

Labor Market Effects of a Credit Crunch*

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Abstract

We investigate the transmission of a credit crunch to the labor market, studying the effects of the 2008 international financial crisis in Brazil, where the crisis was arguably exogenous to banks and non-financial firms. Building upon a unique data set that connects banks to firms and firms to workers, we are able to investigate the transmission chain from banks to workers. We construct exogenous variation in credit supply by exploiting firms' relationships with banks before the crisis and how severe the banks' credit supply was affected. Our results show that the credit crunch had an economic and statistically significant effect on firms' employment level and their wage bill. Employment adjustment occurred through an increase in layoffs rather than through a reduction in hirings or an increase in quits. Firms with working capital loans and loans maturing during the peak of the crisis experienced a more severe credit reduction. Additionally, skilled workers had a lower probability of being fired as a result of their employee's credit restriction than unskilled workers.

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1 Introduction

The macroeconomic effects of credit crunches have called attention of economists long time ago (e.g. [Bernanke, 1983](#)). More recently, disruptions in the credit market during the 2008 financial crisis motivated several studies on the connection between the credit market and the real outcomes. An extensive literature documents effects of credit supply on real outcomes such as investment, employment, productivity and exports.¹ In this paper, we revisit the question in the context of a developing country, and we try to advance the literature by documenting how firms restructure their labor force, the persistence of the effects on workers and firms, and the role of loan types and characteristics in shaping these effects.

Brazil is an appealing setting for our study. First, there is rich matched employer-employee data covering the universe of formal workers. The richness of the data allows us to go beyond aggregate results at the firm level and study how firms change the composition of their labor force as well as long-term consequences of such decisions on their employees' career. Second, the credit registry data provide detailed loan-level information. We investigate how the credit supply shock and the restructuring process interact with loan types (working capital or investment loans) and characteristics (maturity). The importance of loan types has been recently acknowledged in both the macro-finance and bank lending channel literature ([Ivashina et al., 2022](#); [Lian and Ma, 2021](#); [Kermani and Ma, 2020](#)). Finally, the contagion was arguably exogenous to local financial and labor market conditions. It happened due to external links to international credit markets, despite the fact that the domestic credit market was dominated by well-capitalized banks. In contrast, most of studies of the effect of a credit contraction using the 2008 financial crisis use data from the US or other countries where the simultaneous burst of the real state bubble could raise concerns about causality actually running from the real sector to the credit market. Moreover, as a result of the soundness of local banks and counter-cyclical policies, the crisis was comparatively short-lived in Brazil, with most indicators taking around two quarters to return to their pre-crisis levels. This feature allows us to better pin down the persistence of credit effects, which are in general accompanied by a persistent effects on demand and production.

The question we try to answer present some hurdles to be overcome. As we only observe equilibrium credit quantities that reflect both supply and demand forces, a regression of changes in firm employment on changes in credit can suffer from reverse causality. Such a situation would arise if any observed reduction in employment is due

¹Studies that document the impact of the 2008 financial crisis include [Acabbi et al. \(2020\)](#), [Adamopoulou et al. \(2021\)](#), [Barbosa et al. \(2017\)](#), [Benmelech et al. \(2019\)](#), [Bentolila et al. \(2018\)](#), [Bottero et al. \(2020\)](#), [Chodorow-Reich \(2014\)](#), [Cingano et al. \(2016\)](#), [Cortes et al. \(2019\)](#), [Duval et al. \(2020\)](#), [Duygan-Bump et al. \(2015\)](#), [Huber \(2018\)](#), [Paravisini et al. \(2015\)](#). [Güler et al. \(2021\)](#) provide a review of the literature.

to other conditions (e.g. a demand shock) that prompt firms to demand less credit or banks to cut credit because of a deterioration in firms' insolvency risk. Exogenous variation in credit supply that is unrelated to firms' demand for credit or changes in risk profile is thus necessary. A similar concern would arise if firms match endogenously with banks (Bolton et al., 2016; Gan, 2007; Paravisini et al., 2017; Schwert, 2018). If firms less able to deal with the shock (e.g. less liquid) or more exposed to it (e.g. exporters) borrow from banks that cut more credit, a regression of employment changes on credit changes would yield upward biased estimates.

