Does bank health matter for corporate borrowers? Evidence from France

Pietro Grandi* , Marianne Guille†, Jean Belin‡ , Elisa Darriet§

March 4, 2019

Preliminary version

Abstract

We investigate the extent to which bank financial health affects firms' financial and real outcomes using a large panel dataset of more than 80.000 firms matched to 175 banks in France from 2008 to 2016. We provide evidence of the transmission of financial shocks from the financial to the real sphere through the banking system: firms that borrow from less capitalized banks tend to obtain less long-term credit and face higher funding costs. Furthermore, we find that firms obtain less credit and face higher borrowing costs when their relationship bank sustained losses on its proprietary trading activities, with smaller firms being relatively more credit constrained than larger firms. Finally, we find that bank shocks matter for real economic activity: firms borrowing from banks that sustained larger losses on proprietary trading activities also reduce investment, employment and the wage bill. These findings are consistent with a bank lending channel whereby financial shocks affecting financial intermediaries are passed onto borrowing firms in the form of tighter credit conditions.

Keywords: Financial Crisis; Relationship Lending; Financing constraints; Bank lending channel, SMEs.

JEL classification: G01; G21; O16; F34.

*LEMMA, Université Paris II Panthéon-Assas
†LEMMA, Université Paris II Panthéon-Assas, Labex MME-DII
‡Gretha (UMR CNRS 5113), Université de Bordeaux; Chaire Economie de la Défense, FDD de IHEDN
§Chaire Economie de la Défense, FDD de IHEDN; LEMMA, Université Paris II Panthéon-Assas

1 Introduction

The Great Recession wrought by the 2007-8 US financial crash and the 2010-11 European Sovereign Debt Crisis highlighted the extent to which stress on banking intermediaries can spill over into the wider economy via the rationing of bank loans to otherwise creditworthy households and borrowers (Ivashina and Scharfstein, 2010; Chodorow-Reich, 2014; Iyer et al., 2014; Ongena et al., 2015; Amiti and Weinstein, 2011; Berger et al., 2017). With respect to other transmission channels of financial shocks to real economic activity (e.g. international trade and capital markets) the bank lending channel may be especially important in France where banks remain the main funding source for small and medium-sized enterprises (SMEs henceforth) which are a fundamental component of the economy, making up 99,9% of all business and 48,3% of employment.[1]

In this paper we study the transmission of financial shocks from the financial to the real sphere by investigating how the financial health of banks affects the real and financial activities of borrowing firms. To do so we exploit a large database containing information on 82.380 relationships between 175 European banks and more than 80.000 French firms between 2008 and 2016. Importantly, this database provides us with rich information on relationships between lenders and borrowers of any size, including on almost 8000 very small and young French firms – micro-firms[2] – which are typically under-represented in other comparable studies on the impact of financial shocks on French business.[3]

To identify how shocks to banks' health spill onto their corporate customers, we test how firms' credit conditions covary with their relationship bank's capitalisation and losses on proprietary trading.[4] We find three sets of results. First, firms that borrow from less capitalized banks tend to obtain less long-term credit and face higher funding costs. Importantly, this finding is very robust to controlling for other relevant firm and bank level variables as well as for year, industry and regional fixed effects. Second, firms do obtain less credit and face higher borrowing costs when their lender sustains deeper losses on proprietary trading activities. Moreover, the effect is heterogeneous across borrowers connected to the same lender: when a bank incurs losses on its trading portfolio, smaller firms obtain less credit and face higher funding costs than larger firms. In this sense, this finding is consistent with the preference by affected banks to "fly to quality" towards safer borrowers (Bernanke et al., 1996; Berger et al., 2017; De Jonghe

[1] Centre de Documentation Economie-Finances (2015). SMEs are defined by the 2008 French Law of Modernization of the Economy (LME) as firms with less than 250 employees, an annual turnover of less than € 50 million and total assets amounting to less than € 43 million.

[2] The LME defines micro-firms as having less than 10 employees and sales and total assets not exceeding €2 million. In our sample there are 7944 such micro-firms whose median age was 10 years in 2008.

[3] As, for instance, studies using the Banque de France FIBEN individual company database such as Andrade et al. (2018), Cahn et al. (2017) and Beatriz et al. (2018). The FIBEN database gathers balance sheet data on company with a turnover of over € 750.000. In our sample we have 12.128 firms recording less than this amount.

[4] The bank lending channel typically looks at the transmission of monetary policy tightening – i.e. interest rates hikes – to bank lending (Bernanke and Blinder, 1988; Kashyap and Stein, 1995). However, monetary policy was extremely accommodative between 2008 and 2016 so that these kind of (negative) monetary shocks are not easily available for the period of our study. For this reason we find more appropriate to focus on other types of adverse financial shocks hitting the banking system during this period.

et al., 2019; Degryse et al., 2019). Third, bank shocks appear to have material real consequences: firms' whose relationship bank incurs losses on trading portfolios tend to reduce total liabilities, long-term credit, investment in physical capital, employment and the wage bill. Overall, the findings are consistent with a bank lending channel working through relationship banks, whereby financial shocks affecting banks are passed onto relationship firms in the form of tighter credit conditions. The reduction in firms' real outcomes has therefore consequences for the wider economy. Furthermore, we document that the effects of such financial-crises-induced credit crunch are heterogeneous across borrowers and tend to be more severe for smaller firms.

This paper contributes to the broad and growing literature identifying the transmission of financial shocks to the real economy via bank-firm relationships. For instance, Gan (2007) shows that a negative shock to the financial health of Japanese banks — the collapse of the land market in 1990 — led to a significant reduction in bank lending to manufacturing firms borrowing from banks most exposed to the shock. Using similar data, Amiti and Weinstein (2011, 2013) find that deteriorating bank health caused marked worsening of customer firms' investment and export rates, and that the share of the contraction in economic activity imputable to bank distress was macro-economically sizeable. Khwaja and Mian (2008) exploit the exogenous liquidity shock on banks engendered by unexpected nuclear tests in Pakistan in 1998 and document that this shock is transmitted to lower amounts lent by most exposed banks. Looking at the US subprime crisis, Chodorow-Reich (2014) use syndicated loan data and finds that pre-crisis clients of banks more affected by the financial shock had a 50% lower likelihood of receiving a new loan. Furthermore, the withdrawal of credit accounted for more than one-third of the employment decline at SMEs in the year following the Lehman bankruptcy. Using German data, Dwenger et al. (2018) find that banks with larger losses from proprietary trading activities matured during the 2007-8 financial crisis decreased their lending significantly, and that their customer firms tended to reduce their investment and employment by more than other firms. Using the same database, Popov and Rocholl (2018) document that German firms borrowing from banks most exposed to the US subprime crisis experienced a significant decline in labour demand – with a simultaneous reduction in firm-level employment and average wages – relative to firms borrowing from healthy banks. Finally, in the context of the sovereign debt crisis Balduzzi et al. (2018) document that in Italy higher bank risk was closely related to lower investment, employment and borrowing by customer firms.

