shift across firms towards firms that borrow more from diversified banks. Columns (5)-(8) use country*industry instead of firm fixed effects and compare how exposure changes across firms within a given country-industry pair. Results show that during a banking crisis there is a shift towards borrowers from diversified banks. The share of loans from diversified banks increases by 0.3% in the year of the crisis. It is still 1.1% higher three years after the crisis. The stronger effect on the industry level suggests that on top of a shift towards diversified lenders *within* firms, there is also a shift within industries *across* firms towards borrowers with higher exposure.

The increase in firms’ reliance on diversified banks should be mirrored in banks’ loan portfolios. We run the following regression on the bank (b) – borrower country (j) – year (t) level:

$$share_{b,j,t} = \gamma_1 BC_{j,t} + \gamma_2 diversification_{b,t} + \gamma_3 DIV_{b,t} \times BC_{j,t} + X_{j,t} + \epsilon_{b,j,t}.$$

$share_{b,j,t}$ denotes bank b’s share of total loans in country j in year t and X is a set of controls for the borrower country. Based on our above findings, we expect that a banking crisis leads to a decline in $share$ ($\gamma_1 < 0$), but the decline should be smaller or absent for diversified banks ($\gamma_3 > 0$), as they are a more stable source of funding. The coefficient γ_2 on DIV is expected to be negative, as diversified banks will have a lower average loan share

⁴⁰The *regional BC* dummy takes on value one for Asian countries during the Asian crisis (1997-1999), South American countries during the Latin crisis (1995-1996), as well as the Great Financial Crisis in Europe and the US.

than concentrated banks. In each regression, we use bank*borrower country fixed effects and analyze variation in loan shares within a specific bank-borrower country connection. We also employ time-varying fixed effects on the bank country level to absorb changes in each banks' home country. If, for example, there is a contemporaneous negative shock in a banks' home country that we do not account for, the stabilizing effect of diversification is likely to be muted.

Table C.4, column (1), shows that a banking crisis in host country j reduces banks' share of loans extended to j by 0.7%. The effect is significant at the 1% level and economically meaningful. The median loan share is 2.2%, so a banking crisis reduces banks' loan share by around 31% relative to the median. Once we interact our crisis dummy with our diversification metric in column (2), we see that *i*) in non-crisis times, diversified banks have a lower loan share in host countries than concentrated banks; and *ii*) their share falls by less during banking crises. Columns (2)-(5) lead the dependent variable by subsequent periods. In each specification we find that diversified banks reduce their loan share by less. For example, in column (2), fully diversified banks reduce their loan share by 0%, compared to 1.3% for banks with no diversification. Combining our evidence in Tables C.3 and C.4, we find that banking crises in host countries increase borrowers' reliance on lending by diversified banks.

Cross-sectional analysis Table C.5 re-runs our baseline bank-firm level analysis in the cross-section, instead of a panel. We collapse our data to bank-firm level and define the dependent variable as the (log) change in loan volume from year $t - 1$ to year T , where t denotes the start year of a banking crisis and T the end year. In other words, we look at the change in lending by bank b to firm f over the pre- to post-crisis period. Columns (1)-(4) use diversification as defined in equation (1) and look at the intensive (columns 1 and 2) and extensive margin (column 3 and 4). The extensive margins adds a value of zero to loans that start (end) in the year before (last year of) the crisis, i.e. we allow for formation and termination of bank-firm relationships. Columns (5)-(8) repeat the exercise, but use a diversification dummy with value one if a bank is in the yearly top tercile of diversification, and zero if it is in the bottom tercile. Across specifications, diversification has a positive effect on loan supply, and is significant (except for column (3)). Across specifications, we control for unobservable bank characteristics through bank fixed effects, and then contrast specifications with borrower country*industry vs. firm fixed effects (analogous to the main specification on the bank*firm*year level). We find that diversification has a positive effect even after controlling for firms' loan demand through fixed effects.

Clustering Table C.6 shows that our results are robust to clustering on different levels (see last row in Table) Across specifications, the effect of diversification on loan supply during crises remains significant at the 1% level.