We construct exogenous variation in credit supply by exploiting firms' relations with banks before the crisis and how severe the banks' credit supply was affected, as in Chodorow-Reich (2014). We add a rich set of covariates and fixed effects and perform several tests to further alleviate concerns that results are driven by sorting between banks and firms. Our results indicate that firms that suffered a credit restriction adjusted mainly by reducing their number of employees, while hirings and voluntarily separations (quits) are not affected. Although we find that the average wage was not affected by the credit restriction, there is an adjustment in the wage bill due to the reduction in the number of workers. We classify loans into working capital and investment loans, and we document that only firms that relied more on working capital loans *ex ante* were affected. We also find that only firms with a large proportion of debt maturing during the crisis were affected. The effect is quantitatively more important for medium-size firms, while large firms are not affected, indicating that large firms are able to switch lenders or issue other types of securities such as bonds. Our worker's level investigation indicated that a higher skill worker was much less likely to be fired as a result of a credit contraction than a low skill worker. Finally, we document that despite the short-term nature of the crisis in Brazil, effects are persistent both at the firm- and worker-level, and remain significant for several years after the shock.

Related Literature

This paper relates to the recent literature that uses microdata to investigate the real effects of variations in credit market conditions. Chodorow-Reich (2014) analyses the effect of credit disruptions in US caused by the 2008-9 financial crisis on employment. Using data from syndicated corporate loans, he shows that firms more exposed to the credit shock reduce employment. Moreover, effects are only present for small and medium firms. Using a different samples of US firms, García (2020), Greenstone et al. (2020) and Mondragon (2018) document effects that are qualitatively similar. Works using data from Europe complement the evidence for the US, including Acabbi et al. (2020), Huber (2018), Bentolila et al. (2018), among others. Huber (2018) also documents indirect effects on firms through reductions in local aggregate demand and

agglomeration spillovers.

We also build on the literature that documents how firms adjust their labor force after a credit supply shocks and the consequences on workers' career paths. [Barbosa et al. \(2017\)](#), [Bentolila et al. \(2018\)](#), [Berton et al. \(2018\)](#) and [Hochfellner et al. \(2015\)](#) show that employees that are less educated, younger, working under temporary contracts and for a shorter period before separation are more likely to be fired. Moreover, [Caggese et al. \(2019\)](#) show that financially constrained firms fire the wrong type of workers, such as workers with steeper productivity profiles or lower firing costs, relative to unconstrained firms. [Adamopoulou et al. \(2021\)](#) document long-term effects on workers. More generally, we contribute to the labor literature that studies the consequences of job losses ([Bertheau et al., 2022](#); [Davis et al., 2011](#); [Huckfeldt, 2022](#); [Jacobson et al., 1993](#)).

The transmission of the 2008-9 financial crisis through the Brazilian banking system was also studied by [Coleman and Feler \(2015\)](#), [Cortes et al. \(2019\)](#) and [Oliveira et al. \(2015\)](#). [Coleman and Feler \(2015\)](#) use municipality level data, focusing on the role of government-owned banks in mitigating the effects of the crisis and its allocative effects. They found that localities with a high share of government banks received more loans and experienced better employment outcomes relative to localities with a low share of government banks. [Cortes et al. \(2019\)](#) analyze the propagation of credit shocks in supplier-customer networks. [Oliveira et al. \(2015\)](#) shows that banks not perceived as "too-big-to-fail" suffered a large decline in funding, in particular time deposits.