This paper is also related to the literature that examines whether the real effects of credit shocks are heterogeneous across borrowers. Indeed, the role played by financial intermediaries in reducing SMEs' asymmetric information problems makes bank-firm relationship of crucial importance.[5] In this sense, one strand of the literature tested whether a financially distressed bank is able to shield its relationship firms from the impact of financial shocks and, if not, how it readjusts lending among borrowers with different characteristics. On the one hand, Khwaja and Mian (2008), Chodorow-Reich (2014) and Montoriol-Garriga and Wang (2011) find that small and

[5]See, for instance, Stiglitz and Weiss (1981); Diamond (1991); Petersen and Rajan (1995); Berger and Udell (1995).

bank-dependent firms are more affected by financial shocks affecting their lenders, while Beck et al. (2018), Berger et al. (2017) and Cotugno et al. (2013) argue that strong bank-firm relationship could offset the impact of credit rationing. In this sense, using French data Beatriz et al. (2018) document that relationship banks charge higher interest rates in good time and lower rates in bad times, but single-bank firms do not appear to benefit from this compensating mechanism and are held-up by their relationship bank.

Our paper makes two distinct contributions to the literature. First, it provides evidence of the transmission of financial shocks from the banking sector to the French real economy through the impact on SMEs. While large firms finance themselves through capital markets, French SMEs are still highly bank-dependent (Beatriz et al., 2018). Given the aforementioned relevance of SMEs in France, banking relationships are of particular macroeconomic significance. In this respect, this paper also contributes to the debate on whether the reduction in SME's credit was mainly supply or demand driven (Kremp and Sevestre, 2013). Second, this paper traces the impact of bank financial shocks onto real outcomes such as firm investment, employment and wages. In so doing, it bestows external validity to other country-specific works measuring the real economy effects of financial and banking crises (Amiti and Weinstein, 2011, 2013; Chodorow-Reich, 2014; Dwenger et al., 2018; Popov and Rocholl, 2018; Balduzzi et al., 2018; De Jonghe et al., 2019; Degryse et al., 2019).

The remainder of the article is organized as follows: section 2 describes the database, while section 3 outlines the empirical methodology, discusses the testable hypotheses and presents the results. Finally, Section 4 concludes.

2 Data

In our analysis we combine bank-level data from Fitchconnect with firm-level data from Amadeus.[6] We extract annual financial statement information on 3110 European banks and 98.858 firms located in France for the period 2008-2016. We then match banks to firms using the information on the identity of firms' reference bankers as in Amiti and Weinstein (2011, 2013), Dwenger et al. (2018), Popov and Rocholl (2018) and De Marco (2019). The final sample contains balance sheet and income statement information on 175 banks and 80.822 firms for the period 2008-2016. Our matched sample provides a good coverage of the universe of banks and non-financial corporations in France. As of 2016, banks in our sample represent 77% of the French credit market. Similarly, firms reported by Amadeus represent 67% of total French employment.[7] In order to control for

[6]Fitchconnect is a database compiled by Fitch Solutions providing credit market data on banks around the world, while Amadeus contains financial information on over 24 million public and private European companies. Amadeus is compiled by Bureau Van Dijk, a Moody's Analytics company, while Fitchconnect by Fitch Solutions, a Fitch Ratings company.

[7]We obtain these figures by aggregating out bank-level lending and firm-level employment and by comparing these figures with French credit and employment aggregates provided by the ECB Statistical Data Warehouse and Eurostat employment statistics, respectively.

the influence of mergers and acquisitions, as in Andrade et al. (2018), we drop all banks and firms that in any given year report loans or total assets growth rates of more than 50%. We finally trim all bank and firm level variables at the 1% to minimise the incidence of outliers. Table 1 reports descriptive statistics and the complete list of bank and firm level variables.

Table 1 here

While we do not observe whether the firms hold deposits with and/or borrow from these banks, in this paper we consider a reference bank as the primary institution from which firms obtain most of short and long term credit (Ongena et al., 2015; Dwenger et al., 2018) and with which are likely to build lasting relationships in the sense of Petersen and Rajan (1995).[8] Activities related to the provision of credit and monitoring allow reference banks and firms to form ties through repeated interaction over time and across multiple financial products. For instance, firms typically hold checking and savings account at their reference bank, while in turn banks also provide support for IPOs. The deep and complex dimension of bank-firm relationships facilitates the storing of information and may increase the availability of funds to the firm.[9] Moreover, lending relationships imply that banks and firms are interdependent: shocks affecting banks are likely to be reflected on customer firms, and vice versa (Chodorow-Reich, 2014).

On the other hand, our matching presents two important limitations. First, we only have information updated on 2016 on the relationship banks in Amadeus. In other words, bank-firm records are a snapshot of borrowers-lenders relationships at one point in time and are retroactively imputed for the previous years. We note however that, using equivalent data for Germany, Dwenger et al. (2018)[10] are able to obtain the relationship bank updated over time and show that in their sample relationships are sticky: only 3% of sampled firms ever swap a lender for another, and less than 2% add or interrupt a lending relationship in any given year. Furthermore, while is not uncommon for French firms to deal with several lenders, most firms tend to have single-bank relationships, especially SMEs (Cressy and Olofsson, 1997; Andrade et al., 2018). SMEs are also more likely to rely on a single bank and to face significant switching costs if they wish to change lender. In this respect, we note that 73% of companies in our sample are SMEs. For these reasons, we regard as tenable the assumption that bank-firm relationships remain stable over our period of interest.

[8] As noted by Dwenger et al. (2018), if our bank-firm matches reflect only partially true lending relationships, our estimates should be considered as lower bounds.

[9] For instance, by monitoring cash flows through its checking account the bank can learn about the firm's sales. In addition, the bank reaches cost efficiencies by spreading the fixed costs related to producing information over multiple products (Petersen and Rajan, 1995).

[10] Dwenger et al. (2018) extract firm information from Dafne database, the German focused version of Amadeus provided by Bureau Van Dijk.

3 Empirical analysis

In this study we use a sample of matched firm-bank data to test whether and how negative financial shocks affecting banks' health are transmitted to customer firms. To do so, we define three hypotheses that will be tested in the following analysis.

3.1 Testable hypotheses

We test the following three hypotheses. First, we look at the direct relationship between a proxy for bank's health (capitalization) and firms' access to credit. As suggested by Hancock and Wilcox (1998) a bank's loan supply is positively related to its own capital. Bank capital may affect credit supply either because an exogenous regulatory constraint on the capitalization ratio (Equity capital/total assets) or because the bank endogenously chooses to impose one on itself. In this sense, under Basel II and III risk-based capital requirements, erosion in a bank's regulatory capital requires banks to either deleverage or raise additional equity.[11] Since the latter option is particularly expensive in periods of financial turmoil, banks that are at or close the regulatory capital floor may have to sell securities or curtail their lending to restore their regulatory ratio (Peek and Rosengren, 1995; Van den Heuvel, 2002). Furthermore, equity losses also imply that banks face higher funding costs on wholesale markets since they are perceived to be riskier (Peek and Rosengren, 2005; Gambacorta and Shin, 2016).

H.I Firms borrowing from less capitalised banks should obtain less credit and face higher funding costs

Second, we test whether an exogenous shock to a bank's financial position is transmitted onto its corporate customers. To do so, as in Dwenger et al. (2018), we use banks' losses on proprietary trading as an exogenous shock affecting banks asymmetrically. During the period 2008-2012, French banks' losses from proprietary trading activities can be attributed to their exposure to US-originated asset-backed securities and to sovereign bonds issued by GIIPS countries subsequently.[12] Since such losses were not anticipated by banks and, by definition, were unrelated to the activity of their corporate customers, they can be considered as an exogenous financial shock. By eroding bank capitalization, realized losses on proprietary trading are likely to spill over to the real economy via restrictions in commercial lending. However, a negative credit supply shock may be smoothed by borrowers if firms can switch between alternative sources of funding (Becker and Ivashina, 2014; De Marco, 2019). Yet, firms more likely to experience information asymmetries (e.g. small, young and innovative firms) may find it hard to do so and end up being credit constrained.