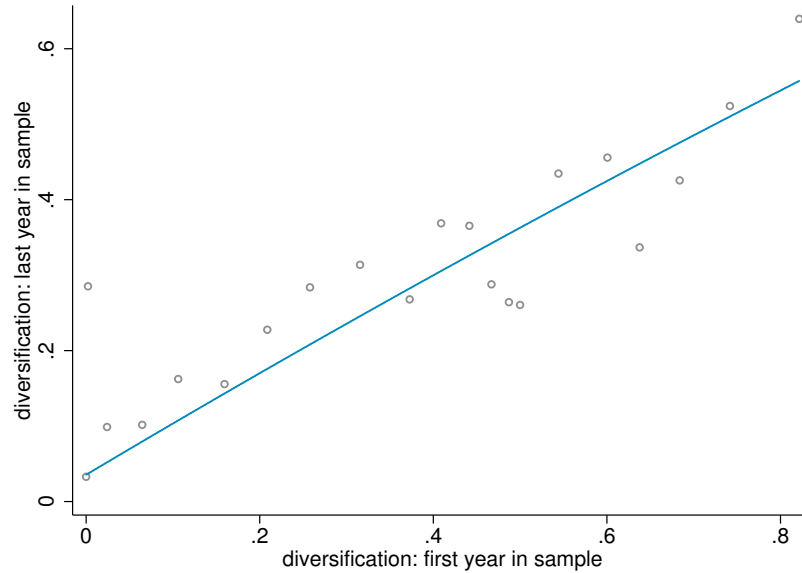
Further robustness Table C.7 provides additional robustness checks. Our results are robust to

- Panel (a), column (1): excluding borrowers in finance, insurance and real estate industries (FIRE)
- Panel (a), column (2): excluding borrowers in insurance industries
- Panel (a), column (3): excluding banks with only one loan per year
- Panel (a), column (4): excluding banks in the top 10% of total loans per year
- Panel (a), column (5): excluding banks with *diversification* (DIV) = 0
- Panel (a), column (6): replacing continuous *diversification* with a dummy for above and below median
- Panel (b), column (1): focusing on lead arrangers only
- Panel (b), column (2): excluding loans (facilities) with only one lender (no syndicate de facto).
- Panel (b), column (3): excluding credit lines
- Panel (b), column (4): excluding term loans
- Panel (b), column (5): imputing participants loans shares based on existing information on 'lender role' using respective sample means from non-missing loan shares
- Panel (b), column (6): imputing participants loans shares by 'lender role' and 'syndicate size' using respective sample means from non-missing loan shares

Bank-country-year level Table C.9 reports regressions on the bank-borrower country-year level. Column (1) shows that during banking crises, and in line with bank-firm-year level findings, countrywide loan growth drops significantly. For borrowers from banks with $DIV = 0$, loan supply declines by 10.4%. Also on the aggregate level, diversified banks are stabilizing, relative to banks with a concentrated portfolio. Similar to findings on the loan and firm level, the coefficient on diversification, interacted with banking crisis, is significant and positive. For banks with zero diversification, loan growth falls by 10.4% during banking crises. Increasing diversification from the 25th to the 75th percentile attenuates the effect by $(0.63 \times 0.107 =)$ 6.7%. Note that the highly significant coefficient on $DIV \times BC$ is equal in magnitude to the negative coefficient on banking crisis. This implies that banks with a fully diversified portfolio are able to completely offset the negative effect of a banking crisis on countrywide loan growth. Similar to the bank-firm level, columns (2) and (3) show that results survive when we control for unobservable country and bank characteristics. Including borrower country*year fixed effects in column (2) absorbs common shocks to all firms within one country. Column (3) adds bank*year fixed effects to ensure that unobservable bank characteristics are not explaining the positive effect of diversification.