2 Empirical setting

2.1 The 2008 Financial Crisis in Brazil

Brazil hardly felt any real effects of the subprime crisis until the Lehman Brothers crash in September 2008, as the economy was expanding with an accumulated GDP growth of 6.5% in the first three quarters of 2008, while the stock of credit expanded 26.3% in real terms between September 2007 and September 2008.² Therefore, the Lehman crash is a good identifier of the beginning of an acute but short-lived crisis that started for reasons exogenous to the Brazilian economy.³

Panel (a) of [Figure 1](#) compares the evolution of quarterly real GDP of Brazil and the US. Brazil was growing at a faster pace than the US before the Lehman collapse. In the

²We deflate the stock of credit by the consumer price index (IPCA). [De Mello and Garcia \(2012\)](#) provide for an account of the evolution of the Brazilian financial system from the Real Plan until the 2008/09 financial crisis.

³Even though prices of risky assets adjusted sharply after the Lehman collapse, some correction was noticeable before this event. The depreciation of the Brazilian currency started in August while the stock market index (Ibovespa) peaked at the end of May and started to decrease steadily thereafter. See [Figure 5](#).

two quarters after September 2008, the recession in Brazil was deeper than the one in the US, but while the Brazilian economy recovered already in the fourth quarter of 2009, ending up with a GDP growth of -0.13% in 2009, and grew sharply in 2010 (7.5%), the US economy stagnated. The recession in Brazil was then comparatively shorter, with its main effects operating in the fourth quarter of 2008 and the first quarter of 2009.⁴ This fact is reflected in the mild effect on the amount of loans outstanding to firms. In Panel (b), we show that while this amount remained flat for three quarters in Brazil and then started to grow again, in the US it decreased and did not recover to pre-crisis levels.

However, the mild effect of the crisis on aggregate credit hides an important heterogeneity, which we document in Figure 2. Panel (a) shows that large banks – that were perceived as safe and too-big-to-fail – experienced a positive inflow of funding, while small and medium banks encountered difficulty in raising resources. This fact was documented by [Oliveira et al. \(2015\)](#) using Brazilian data and [Iyer et al. \(2019\)](#) using Danish data.⁵ In Panel (b), we show that this decrease in funding occurred despite an increase in the spread small and medium banks paid to raise resources in comparison to big banks. In Panel (c), we show that less funding in small and medium banks was reflected in less credit, which took four quarters to reach again its pre-crisis level; credit granted by big banks, on the other hand, kept increasing after the Lehman collapse. In Panel (d), we decompose big banks into private and government-owned banks, and show that the increase in lending in big banks was particularly pronounced in government-owned banks, a result of countercyclical measures put into effect by the government.⁶ Banks that cut credit accounted for about 10% of the outstanding credit before the crisis and it took 8 quarters for them to recover pre-crisis levels.

In Panels (a) and (b) of Figure 4, we show that layoffs shot up after the Lehman collapse, while the flow of hirings interrupted its growth tendency. The year-over-year comparison shows a divergence between the flows of hirings and layoff after September 2008, resulting in an increase in the unemployment rate, which we document in Panels (c) and (d) of the same figure.

⁴Table A.1 in the appendix decomposes the GDP in Brazil around the financial crisis and shows that the services sector led the recovery, while manufacturing and agriculture took a longer time to recover. The table also shows that consumption was barely affected by the crisis.

⁵We classify large banks as in [Oliveira et al. \(2015\)](#): Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and BNDES, Caixa Econômica Federal. We also include Banco Nossa Caixa, bought by Banco do Brasil in 2009.

⁶The Brazilian Central Bank also took several measures to contain the effects of the crisis. See, for instance, [Mesquita and Toros \(2010\)](#).

2.2 Data and sample construction

Our analysis combines credit registry data from the Central Bank of Brazil and matched employer-employee data from the Brazilian Ministry of Labor and Employment. The credit registry contains the taxpayer identifier of each bank and firm, and a time-invariant identifier for each loan, allowing us to track any corporate loan above 5,000 BRL granted by a financial institution operating in Brazil. We exclude firms with the following characteristics: financial firms, exporters and importers, firms with no outstanding bank credit in August 2008, and firms without any employees in August 2008.⁷ Exporters and importers are excluded to prevent any confounding shock arising from a direct exposure to the “great trade collapse” or the exchange rate depreciation that ensued the Lehman bankruptcy. To prevent any contamination from the counter-cyclical reaction of the federal development bank (Brazilian Development Bank, BNDES), we also exclude firms with positive outstanding loans granted by this bank in August 2008 or January 2009. Finally, since large banks were not affected by the crisis (as documented in the previous section and in [Oliveira et al., 2015](#)), we exclude from our sample firms that only had ties with such banks. Our sample is then comprised of firms that had relationships with small and medium banks, either only borrowing from them or borrowing from them and large banks at the same time.