[11] The introduction of Basel III capital requirements in 2009 further strengthened this necessity (Gambacorta and Shin, 2016).

[12] GIIPS – Greece, Ireland, Italy, Portugal and Spain – were the countries most exposed to the European Sovereign Debt crisis. Between 2010 and 2012 the market value of their sovereign bonds fell rapidly while its yield increased at unsustainable levels (Lane, 2012).

H.II Firms should obtain less credit and face higher borrowing cost when their relationship bank experiences losses on its proprietary trading, with smaller firms being more affected than larger firms

Third, the damage of bank shocks may be relatively confined if borrowing firms could still find alternative funding sources or absorb the credit disruption. However, if a firm finds it difficult or expensive to obtain credit or roll on its outstanding debt, it may be forced to forego investment projects, employ less labour and/or reduce the wage bill (Chodorow-Reich, 2014; Dwenger et al., 2018; Popov and Rocholl, 2018; Degryse et al., 2019).

H.III For bank shocks to have real effects we expect firms borrowing from banks that experienced larger losses on proprietary trading activities to reduce real as well as financial outcomes by more than firms borrowing from banks that experienced lower losses

3.2 Results

3.2.1 The relationship between banks' capitalisation and firms' credit conditions

In a first step, we test the first hypothesis — that is, whether firms borrowing from less capitalised banks obtain systematically less credit and face higher borrowing costs — by estimating the following model:

$$y_{f,r,i,t} = \beta \textit{Capital ratio}_{b,t-1} + \theta_1 B_{b,t-1} + \theta_2 F_{f,r,i,t-1} + \alpha_i + \gamma_r + \delta_t + \epsilon_{f,r,i,t} \quad (1)$$

where f defines firms, b banks, r regions, i industries and t years. The dependent variable (y) corresponds to three measures of credit availability at the firm level: short and long-term credit (in logs) and the implied funding costs, computed as interest expenses divided by total borrowing in line with Carbo-Valverde et al. (2007) and Fungáčová et al. (2014).[13] The main explanatory variable (*Capital ratio*) is the one-year lagged bank's equity/assets ratio. Vector F contains firm level control variables, including total assets, cash flow, net worth (all in logs), EBITDA scaled by total assets, export income scaled by revenues, and the share of physical over total assets. Vector B contains bank level control variables including the log of total assets, a liquidity ratio computed as cash and liquid securities over total assets , and the ratio between loan interest income and net interest income. To control for unobservable heterogeneity, we include industry, region and time fixed effects, where regions correspond to Eurostat's Nuts1 units[14] and industries are 4-digits

[13] Short-term loans are defined as bank borrowing earmarked in AMADEUS under current liabilities (less than one year), while long-term loans as borrowing earmarked under non-current liabilities (more than one year).

[14] Eurostat defines NUTS (Nomenclature of territorial units for statistics, abbreviated NUTS from the French version Nomenclature des Unités territoriales statistiques) as a geographical nomenclature subdividing the economic territory of the European Union into regions at three different levels (NUTS 1, 2 and 3 respectively, moving from larger to smaller territorial units). NUTS1 thus correspond to macro-regions. In our sample, we have firms located across 14 such French regions.

NACE industry codes.[15] Standard errors are clustered at the bank level.

All right-hand side variables are entered with a lag to attenuate concerns of reverse causality. Indeed, causality may reversely run from the dependent variable (e.g. credit borrowed) to independent variables at the firm level, as current and future lending could in fact be driving changes in other balance sheet characteristics rather than the other way around. This type of endogeneity appears less of an issue for bank level variables: indeed, since the smallest bank in the sample is three times as large as the median firm it seems unlikely that an individual firm's borrowing can meaningfully drive its relationship bank's capital ratios or total assets. We therefore also estimate model 1 using the System GMM estimator (Arellano and Bond, 1991; Blundell and Bond, 1998) to mitigate endogeneity issues by instrumenting suspected endogenous variables (firm-level variables) with their lags or differenced lags. Exogenous variables (bank-level variables) are instrumented by themselves.[16]

We first look at long-term credit and report results in Table 2, where the model is progressively saturated with fixed effects and a dummy that takes value 1 if the firm is publically listed. Findings indicate that firms borrowing from less-capitalised banks obtain less long-term credit. The effect is very robust across specifications and economically sizeable: on average, a one-standard deviation drop in bank capital ratio (i.e. 0.035) is associated to a 4.1% fall in customer firms' long-term borrowing. Results also indicate that firms' long-term credit is closely and positively related to firm size and endowment of physical capital – general indicators of borrowers' creditworthiness and capacity to post collateral against their borrowing. This result is consistent with the view that safer and healthier firms face lower financial constraints and lower external financial premia (Bernanke et al., 1996). Besides, firms' long-term credit is negatively related to profitability and cash flow, consistent with the notion that highly profitable and liquid firms borrow less. Bank size does not instead seem to affect customer firms' long-term borrowing, while firms borrowing from illiquid banks tend to obtain more long-term credit, although the economic magnitude of this effect is small.

Tables 2,3 and 4 here

We next turn to firms' short-term credit, and present results in Table 3. Coefficients on firm-level covariates are qualitatively similar to those of Table 2 (albeit quantitatively smaller), but bank capitalisation and liquidity do not seem to affect customer firms' short-term borrowing. Bank size does instead, with firms borrowing from smaller banks drawing more short-term credit.

Finally, we look at firms' funding costs and report results in Table 4. Findings indicate that firms borrowing from less-capitalised banks tend to pay higher borrowing costs. Again, the effect is robust across specifications and economically sizeable: on average, a one-standard deviation

[15] NACE codes are the narrowest available definition of industrial sectors under the official Statistical Classification of Economic Activities in the European Community (Ryan et al., 2014). In our sample we have up to 568 industrial sectors.

[16] Specifically, the system version of the estimator is preferred as it tends to outperform difference GMM in terms of both consistency and efficiency (Blundell and Bond, 1998).

drop in bank capital ratio (i.e. 0.035) is associated to a 1.5% increase in customer firms' borrowing costs. Furthermore, firms' funding costs are positively related to their reference bank's share of interest income accrued from commercial loans, suggesting that firms borrowing from banks' with high intermediation margins on loans do indeed pay higher funding costs. Firm-level characteristics are also meaningfully related to a firm's funding costs. In line with previous results, we find that firms' funding costs are negatively associated to their size and their endowment of physical capital, implying that large firms and firms with a large share of tangible assets pay lower borrowing costs. Firms' funding costs are also negatively related to profitability, suggesting that unprofitable firms face higher borrowing costs.

Overall, we find robust – if not necessarily causal – evidence that lower bank capitalisation is associated to less long-term credit and higher borrowing costs for borrowing firms. These results are in line with a "capital crunch" as documented by Hancock and Wilcox (1998) and confirm that bank capital is an important determinant of firms' access to credit. Yet, these findings are not inconsistent with the alternative view whereby less capitalised banks may prefer riskier borrowers and charge higher interest rates to compensate for the latter's higher default risk (Shrieves and Dahl, 1992). As a result of this potential endogenous matching between risky lenders and borrowers, lower bank capitalisation may not be the most suitable indicator of banks' financial distress. However, the fact that quantity and price move in opposite directions – that is, a drop in equity capital is associated to both a decrease in long-term loans and an increase in borrowing costs by relationship firms – point to a general restriction in credit supply. In order to further corroborate this finding, in subsequent analysis we will utilise banks' exposure to an exogenous shock as an alternative measure of bank fragility.