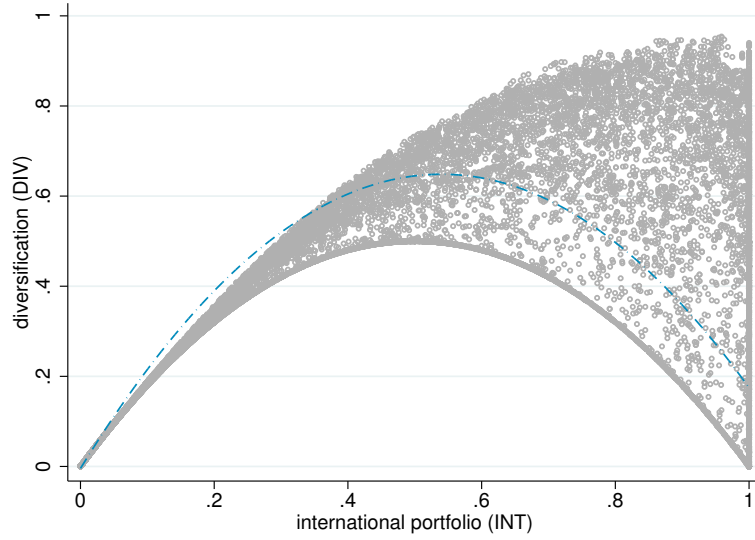
C.1 Tables and Figures

Figure C.1: Diversification: Stability over time



Note: This figure provides a binscatter plot of bank diversification in banks' first (x-axis) and last (y-axis) year in the sample. Sample period is from 1995 to 2008, pre-ceeding the great retrenchment period during and after the GFC. A regression of last on first year diversification yields $\beta = 0.64$, $t = 59.43$, $R^2 = 0.38$, $N = 5,799$. For the sub-sample of banks with diversification > 0 in their first year, $\beta = 0.55$, $t = 15.65$, $R^2 = 0.18$, $N = 1,109$.

Figure C.2: Diversification and international portfolio



Note: This figure shows the relationship between banks' geographic diversification (DIV) and the international allocation of their loan portfolio (INT) on the bank-firm level. The blue dashed line is a quadratic fit. Higher values denote more geographic diversification, and a higher share of loans extended to foreign borrowers, respectively. For detailed variable definitions see Table B.1 and text.

Table C.1: Firm level – effects are stronger for financially constrained firms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	uncons. payout	cons. payout	uncons. size	cons. size	uncons. payout	cons. payout	uncons. size	cons. size
VARIABLES	Δ employment	Δ employment	Δ employment	Δ employment	Δ investment	Δ investment	Δ investment	Δ investment
exposure	-0.055* (0.029)	-0.103*** (0.032)	-0.033 (0.024)	-0.033 (0.024)	0.024 (0.080)	-0.265*** (0.083)	-0.075 (0.067)	-0.106 (0.079)
exposure \times BC	-0.003 (0.024)	0.094*** (0.033)	0.063 (0.041)	0.041* (0.025)	-0.058 (0.072)	0.277** (0.109)	-0.077 (0.134)	0.201** (0.084)
Observations	11,347	12,207	15,598	15,433	12,017	12,808	16,742	16,660
R-squared	0.336	0.472	0.333	0.413	0.272	0.317	0.249	0.260
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table shows regressions on the firm-year (firm) level. The dependent variables are log difference of firms' employment and investment; *banking crisis (BC)* is a dummy with value one during banking crises in the firm country, as defined in Laeven and Valencia (2013); *exposure* is firms' exposure to diversified banks. All regressions include *log total assets*, *return on assets*, and *leverage* as firm level controls. *uncons.* and *cons.* denote constrained and unconstrained firms, split into bottom and top tercile of payout ratio or size for each year. For detailed variable definitions see Table B.1 and text. All standard errors are clustered on the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table C.2: Firm level – maturity and sample selection