Linked employer-employee data come from the *Relação Anual de Informações (RAIS)*, a mandatory survey filled out annually by all tax-registered firms in Brazil.⁸ The RAIS data contain the taxpayer identifier of each firm, which allows us to perform a merge with the credit registry data. The data also contain the taxpayer identifier of each worker, which allows us to follow individuals over time. We observe data on average gross monthly earnings and average number of hours worked, as well as worker characteristics (education, occupation, race, age, and gender) and firm characteristics (industry and location). Using information on employees’ starting and termination dates, we can construct, for each firm, a time-series of the number of employees, total wage bill, average wage paid, hirings and separations.

Table 1 compares our final sample (columns 4 and 5) with the firms in the RAIS that are not in the credit registry (column 1) and firms that only had ties with large private and government banks (column 3). Our sample is comprised of firms that are relatively larger in terms of pre-crisis number of employees and credit, and have a smaller share of loans maturing during the peak of the crisis. On the other hand, measures of default are similar for firms in and out of our sample. The contraction of credit is particularly strong for firms that only borrow from small and medium banks (column

⁷We excluded potential exporter and importer firms by requiring the firms in our sample to have no foreign trade loans and to be out of the import/export database from 2010 to 2016.

⁸Incomplete or late information results in severe penalties, which leads to a high degree of compliance and essentially complete coverage of all employees in the Brazilian formal sector.

5), corroborating the findings of the previous section. Interestingly, the contraction of employment is not larger for those firms, indicating some degree sorting and the necessity to use a rich set of control variables in the regressions. Table A.2 in the appendix describes firms that are in the SCR data but not necessarily in the RAIS data.

2.3 Methodology

We would like to measure the effect of the variation in credit supply to firm i during the crisis, which we denote by ΔL_i^s , on the variation of firm-level employment variables such as size of the labor force, wage bill, hirings and separations, denoted by ΔY_i , through the following regression:

$$\Delta Y_i = \alpha + \beta \Delta L_i^s + \gamma' X_i + e_i$$

where X_i is a vector of baseline firm controls measured before the credit supply shock. Our interest is to measure the effect captured by the coefficient β . Two challenges arise when estimating this regression. First, credit supply is not observed. We only observe the amount of credit that firm i takes, which also reflects demand factors that can correlate with employment choices. For instance, the supply shock can coincide with a demand shock that diminishes the need to raise working capital and reduces the optimal size of the workforce. Second, firms do not match randomly with banks (e.g. Bolton et al., 2016, Paravisini et al., 2017, Schwert, 2018), and shocks to a particular bank can correlate with shocks to firms that borrow from it. For instance, firms that match with banks that are more severely hit can also be less prepared to withstand the crisis (less cash holdings, higher leverage and short-term debt) and thus have to downsize their workforce.

Our first specification task is to pin down the timing the credit variation we want to measure. We identify the outbreak of the crisis with the Lehman bankruptcy on September 15th, 2008. We split the monthly sample based on this date. August 2008 is used as the base level for our credit variables *before* the crisis. The credit supply shock for each firm is calculated by comparing a credit supply measure in January 2009 with that of August 2008. We then construct a measure of variation in credit supply to firms by exploring firms' relationships with banks before the crisis and the fact the banks' capacity to attract funding and keep the pre-crisis level of loan origination was heterogeneous during the crisis.