3.2.2 Bank financial shocks and firm credit availability

We next test the second hypothesis by looking more precisely at how an exogenous shock on banks' health is reflected on their customer firms' financial and real outcomes. A recurrent identification problem in empirical banking is the identification of loan supply. Indeed, credit demand and supply will simultaneously determine the amount of finance a firm effectively receives at any point in time. As a result, a "supply shifter" is required to identify a genuine shock to credit supply independent of demand conditions.

To do so, we follow Dwenger et al. (2018) and consider individual banks' losses from proprietary trading activities in 2008 as such a shock. During the 2007-8 financial crisis and the 2011-12 sovereign debt crisis, French banks' losses from proprietary trading activities were largely due to their exposure to US-originated asset-backed securities and to GIIPS sovereign bonds, respectively. Arguably such losses were not anticipated by banks and unrelated to the activity or the financial health of their corporate customers. Furthermore, in France most banks are universal banks engaged in both commercial banking and proprietary trading. As a result, by eroding bank capitalisation, realised losses on proprietary trading are likely to spill over to the real economy

via restrictions in commercial lending. In this respect, bank-level data seems to validate this hypothesis: Figure 2 shows that banks that recorded losses in 2008 restricted their total lending by more than banks that made no losses, and that the credit restriction is persistent over time.

Figure 2 here

In the following analysis, we therefore expect that firms whose relationship banks suffered losses from proprietary trading may borrow less and face higher funding costs as compared to other firms. However, a negative credit supply shock may be smoothed by borrowers if firms can switch between alternative sources of funding (Becker and Ivashina, 2014; De Marco, 2019). Yet, alternative sources of funding may be imperfectly substitutable, particularly for small and young firms that may as a result be credit constrained. In this section we further explore heterogeneities of bank credit shocks across firms by looking at how the effect varies for firms of different size. Specifically, we would expect that the credit restriction engendered by banks' losses on proprietary trading be more severe for small rather than large firms. To do so we estimate the following model:

$$y_{f,r,i,t} = \textit{Bank loss}_{b,t}(\beta_1 + \beta_2 ln\textit{Total assets}_{f,r,i,t}) + \theta_1 B_{b,t-1} + \theta_2 F_{f,r,i,t-1} + \alpha_b + \delta_{t,i,r} + \epsilon_{f,r,i,t} \quad (2)$$

where as before f stands for firms, b for banks, i for industries, r for regions and t for time. The dependent variables are three measures of firm's credit conditions: (the log of) short and long-term credit and the funding cost. The main explanatory variable (*Bank loss*) is a dummy variable that takes value 1 whenever a bank reports a loss on its trading and security portfolio, and 0 otherwise.[17] As in (Dwenger et al., 2018), we focus on bank losses (rather than losses *and* gains) on trading activities because we are interested in exogenous shocks that negatively affect bank credit supply by worsening bank fragility through bank equity (Bernanke and Gertler, 1990).

To test for the distributional dimension of banks' shocks, we include an interaction term designed to test how banks' losses from proprietary trading are transmitted to customers of the same bank. Specifically, we would expect smaller firms to be less able to substitute the credit shortfall with alternative funding and thus reduce borrowing by more. Vectors B and F contain firm and bank level control variables. Note that since we introduce a bank fixed effect, this specification tests whether the credit conditions of firms related to the same bank worsen in years when their reference bank report losses on its trading portfolio. In other words, this model wipes out all cross-banks variation and focuses on within-bank variation. Finally, we also add year×industry×region fixed effects to control for time-varying credit demand conditions at the local and industry level (De Marco, 2019). Standard errors are clustered at the bank level.

[17] In this section we use dummies for bank losses since we encounter large collinearity issues if we use a continuous variable and interact it with firm-level variables.

Results are reported in Table 5. Columns 1,3 and 5 indicate that losses on a bank's trading portfolios do not appear to be related to their customer firms' credit conditions. However, once we introduce the interaction term and allow the effect to vary across firms, the coefficient becomes negative and statistically significant. In the years when their reference bank incurs losses on trading activities, customer firms obtain less short and long-term credit and face higher funding costs. The results are economically sizeable: on average firms obtain 9.7% (6.3%) less long-term credit (short-term credit) and paid 1.9% higher funding costs when their relationship bank incurs losses on its trading portfolio. Furthermore, the coefficients on the interaction terms are statistically significant and carry a positive sign, revealing substantial heterogeneity across firms. In particular, when their reference bank incurs losses on its trading portfolio, smaller firms obtain less short and long-term loans and face higher funding costs than larger firms. By plotting the estimates of β_2 as a function of firm size, Figure 1 reveals to what extent bank losses affect different firms in different ways. When the same bank incurs losses on its trading portfolio, a small customer firm (bottom decile) obtains 24% (11%) less long-term credit (short-term credit) and pays 0.4% higher funding costs, while a large customer firm (top decile) obtains 26% (16%) more long-term credit (short-term credit) and pays 0.5% lower funding costs. In this sense, these results may reflect that banks affected by negative financial shocks may "fly to quality" by preferring safer borrowers as larger corporations (Bernanke et al., 1996; Berger et al., 2017; Degryse et al., 2019; De Jonghe et al., 2019).

Table 5 here

3.2.3 Bank shocks and firm real outcomes

Having established that shocks on banks' balance sheets are transmitted to their corporate customers in the form of worsened access to credit, particularly for smaller firms, in this section we measure how firms adjust their non-financial behaviour in response. Specifically, if a firm finds it particularly difficult or more expensive to obtain credit or roll over outstanding debt, it may be forced to forego investment projects, employ less labour and/or reduce the wage bill. To test for this hypothesis, we estimate the following model:

$$y_{f,r,i,t} = \beta_1 Bank\ loss_{b,t} + \theta_1 F_{f,r,i,t-1} + \delta_{t,i,r} + \epsilon_{f,r,i,t} \tag{3}$$

where as before f stands for firms, b for banks, i for industries, r for regions and t for time. The dependent variables are now firms' financial and real outcomes: total liabilities, short and long term loans, physical capital, number of employees, total wages (in logs) and funding costs. The main explanatory variable (*Bank loss*) is now a continuous variable – the absolute value of a bank's losses on its trading securities portfolio scaled by total assets. As in Dwenger et al. (2018), we code as zeros any gains banks make on their trading securities portfolio, so that higher values of *Bank loss* can directly be interpreted as higher losses. We also add year×industry×region fixed

effects to control for time-varying credit demand conditions at the local and industry level (De Marco, 2019).

Table 6 here

Results reported in Table 6 suggests that firms whose relationship bank incurs high losses on trading portfolios reduce total liabilities, long-term credit, investment in physical capital, employment and the wage bill more than firms related to banks than incurred lower losses. With respect to previous results, the estimate for long-term credit is less significant and estimates for short-term credit and funding costs are not statistically significant at conditional levels, likely reflecting the underlying heterogeneity across firms. The finding that bank shocks are transmitted to firms' real outcomes is in line with the findings of Chodorow-Reich (2014), Amiti and Weinstein (2011, 2013), Dwenger et al. (2018),Degryse et al. (2019), De Jonghe et al. (2019) and Balduzzi et al. (2018). Furthermore, as in Popov and Rocholl (2018), the simultaneous reduction in employment and wages points to a substantial decline in firms' labour demand with respect to firms borrowing from banks less affected by the financial shock. Overall, the findings are consistent with a bank lending channel through relationship banks: when they incur losses from proprietary trading, banks tighten credit conditions and this has adverse consequences for their corporate customers and the wider economy.