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	loan spread	maturity	1995-2008 Δ loan volume	GFC Δ loan volume	regional crisis Δ loan volume	exp > 0 Δ loan volume	DIV dummy Δ loan volume
exposure	-35.486*** (6.932)	6.392*** (1.763)	-0.249*** (0.027)	-0.186*** (0.022)	-0.182*** (0.022)	-0.155*** (0.023)	
exposure \times BC	30.816*** (6.288)	2.636 (1.899)	0.070*** (0.023)	0.057*** (0.022)	0.054** (0.022)	0.062*** (0.020)	
exposure \times GFC				0.066** (0.025)			
exposure \times GFC \times BC				-0.100*** (0.031)			
exposure \times regional BC					-0.029* (0.018)		
exposure (median)							-0.030*** (0.006)
exposure (median) \times BC							0.037*** (0.008)
Observations	139,505	199,799	133,542	196,038	196,038	191,445	196,038
R-squared	0.905	0.951	0.338	0.317	0.317	0.321	0.317
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country*Industry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table shows regressions on the firm-year (firm) level. The dependent variable is firms' average *loan spread* over LIBOR (in basis points) and *maturity* (in months) in columns (1) and (2), and log difference of firms' total outstanding loan volume in columns (3)-(5); *banking crisis (BC)* is a dummy with value one during banking crises in the firm country, as defined in [Laeven and Valencia \(2013\)](#); *exposure* is firms' exposure to diversified banks. *Great Financial Crisis (GFC)* is a dummy with value one during banking crises from 2008-2010. *regional crisis* is a dummy with value one during regional banking crises in Asia, Latin America, and Europe. For detailed variable definitions see Table B.1 and text. All standard errors are clustered on the firm level. *** p<0.01, ** p<0.05, * p<0.1

Table C.3: Substitution towards diversified lenders

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	firm t exposure	firm t+1 exposure	firm t+2 exposure	firm t+3 exposure	industry t exposure	industry t+1 exposure	industry t+2 exposure	industry t+3 exposure
banking crisis	0.007*** (0.002)	0.006** (0.002)	0.010*** (0.002)	0.007** (0.003)	0.003 (0.004)	0.005 (0.004)	0.012*** (0.004)	0.011*** (0.004)
Observations	192,495	155,610	123,045	98,076	192,495	159,703	127,892	101,469
R-squared	0.924	0.926	0.928	0.928	0.505	0.497	0.489	0.485
Firm FE	Yes	Yes	Yes	Yes	-	-	-	-
Country*Industry FE	-	-	-	-	Yes	Yes	Yes	Yes
Region*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table shows regressions on the firm-year (firm) level. The dependent variable is firms' exposure to diversified banks (the share of total loans extended by diversified banks), where we lead the dependent variable by up to 3 periods. *banking crisis (BC)* is a dummy with value one during banking crises in the firm country, as defined in [Laeven and Valencia \(2013\)](#). Columns (1)-(4) use firm fixed effects and look at within firm variation, columns (5)-(8) use country-industry fixed effects and look at changes across firms within industries. For detailed variable definitions see Table B.1 and text. All standard errors are clustered on the firm level. *** p<0.01, ** p<0.05, * p<0.1

Table C.4: Diversified banks increase their loan share following a crisis

VARIABLES	(1) t share	(2) t share	(3) t+1 share	(4) t+2 share	(5) t+3 share
banking crisis (BC)	-0.007*** (0.002)	-0.013*** (0.004)	-0.012*** (0.004)	-0.010*** (0.003)	-0.010*** (0.003)
diversification (DIV)		-0.310*** (0.013)	-0.198*** (0.011)	-0.125*** (0.010)	-0.067*** (0.010)
DIV × BC		0.013*** (0.005)	0.008* (0.005)	0.005 (0.004)	0.003 (0.005)
Observations	199,427	173,368	149,664	127,568	109,366
R-squared	0.959	0.967	0.968	0.970	0.971
Bank*Borrower Country FE	Yes	Yes	Yes	Yes	Yes
Bank Country*Year FE	Yes	Yes	Yes	Yes	Yes

Note: This table shows regressions on the bank-firm country-year (bank) level. The dependent variable is banks' share of total outstanding loan volume extended to all borrowers in country j , up to a lead of three years; *banking crisis (BC)* is a dummy with value one during banking crises in the firm country, as defined in [Laeven and Valencia \(2013\)](#); *diversification (DIV)* is banks' geographic diversification. For detailed variable definitions see Table B.1 and text. All standard errors are clustered on the firm country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table C.5: Bank-firm level – cross-section