A usual approach in the literature (e.g. Chodorow-Reich, 2014) is to construct proxies for the credit supply shock faced by firm i from bank b by using the change in total loans from bank b but excluding the loans to the firm i itself. In order to avoid concerns that loan demand shocks for a firm may be correlated with shocks in loan demand for firms in the same sector, we go one step beyond and exclude all loans from bank b to

firms in the same sector as firm i , which we denote by $s(i)$. We denote by $L_{b,-i}^{crisis}$ the amount of outstanding loans granted by bank b in January 2009 (after the crisis) to firms j in a sector $s(j) \neq s(i)$, and by $L_{b,-i}^{before}$ the amount of outstanding loans granted by bank b in August 2008 (before the crisis) to firms j in a sector $s(j) \neq s(i)$. We then define the potential credit supply shock of bank b to firm i as:

$$\Delta L_{b,-i} = \frac{L_{b,-i}^{crisis} - L_{b,-i}^{before}}{0.5(L_{b,-i}^{crisis} + L_{b,-i}^{before})}$$

where

$$L_{b,-i}^{crisis} = \sum_{j:s(j) \notin s(i)} L_{b,j}^{crisis} \quad \text{and} \quad L_{b,-i}^{before} = \sum_{j:s(j) \notin s(i)} L_{b,j}^{before}$$

and where $s(i)$ is the sector of firm i , $s(j)$ is the sector of firm j , $L_{b,j}^{before}$ and $L_{b,j}^{after}$ are the total credit from bank b to firm j in August 2008 and January 2009, respectively. The measure of loan supply growth to each borrower i , ΔL_i^s , is given by:

$$\Delta L_i^s = \sum_b \alpha_{b,i}^{before} \Delta L_{b,-i} \quad (1)$$

where $\alpha_{b,i}^{before}$ is the share of loans of bank b to firm i before the crisis.

We use the variable ΔL_i^s to instrument changes in the total credit of firm i :

$$\Delta L_i = \beta \Delta L_i^s + \gamma' X_i + \alpha_{s(i)-state} + \epsilon_i \quad (\text{first-stage}) \quad (2)$$

$$\Delta Y_i = \beta \Delta L_i^s + \gamma' X_i + \alpha_{s(i)-state} + \epsilon_i \quad (\text{reduced-form}) \quad (3)$$

where ΔY_i is the change in a firm-level variable such as the number of employees and $\alpha_{s(i)-state}$ denotes sector-state dummies. We cluster standard errors at the industry level and weight regressions by firm size.⁹

The validity of our strategy relies on the assumption that, controlling for our set of covariates, the only reason for the change in credit supply ΔL_i^s to be correlated with the change in employment ΔY_i is through its effect on the change in the amount of credit that firm i takes, ΔL_i . If firms less prepared to deal with the crisis match with banks that reduce more their supply, this assumption would be violated. We believe this concern is mitigated by features of the episode we are analyzing. First, the crisis in Brazil was relatively short in comparison to other countries. GDP and investment were at their pre-crisis levels in the fourth quarter of 2009, and the credit market was normalized after a few months. Second, the richness of borrower characteristics we observe mitigate concerns about the endogenous matching between firm and banks. We include as baseline controls: percentage of credit outstanding more than 90 days

⁹In the appendix we also report OLS regressions, following Solon et al. (2015).

past due, a dummy if the firm has multiple lenders, its risk category, average time of the relationship with banks, firm size measured by the number of employees. We also include sector-state fixed effects to control for banks' specialization in certain industries or locations that might have been heterogeneously affected by the crisis. Third, we show that firms that confronted different credit supply shocks were following similar trajectories before the crisis. Finally, we show that matching with a bank that contracts credit supply is not enough for a firm to have a poorer performance during the crisis: only firms with larger portions of debt maturing in the fourth quarter of 2008 have their employment reduced.

Then we proceed to understand how firms restructure their labor force after a credit shock and the short- and long-term impacts on the workers' careers. Using the sample of individuals that were working in August 2008 with one of the firms of our previous analysis, we run the following regression:

$$Y_{ji} = \alpha_{smo} + \beta \Delta L_i^s + \theta \Delta L_i^s \times x_j, i + \epsilon_j$$

where Y_{ji} is an outcome for an individual j working in firm i , for instance an indicator variable that takes the value 1 if the contract between the worker j and firm i is terminated in August 2009 and 0 otherwise, and x_j is a variable that represents a worker characteristic, for instance education. Our interest is in the coefficient θ , which will allow us to understand if the effects were heterogeneous across workers characteristics.