Conclusion

This paper investigates the transmission of financial shocks affecting banks' health onto borrowing firms' financial and real outcomes by using a large panel dataset of more than 80.000 firms matched to 175 banks in France from 2008 to 2016. We find that firms that borrow from less capitalized banks tend to obtain less long-term credit and face higher funding costs. Furthermore, we also find that firms obtain less credit and face higher funding costs when their relationship bank sustains losses on its proprietary trading activities, with smaller firms being relatively more credit constrained than larger firms. Finally, we find that bank shocks matter for real economic activity: firms borrowing from banks that sustain larger losses on proprietary trading activities also reduce investment, employment and the wage bill. These findings are consistent with a bank lending channel working through banks, whereby financial shocks affecting financial intermediaries are passed onto relationship firms in the form of tighter credit conditions.

References

Amiti, M., Weinstein, D.E., 2011. Exports and Financial Shocks. The Quarterly Journal of Economics 126, 1841–1877. URL: https://academic.oup.com/qje/article-lookup/doi/10.1093/qje/qjr033, doi:10.1093/qje/qjr033.

Amiti, M., Weinstein, D.E., 2013. How Much Do Bank Shocks Affect Investment? Evidence from Matched Bank-Firm Loan Data. NBER Working Paper .

Andrade, P., Cahn, C., Fraisse, H., Mésonnier, J.S., 2018. Can the Provision of Long-Term Liquidity Help to Avoid a Credit Crunch? Evidence from the Eurosystem's LTRO. Journal of the European Economic Association URL: https://academic.oup.com/jeea/advance-article/doi/10.1093/jeea/jvy020/5035663, doi:10.1093/jeea/jvy020.

Arellano, M., Bond, S., 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. The Review of Economic Studies 58, 277. URL: https://academic.oup.com/restud/article-lookup/doi/10.2307/2297968, doi:10.2307/2297968.

Balduzzi, P., Brancati, E., Schiantarelli, F., 2018. Financial markets, banks' cost of funding, and firms' decisions: Lessons from two crises. Journal of Financial Intermediation 36, 1–15. URL: https://www.sciencedirect.com/science/article/pii/S104295731730058X, doi:10.1016/J.JFI.2017.09.004.

Beatriz, M., Coffinet, J., Nicolas, T., 2018. Relationship lending and SMEs' funding costs over the cycle: why diversification of borrowing matters. Banque de France Working papers, 705. URL: https://ideas.repec.org/p/bfr/banfra/705.html.

Beck, T., Degryse, H., De Haas, R., van Horen, N., 2018. When arm's length is too far: Relationship banking over the credit cycle. Journal of Financial Economics 127, 174–196. URL: https://www.sciencedirect.com/science/article/pii/S0304405X17302957, doi:10.1016/J.JFINECO.2017.11.007.

Becker, B., Ivashina, V., 2014. Cyclicality of credit supply: Firm level evidence. Journal of Monetary Economics 62, 76–93. URL: https://www.sciencedirect.com/science/article/abs/pii/S0304393213001372, doi:10.1016/J.JMONECO.2013.10.002.

Berger, A.N., Bouwman, C.H.S., Kim, D., 2017. Small Bank Comparative Advantages in Alleviating Financial Constraints and Providing Liquidity Insurance over Time. The Review of Financial Studies 30, 3416–3454. URL: https://academic.oup.com/rfs/article/30/10/3416/3792480, doi:10.1093/rfs/hhx038.

Berger, A.N., Udell, G.F., 1995. Relationship Lending and Lines of Credit in Small Firm Finance. The Journal of Business 68, 351–381. URL: https://www.jstor.org/stable/pdf/2353332.pdf?refreqid=excelsior{%}3A64e628367d7a1a14023cea39973a985d, doi:URL:https://www.jstor.org/stable/2353332.

Bernanke, B., Gertler, M., 1990. Financial Fragility and Economic Performance. The Quarterly Journal of Economics 105, 87. URL: https://academic.oup.com/qje/article-lookup/doi/10.2307/2937820, doi:10.2307/2937820.

Bernanke, B., Gertler, M., Gilchrist, S., 1996. The Financial Accelerator and the Flight to Quality. The Review of Economics and Statistics 78, 1. URL: https://www.jstor.org/stable/2109844?origin=crossref, doi:10.2307/2109844.

Bernanke, B.S., Blinder, A.S., 1988. Credit, Money, and Aggregate Demand. The American Economic Review 78, 435–439. URL: http://links.jstor.org/sici?sici=0002-8282{%}28198805{%}2978{%}3A2{%}3C435{%}3ACMAAD{%}3E2.0.CO{%}3B2-1.

Blundell, R., Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics 87, 115–143. URL: http://www.sciencedirect.com/science/article/pii/S0304407698000098, doi:10.1016/S0304-4076(98)00009-8.

Cahn, C., Duquerroy, A., Mullins, W., 2017. Unconventional Monetary Policy and Bank Lending Relationships. Banque de France Working Paper URL: http://www.ssrn.com/abstract=2970199, doi:10.2139/ssrn.2970199.

Carbo-Valverde, S., Rodriguez-Fernandez, F., Udell, G.F., 2007. Bank Market Power and SME Financing Constraints. Review of Finance 13, 309–340. URL: https://academic.oup.com/rof/article-lookup/doi/10.1093/rof/rfp003, doi:10.1093/rof/rfp003.

Chodorow-Reich, G., 2014. The employment effects of credit market disruptions: Firm-level evidence from the 2008-9 financial crisis. Quarterly Journal of Economics 129, 1–59. doi:10.1093/qje/qjt031.

Cotugno, M., Monferrà, S., Sampagnaro, G., 2013. Relationship lending, hierarchical distance and credit tightening: Evidence from the financial crisis. Journal of Banking & Finance 37, 1372–1385. URL: https://www.sciencedirect.com/science/article/pii/S0378426612002208, doi:10.1016/J.JBANKFIN.2012.07.026.

Cressy, R., Olofsson, C., 1997. European SME Financing: An Overview. Journal of Small Business Economics 9, 87–96. URL: https://link.springer.com/content/pdf/10.1023/A:1007921004599.pdf.

De Jonghe, O., Dewachter, H., Mulier, K., Ongena, S., Schepens, G., 2019. Some Borrowers are More Equal than Others: Bank Funding Shocks and Credit Reallocation. Review of Finance Forthcomin. URL: https://www.ssrn.com/abstract=2774441, doi:10.2139/ssrn.2774441.

De Marco, F., 2019. Bank Lending and the European Sovereign Debt Crisis. Journal of Financial and Quantitative Analysis (Forth.). URL: http://www.ssrn.com/abstract=2673967, doi:10.2139/ssrn.2673967.

Degryse, H., De Jonghe, O., Jakovljevii, S., Mulier, K., Schepens, G., 2019. Identifying Credit Supply Shocks with Bank-Firm Data: Methods and Applications. Journal of Financial Intermediation Forthcomin. URL: https://www.ssrn.com/abstract=2788512, doi:10.2139/ssrn.2788512.

Diamond, D.W., 1991. Monitoring and Reputation: The Choice between Bank Loans and Directly Placed Debt. Journal of Political Economy 99, 689–721. URL: https://www.journals.uchicago.edu/doi/10.1086/261775, doi:10.1086/261775.

Dwenger, N., Fossen, F.M., Simmler, M., 2018. Firms' financial and real responses to credit supply shocks: Evidence from firm-bank relationships in Germany. Journal of Financial Intermediation URL: https://www.sciencedirect.com/science/article/pii/S1042957318300093, doi:10.1016/J.JFI.2018.01.003.