VARIABLES	(1) continuous Δ loan (int.)	(2) continuous Δ loan (int.)	(3) continuous Δ loan (ext.)	(4) continuous Δ loan (ext.)	(5) dummy Δ loan (int.)	(6) dummy Δ loan (int.)	(7) dummy Δ loan (ext.)	(8) dummy Δ loan (ext.)
diversification (DIV)	0.179*** (0.050)	0.090* (0.051)	0.115 (0.292)	0.382*** (0.137)				
diversification (DIV, terciles)					0.058*** (0.020)	0.052** (0.024)	0.230*** (0.044)	0.256*** (0.044)
Observations	27,079	26,741	64,346	64,185	18,107	17,505	44,658	43,544
R-squared	0.251	0.500	0.358	0.655	0.271	0.555	0.371	0.664
Country*Industry FE	Yes	-	Yes	-	Yes	-	Yes	-
Firm FE	-	Yes	-	Yes	-	Yes	-	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table shows regression results on the bank-firm level. Dependent variable is the pre/post crisis change in loans from the last year before the start of the banking crisis to the last year of the banking crisis. *int.* refers to the intensive margin, where we do not include new or terminated bank-firm lending relationships. *ext.* refers to the extensive margin and adds “zeros” for bank-firm connections that did not exist before the crisis or were terminated over the crisis. It includes pre-crisis bank diversification as continuous variable, as well as a dummy with value one (zero) for banks in the top (bottom) tercile of diversification. All standard errors are clustered on the bank level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table C.6: **Bank-firm level – Alternative levels of clustering**

VARIABLES	(1) log loan volume	(2) log loan volume	(3) log loan volume	(4) log loan volume	(5) log loan volume	(6) log loan volume
diversification (DIV)	-0.021 (0.018)	-0.021 (0.019)	-0.021 (0.062)	-0.008 (0.088)	-0.021 (0.039)	-0.021 (0.038)
DIV \times BC	0.158*** (0.013)	0.158*** (0.013)	0.158*** (0.016)	0.157*** (0.028)	0.158*** (0.048)	0.158*** (0.045)
Observations	1,621,124	1,621,124	1,621,124	1,524,914	1,621,124	1,621,124
R-squared	0.977	0.977	0.977	0.976	0.977	0.977
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Firm	Country*Industry	Country	Region	Bank	Bank Firm

Note: This table shows regressions on the bank-firm-year (loan) level. The dependent variable is log of total outstanding loan volume; *banking crisis* (BC) is a dummy with value one during banking crises in the firm country, as defined in [Laeven and Valencia \(2013\)](#); *diversification* (DIV) is banks' geographic diversification. For detailed variable definitions see Table B.1 and text. Standard errors are clustered on different levels, as indicated in the last table row. *** p<0.01, ** p<0.05, * p<0.1

Table C.7: Bank-firm level – further robustness checks

Panel (a)

VARIABLES	(1) no FIRE log(loan vol)	(2) no insurance log(loan vol)	(3) banks > 1 loan log(loan vol)	(4) no large banks log(loan vol)	(5) DIV > 0 log(loan vol)	(6) high/low DIV log(loan vol)
diversification (DIV)	-0.016 (0.056)	-0.012 (0.056)	-0.021 (0.062)	0.015 (0.044)	-0.024 (0.076)	
DIV × BC	0.165*** (0.017)	0.162*** (0.017)	0.159*** (0.016)	0.198*** (0.017)	0.155*** (0.016)	
DIV (median)						-0.019* (0.011)
DIV (median) × BC						0.099*** (0.018)
Observations	1,451,472	1,608,000	1,621,656	1,459,492	1,502,955	1,642,260
R-squared	0.977	0.977	0.977	0.978	0.975	0.977
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Panel (b)

VARIABLES	(1) lead arr. log(loan vol)	(2) no one lender log(loan vol)	(3) no credit lines log(loan vol)	(4) no term loans log(loan vol)	(5) alt shares 1 log(loan vol)	(6) alt shares 2 log(loan vol)
diversification (DIV)	-0.020 (0.050)	-0.001 (0.052)	-0.048 (0.081)	0.027 (0.023)	-0.040*** (0.014)	-0.001 (0.055)
DIV × BC	0.089*** (0.022)	0.138*** (0.013)	0.101*** (0.009)	0.111*** (0.032)	0.098*** (0.013)	0.137*** (0.017)
Observations	458,076	1,638,259	1,149,999	1,130,434	1,467,049	1,645,219
R-squared	0.976	0.978	0.971	0.981	0.972	0.976
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This tables shows regressions on the bank-firm-year level. The dependent variable is log of total outstanding loan volume; *banking crisis (BC)* is a dummy with value one during banking crises in the firm country, as defined in [Laeven and Valencia \(2013\)](#); *diversification (DIV)* is banks' geographic diversification. For detailed variable definitions see Table B.1 and text. All standard errors are clustered at the firm country level. In Panel (a), *FIRE* and *no insurance* denote the exclusion of all borrowers in finance, insurance and real estate industries (FIRE) and 'insurance companies' from the respective sample. In column titled *bank > 1 loan*, we drop all banks with one loan per year on the syndicated loan market; *no large banks* drops all banks above the 90th percentile of their total outstanding lending. In the column titled *DIV > 0*, we include only banks with non-zero values of *geographic diversification*. *DIV (median)* is a dummy variable taking value one for banks with values of geographic diversification above the annual median, and of value zero for banks below. In Panel (b), column *lead arr.* includes only banks with syndicate role lead arrangers in the sample. *no one lender* denotes the exclusion of all syndicates consisting of only one lender. *no credit lines* drops all loans (i.e. facilities) that are credit lines, defined in Dealscan as 'Revolvers' or '364-Day Facility'. *no term loans* drops all loans (i.e. facilities) that are of type 'Term Loan'. Column titled *alt shares 1* provides imputations of missing loan shares in Dealscan by 'lender role' using respective sample means from non-missing loan shares. Column *alt shares 2* provides imputations of missing loan shares in Dealscan by 'lender role' and 'syndicate size' using respective sample means from non-missing loan shares. *** p<0.01, ** p<0.05, * p<0.1

Table C.8: **Bank-firm level – Interest rate and maturity**

VARIABLES	(1) log(rate)	(2) log(rate)	(3) log(rate)	(4) log(maturity)	(5) log(maturity)	(6) log(maturity)
banking crisis (BC)	0.020*** (0.005)			0.088*** (0.011)		
diversification (DIV)	0.262* (0.138)	0.019** (0.009)		0.191*** (0.025)	0.003 (0.007)	
DIV × BC	0.055*** (0.018)	0.000 (0.004)	-0.001 (0.011)	-0.027** (0.011)	-0.017*** (0.004)	-0.003 (0.014)
Observations	1,289,618	1,287,055	1,283,820	1,620,547	1,620,542	1,620,540
R-squared	0.922	0.976	0.977	0.891	0.960	0.960
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Year FE	-	Yes	Yes	-	Yes	Yes
Bank*Year FE	-	-	Yes	-	-	Yes
Cluster	Country	Country	Country	Country	Country	Country

Note: This table shows regressions on the bank-firm-year (loan) level. The dependent variable is log of average interest spread or log of average maturity; *banking crisis (BC)* is a dummy with value one during banking crises in the firm country, as defined in [Laeven and Valencia \(2013\)](#); *diversification (DIV)* is banks' geographic diversification. For detailed variable definitions see Table B.1 and text.. *** p<0.01, ** p<0.05, * p<0.1

Table C.9: **Bank-country-year regressions**

VARIABLES	(1) Δ loan vol.	(2) Δ loan vol.	(3) Δ loan vol.
banking crisis (BC)	-0.104*** (0.005)		
diversification (DIV)	-0.074*** (0.011)	-0.074*** (0.011)	
DIV \times BC	0.107*** (0.008)	0.025*** (0.009)	0.043** (0.021)
Observations	180,115	180,115	128,555
R-squared	0.120	0.200	0.570
Bank FE	Yes	Yes	-
Year FE	Yes	-	-
Borrower Country*Year FE	-	Yes	Yes
Bank*Year FE	-	-	Yes

Note: This table shows regressions on the bank-firm country-year (bank) level. The dependent variable is log difference of total outstanding loan volume by bank b to all borrowers in country j ; *banking crisis (BC)* is a dummy with value one during banking crises in the firm country, as defined in [Laeven and Valencia \(2013\)](#); *diversification (DIV)* is banks' geographic diversification. For detailed variable definitions see Table B.1 and text. All standard errors are clustered at the firm country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

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