Fungáčová, Z., Solanko, L., Weillb, L., 2014. Does competition influence the bank lending channel in the euro area? Journal of Banking & Finance 49, 356–366. doi:https://doi.org/10.1016/j.jbankfin.2014.06.018.

Gambacorta, R.L., Shin, H.S., 2016. Why bank capital matters for monetary policy. Journal of Financial Intermediation 15, 0–1. doi:10.1016/j.jfi.2016.09.005.

Gan, J., 2007. The Real Effects of Asset Market Bubbles: Loan- and Firm-Level Evidence of a Lending Channel. Review of Financial Studies 20, 1941–1973. URL: https://academic.oup.com/rfs/article-lookup/doi/10.1093/rfs/hhm045, doi:10.1093/rfs/hhm045.

Hancock, D., Wilcox, J.A., 1998. The "credit crunch" and the availability of credit to small business. Journal of Banking & Finance doi:10.1016/S0378-4266(98)00040-5.

Ivashina, V., Scharfstein, D., 2010. Bank lending during the financial crisis of 2008. Journal of Financial Economics 97, 319–338. URL: https://www.

sciencedirect.com/science/article/pii/S0304405X09002396, doi:10.1016/J.JFINECO.2009.12.001.

Iyer, R., Peydró, J.L., Da-Rocha-Lopes, S., Schoar, A., 2014. Interbank Liquidity Crunch and the Firm Credit Crunch: Evidence from the 2007–2009 Crisis. Review of Financial Studies 27, 347–372. URL: https://academic.oup.com/rfs/article-lookup/doi/10.1093/rfs/hht056, doi:10.1093/rfs/hht056.

Kashyap, A.K., Stein, J.C., 1995. The impact of monetary policy on bank balance sheets. Carnegie-Rochester Conference Series on Public Policy 42, 151–195. doi:https://doi.org/10.1016/0167-2231(95)00032-U.

Khwaja, A.I., Mian, A., 2008. Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market. American Economic Review 98, 1413–1442. URL: http://pubs.aeaweb.org/doi/10.1257/aer.98.4.1413, doi:10.1257/aer.98.4.1413.

Kremp, E., Sevestre, P., 2013. Did the crisis induce credit rationing for French SMEs? Journal of Banking & Finance 37, 3757–3772. URL: https://linkinghub.elsevier.com/retrieve/pii/S0378426613002537, doi:10.1016/j.jbankfin.2013.05.028.

Lane, R., 2012. The European Sovereign Debt Crisis. Journal of Economic Perspectives 26, 49–68. URL: http://dx.doi.org/10.1257/jep.26.3.49., doi:10.1257/jep.26.3.49.

Montoriol-Garriga, J., Wang, J.C., 2011. The great recession and bank lending to small businesses. Federal Reserve Bank of Boston URL: https://www.econstor.eu/handle/10419/55663.

Ongena, S., Peydró, J.L., van Horen, N., 2015. Shocks Abroad, Pain at Home? Bank-Firm-Level Evidence on the International Transmission of Financial Shocks. IMF Economic Review 63, 698–750. URL: http://link.springer.com/10.1057/imfer.2015.34, doi:10.1057/imfer.2015.34.

Peek, J., Rosengren, E., 1995. Bank regulation and the credit crunch. Journal of Banking & Finance 19, 679–692.

Peek, J., Rosengren, E.S., 2005. Unnatural selection: Perverse incentives and the misallocation of credit in Japan. American Economic Review 95, 1144–1166. URL: https://www.jstor.org/stable/4132709.

Petersen, M.A., Rajan, R.G., 1995. The Effect of Credit Market Competition on Lending Relationships. The Quarterly Journal of Economics 110, 407–443. URL: https:

//academic.oup.com/qje/article-lookup/doi/10.2307/2118445, doi:10.2307/2118445.

Popov, A., Rocholl, J., 2018. Do credit shocks affect labor demand? Evidence for employment and wages during the financial crisis. Journal of Financial Intermediation 36, 16–27. URL: https://www.sciencedirect.com/science/article/pii/S1042957316300493, doi:10.1016/J.JFI.2016.10.002.

Ryan, R.M., O'Toole, C.M., McCann, F., 2014. Does bank market power affect SME financing constraints? Journal of Banking & Finance 49, 495–505. URL: https://www-sciencedirect-com.inshs.bib.cnrs.fr/science/article/pii/S0378426614000053?via{%}3Dihub, doi:10.1016/J.JBANKFIN.2013.12.024.

Shrieves, R.E., Dahl, D., 1992. The relationship between risk and capital in commercial banks. Journal of Banking & Finance 16, 439–457. URL: https://www.sciencedirect.com/science/article/pii/037842669290024T, doi:10.1016/0378-4266(92)90024-T.

Stiglitz, J.E., Weiss, A., 1981. Credit Rationing in Markets with Imperfect Information. The American Economic Review 71, 393–410. URL: https://www.jstor.org/stable/pdf/1802787.pdf?acceptTC=true.

Van den Heuvel, S.J., 2002. Does bank capital matter for monetary transmission? Economic Policy Review 8, 259–265. URL: https://www.newyorkfed.org/medialibrary/media/research/epr/02v08n1/0205vand.pdf.

Tables

Table 1: Descriptive statistics

Variables	Obs.	mean	sd	min	max
Firm variables					
Number of employees	316,228	89.86	872.0	1	79,371
Physical Capital (€ million)	652,558	3.717	180.5	-3.606	49,856
Cash flow (€ million)	638,166	1.406	22.55	-17.22	6,587
Total assets (€ million)	652,579	20.50	380.4	0	56,79
Net worth (€ million)	652,576	2.614	51.49	-1,727	5,969
Total liabilities (€ million)	652,578	20.50	380.4	-0.0260	56,79
Long-term credit (€ million)	652,574	4.001	127.5	-172.4	43,164
Short-term credit (€ million)	652,568	1.037	28.81	-29.55	5,336
Wages (€ million)	626,214	3.169	33.27	-116.7	4,004
Funding costs	545,143	0.244	1.149	0	17
EBITDA/Total assets	627,677	0.0978	0.149	-14.03	31.73
Physical/Total assets	652,553	0.146	0.181	-6.561	43.95
Exports/Revenues	636,132	0.0693	0.258	-98.56	93.38
Bank variables					
Total assets (€ million)	696,701	540,95	746,706	6.278	2.202e+06
Capitalisation ratio	684,563	0.0654	0.0355	0.0220	0.154
Liquidity ratio	687,683	0.118	0.175	2.00e-05	0.782
Loans interest income/Net interest income	649,687	1.652	1.917	-101.7	34.77
Losses on proprietary trading/Total assets	584,947	0.0211	0.0886	0	1.535

Table 2: Bank capitalisation and firms' long-term loans

Dep. variable	(1)	(2)	(3)	(4)	(5)	(6)
ln long-term loans	OLS	FE	FE	FE	FE	GMM
Capital ratio$_{bt-1}$	0.204***	0.218***	0.186***	0.204***	0.203***	0.185***
	(0.0615)	(0.0667)	(0.0519)	(0.0462)	(0.0461)	(0.0505)
ln (total assets)$_{bt-1}$	-0.000548	0.000332	-0.000510	0.00210	0.00208	0.00190
	(0.00220)	(0.00241)	(0.00185)	(0.00173)	(0.00173)	(0.00171)
Liquidity ratio$_{bt-1}$	-0.0200	-0.0303	-0.0276*	-0.0418***	-0.0414***	-0.0407***
	(0.0211)	(0.0248)	(0.0166)	(0.0139)	(0.0139)	(0.0138)
ln (total assets)$_{f,i,r,t-1}$	0.383***	0.383***	0.386***	0.387***	0.386***	0.379***
	(0.00576)	(0.00574)	(0.00574)	(0.00580)	(0.00575)	(0.00591)
ln (cash flow)$_{f,i,r,t-1}$	-0.0670***	-0.0671***	-0.0679***	-0.0676***	-0.0678***	-0.0609***
	(0.00988)	(0.00988)	(0.00976)	(0.00960)	(0.00958)	(0.00701)
Export/revenues$_{f,i,r,t-1}$	-0.00282	-0.00296	0.00233	0.00324	0.00325	0.0114
	(0.00559)	(0.00560)	(0.00426)	(0.00440)	(0.00435)	(0.00865)
EBITDA/total assets$_{f,i,r,t-1}$	-0.103***	-0.105***	-0.125***	-0.127***	-0.126***	-0.225***
	(0.0174)	(0.0174)	(0.0154)	(0.0155)	(0.0156)	(0.0137)
Physical/total assets$_{f,i,r,t-1}$	0.580***	0.580***	0.522***	0.518***	0.518***	0.656***
	(0.0814)	(0.0813)	(0.100)	(0.101)	(0.101)	(0.0210)
ln (net worth)$_{f,i,r,t-1}$	0.0539***	0.0537***	0.0522***	0.0527***	0.0516***	0.0534***
	(0.00657)	(0.00661)	(0.00688)	(0.00686)	(0.00668)	(0.00722)
Constant	-0.296***					
	(0.0264)					
Year FE		✓	✓	✓	✓	✓
Industry FE			✓	✓	✓	✓
Region FE				✓	✓	✓
Listed FE					✓	✓
Observations	394,097	394,097	394,097	394,097	394,097	394,097
R-squared	0.526	0.526	0.544	0.544	0.545	0.543

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Bank capitalisation and firms' short-term loans

Dep. variable	(1)	(2)	(3)	(4)	(5)	(6)
ln short-term loans	OLS	FE	FE	FE	FE	GMM
Capital ratio$_{bt-1}$	0.0885	0.106*	0.0109	-0.0442	-0.0439	-0.0414
	(0.0595)	(0.0567)	(0.0463)	(0.0510)	(0.0509)	(0.0508)
ln (total assets)$_{bt-1}$	-0.00627***	-0.00526***	-0.00513***	-0.00440***	-0.00440***	-0.00436***
	(0.00171)	(0.00158)	(0.00134)	(0.00113)	(0.00113)	(0.00113)
Liquidity ratio$_{bt-1}$	0.0127	0.000746	0.00386	-0.00136	-0.00145	-0.00182
	(0.0202)	(0.0186)	(0.0175)	(0.0168)	(0.0168)	(0.0168)
ln (total assets)$_{f,i,r,t-1}$	0.192***	0.192***	0.184***	0.184***	0.185***	0.188***
	(0.0117)	(0.0117)	(0.0111)	(0.0110)	(0.0110)	(0.0112)
ln (cash flow)$_{f,i,r,t-1}$	-0.106***	-0.106***	-0.0959***	-0.0951***	-0.0951***	-0.105***
	(0.0129)	(0.0129)	(0.0125)	(0.0124)	(0.0124)	(0.0132)
Export/revenues$_{f,i,r,t-1}$	-0.00117	-0.00123	0.00795	0.00953	0.00952	0.0241*
	(0.00541)	(0.00542)	(0.00681)	(0.00739)	(0.00740)	(0.0123)
EBITDA/total assets$_{f,i,r,t-1}$	-0.101***	-0.101***	-0.0874***	-0.0879***	-0.0881***	-0.131***
	(0.00712)	(0.00720)	(0.00611)	(0.00614)	(0.00609)	(0.00739)
Physical/total assets$_{f,i,r,t-1}$	0.147***	0.146***	0.144***	0.136***	0.136***	0.140***
	(0.00702)	(0.00703)	(0.00797)	(0.00809)	(0.00807)	(0.00833)
ln (net worth)$_{f,i,r,t-1}$	-0.0710***	-0.0712***	-0.0603***	-0.0593***	-0.0590***	-0.0638***
	(0.00296)	(0.00295)	(0.00340)	(0.00335)	(0.00336)	(0.00329)
Constant	-0.00252					
	(0.0265)					
Year FE		✓	✓	✓	✓	✓
Industry FE			✓	✓	✓	✓
Region FE				✓	✓	✓
Listed FE					✓	✓
Observations	393,779	393,779	393,779	393,779	393,779	393,779
R-squared	0.216	0.216	0.246	0.248	0.248	0.247

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Bank capitalisation and firms' funding costs

Dep. variable	(1)	(2)	(3)	(4)	(5)	(6)
Funding costs	OLS	FE	FE	FE	FE	GMM
Capital ratio$_{bt-1}$	-0.459*	-0.441*	-0.311	-0.438***	-0.438***	-0.422***
	(0.248)	(0.245)	(0.223)	(0.146)	(0.146)	(0.145)
ln (total assets)$_{bt-1}$	0.00837**	0.0103**	0.0104**	0.000523	0.000533	0.000733
	(0.00403)	(0.00413)	(0.00418)	(0.00276)	(0.00276)	(0.00270)
Liquidity ratio$_{bt-1}$	-0.0394	-0.0638	-0.0751**	-0.0190	-0.0191	-0.0199
	(0.0395)	(0.0424)	(0.0376)	(0.0226)	(0.0226)	(0.0225)
Interests on loans/	0.0130	0.0107	0.0106	0.0131***	0.0131***	0.0132***
Net interest income$_{bt-1}$	(0.00939)	(0.0105)	(0.00946)	(0.00487)	(0.00486)	(0.00486)
ln (total assets)$_{f,i,r,t-1}$	-0.0818***	-0.0811***	-0.0856***	-0.0881***	-0.0881***	-0.0862***
	(0.0128)	(0.0127)	(0.0135)	(0.0129)	(0.0129)	(0.0130)
ln (cash flow)$_{f,i,r,t-1}$	0.0399***	0.0397***	0.0416***	0.0396***	0.0396***	0.0404***
	(0.0132)	(0.0132)	(0.0141)	(0.0136)	(0.0136)	(0.0142)
Export/revenues$_{f,i,r,t-1}$	0.0320*	0.0318*	0.0216*	0.0160	0.0160	0.0197
	(0.0172)	(0.0172)	(0.0122)	(0.00982)	(0.00982)	(0.0214)
EBITDA/total assets$_{f,i,r,t-1}$	-0.0817***	-0.0842***	-0.0756***	-0.0667***	-0.0669***	-0.137***
	(0.0249)	(0.0249)	(0.0254)	(0.0242)	(0.0242)	(0.0395)
Physical/total assets$_{f,i,r,t-1}$	-0.347***	-0.347***	-0.345***	-0.328***	-0.328***	-0.408***
	(0.0616)	(0.0618)	(0.0812)	(0.0779)	(0.0779)	(0.0212)
ln (net worth)$_{f,i,r,t-1}$	0.0355***	0.0351***	0.0281***	0.0235***	0.0236***	0.0214***
	(0.00954)	(0.00956)	(0.00922)	(0.00888)	(0.00891)	(0.00807)
Constant	0.303***					
	(0.0507)					
Year FE		✓	✓	✓	✓	✓
Industry FE			✓	✓	✓	✓
Region FE				✓	✓	✓
Listed FE					✓	✓
Observations	314,669	314,669	314,669	314,669	314,669	314,669
R-squared	0.007	0.008	0.016	0.018	0.018	0.018

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Bank losses and credit conditions across firms

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. variable	ln long term loans		ln short-term loans		Funding costs	
Bank loss $_{b,t}$	0.00258	-0.0965***	-0.000743	-0.0631***	-0.00769	0.0194*
	(0.00177)	(0.0166)	(0.00103)	(0.00563)	(0.00563)	(0.0109)
Bank loss $_{b,t}$		0.109***		0.0690***		-0.0265***
$\times ln$ total assets$_{f,r,i,t}$		(0.0129)		(0.00511)		(0.00642)
Capital ratio$_{bt-1}$	0.182	0.167	-0.151*	-0.165	0.198	0.199
	(0.110)	(0.145)	(0.0888)	(0.111)	(0.403)	(0.412)
ln (total assets)$_{bt-1}$	0.00532	-0.0102	0.00394	-0.00655	-0.0393	-0.0345
	(0.00861)	(0.0156)	(0.00842)	(0.0126)	(0.0426)	(0.0419)
Liquidity ratio$_{bt-1}$	-0.0245**	-0.0326***	0.0151**	0.0101	0.0530*	0.0551**
	(0.00951)	(0.0118)	(0.00603)	(0.00817)	(0.0273)	(0.0275)
ln (cash flow)$_{f,i,r,t-1}$	0.0319***	0.0286***	0.0112***	0.00909***	0.00129	0.00211
	(0.00187)	(0.00220)	(0.00119)	(0.00142)	(0.00129)	(0.00140)
Export/revenues$_{f,i,r,t-1}$	0.155***	0.151***	0.0741***	0.0715***	0.0139	0.0148
	(0.0143)	(0.0161)	(0.00796)	(0.00746)	(0.0188)	(0.0192)
EBITDA/total assets$_{f,i,r,t-1}$	-0.172***	-0.173***	-0.0869***	-0.0872***	-0.0716***	-0.0718***
	(0.0149)	(0.0149)	(0.00509)	(0.00528)	(0.0178)	(0.0179)
Physical/total assets$_{f,i,r,t-1}$	0.652***	0.642***	0.321***	0.313***	-0.347***	-0.344***
	(0.137)	(0.135)	(0.0100)	(0.00894)	(0.0860)	(0.0854)
ln (net worth)$_{f,i,r,t-1}$	0.117***	0.110***	0.0557***	0.0511***	-0.0298***	-0.0280***
	(0.00736)	(0.00949)	(0.00135)	(0.00146)	(0.00245)	(0.00231)
Bank FE	✓	✓	✓	✓	✓	✓
Year*Industry*Region FE	✓	✓	✓	✓	✓	✓
Observations	397,903	397,903	397,545	397,545	336,529	336,529
R-squared	0.392	0.400	0.244	0.251	0.087	0.087

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Bank shocks and firms' real outcomes

Dep. variable	(1) ln total liabilites	(2) ln long-term loans	(3) ln short-term loans	(4) funding costs	(5) ln physical capital	(6) ln employment	(7) ln wages
Bank loss $_{b,t}$	-0.271***	-0.0328	0.00206	0.0450	-0.0833***	-0.365***	-0.135***
	(0.0440)	(0.0230)	(0.0154)	(0.0697)	(0.0185)	(0.0700)	(0.0244)
ln (cash flow)$_{f,i,r,t-1}$	0.867***	0.190***	0.0275***	-0.0227***	0.233***	0.450***	0.292***
	(0.00285)	(0.00158)	(0.00103)	(0.00452)	(0.00126)	(0.00417)	(0.00170)
Export/revenues$_{f,i,r,t-1}$	0.338***	0.0961***	0.0591***	0.0142	0.0893***	-0.0698***	0.0915***
	(0.00856)	(0.00452)	(0.00301)	(0.0140)	(0.00363)	(0.0132)	(0.00481)
EBITDA/total assets$_{f,i,r,t-1}$	-0.100***	-0.178***	-0.109***	-0.0424**	0.0117***	-0.159***	-0.0626***
	(0.0104)	(0.00548)	(0.00365)	(0.0179)	(0.00439)	(0.0171)	(0.00593)
Physical/total assets$_{f,i,r,t-1}$	0.425***	0.597***	0.205***	-0.346***	1.861***	0.191***	0.124***
	(0.00896)	(0.00473)	(0.00360)	(0.0137)	(0.00440)	(0.0129)	(0.00511)
ln (net worth)$_{f,i,r,t-1}$	1.073***	0.400***	0.110***	-0.0601***	0.418***	0.780***	0.537***
	(0.00266)	(0.00152)	(0.000986)	(0.00410)	(0.00123)	(0.00383)	(0.00168)
Year ×Industry×Region FE	✓	✓	✓	✓	✓	✓	✓
Observations	354,634	351,125	350,886	300,093	350,629	168,453	342,123
R-squared	0.681	0.445	0.212	0.082	0.683	0.554	0.538

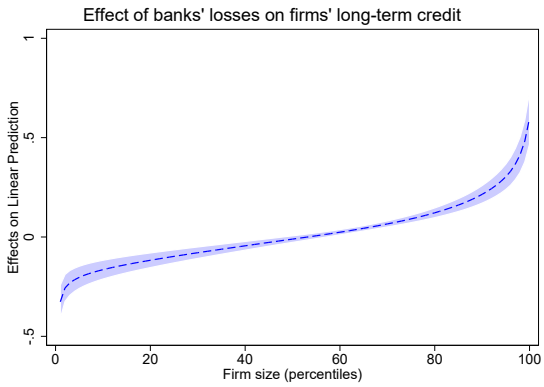
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figures

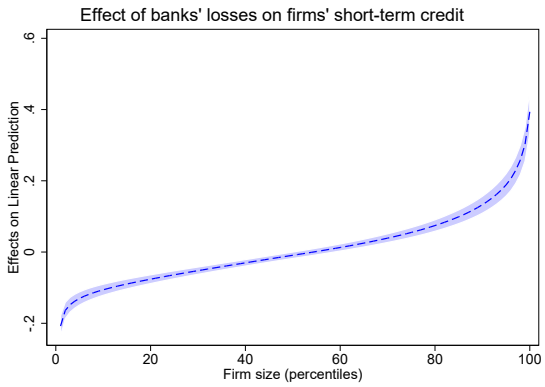
Figure 1: The heterogeneous effect of bank losses across firms

Estimated marginal effect of banks' losses on firms' credit availability as a function of firms' size, based on estimates reported in table 5.

(a) Long-term loans



(b) Short-term loans



(c) Funding costs

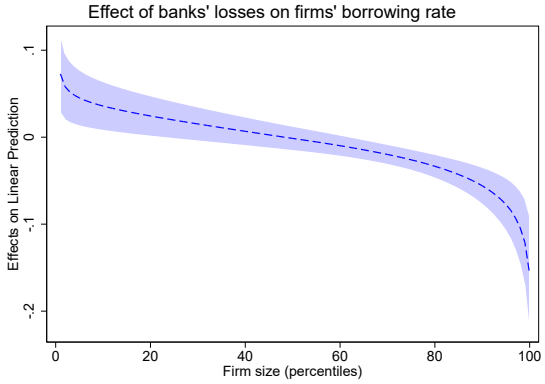


Figure 2: Loan growth by banks with different losses on proprietary trading securities portfolios in 2008. Source: Fitchconnect (2017)