3 Firm-level results

3.1 Descriptive statistics

Table 2 describes the main variables for the sample of firms of our analysis. The average firm has 59 employees, with the smallest firm having 1 employee and the largest 67,678, 55 months of relationship with banks, 26.6% of loans due during the crisis and a share of 3% of non-performing loans. We also provide statistics on our proxy of credit supply growth, credit growth and the growth rate in employment using the normalized measure described in the empirical strategy section. While the growth rates in the credit supply proxy and credit were calculated between August 2008 and January 2009, the growth rate in labor variables was computed between August 2008 and August 2009. There are two reasons for this difference. First, the credit market recovered from the crisis faster than the labor markets. Additionally labor data displays strong seasonality. The average firm suffered a contraction in credit and employment, although the credit supply proxy is slightly positive.

3.2 Credit and employment

We first document the results from estimating equation 2, the impact of the credit supply shock proxy on credit growth. We report results in Table 3. credit supply growth increase of 1 leads to an increase of around 40% in the normalized credit growth of the firm.¹⁰ To better gauge the economic magnitude of the impact, we consider the negative of the interquartile range of the credit supply shock: $p_{25}-p_{75}=-0.03-0.12=-0.15$. Moving from the third quartile to the first quartile of the credit supply shock variable leads to a 6% reduction in the normalized measure the credit growth (5.8% in the standard growth formula).¹¹

Then we proceed to estimate impacts on employment and the labor restructuring process. We report results in Table 4. Moving from the third quartile to the first quartile of the credit supply shock variable leads to a 1.5% decrease in employment growth. The restructuring is driven by an increase in layoffs instead of a decrease in hirings or increase in quits. While average wages are unchanged, the reduction in the number of employees result in a decrease in the wage bill. In Figure ??, we show, using a dynamic panel specification with firm fixed effects, that effects are persistent until 2015.

4 Loan types and characteristics

We first compute for each firm the share of loans maturing during the crisis and divide the sample into four groups by the quartiles of the distribution. We report results in Table 5 and show that all effects are driven by firms with a large proportion of debt maturing during the crisis, consistent with Almeida et al. (2009). This result, beyond highlighting the importance of loan characteristics in the transmission of credit supply shocks, diminishes concerns that results are driven by endogenous matching between banks and firms. Firm that match with affected banks but do not have loans maturing do not decrease employment, which would be the case if bad firms match with affected banks. In Table 6, we show that among firms with a large proportion of debt maturing during the crisis, only those of a medium size cut employment, consistent with the idea that switching costs are smaller for large firms, either due to a higher availability of collateral or verifiable information or due to easier access to other sources of financing (e.g. bonds).

We then compute the share of loans that are asset-backed loans and divide firms according to quintiles of this distribution. In Table 7, we show that the effect of a credit supply shock on credit growth monotonically decreases with the share of asset-backed

¹⁰The magnitudes are quantitatively similar when we estimate OLS regressions. See table A.3 in the appendix.

¹¹ $g = \frac{X_{t+1}-X_t}{X_t} = \frac{2g_n}{2-g_n}$ where $g_n = \frac{X_{t+1}-X_t}{0.5(X_{t+1}+X_t)}$.

loans, consistent with the findings of [Ivashina et al. \(2022\)](#). As a consequence, firms with ex ante smaller shares of asset-backed loans decrease more employment (Table 8). As most cash-flow loans are working capital loans, this result stresses the importance of working capital availability in the financing of labor ([Acabbi et al., 2020](#); [Benmelech et al., 2021](#)).

4.1 Worker-level effects

We use worker level data to examine how workers of different education levels are affected by the credit supply. In order to assess this we regress a separation dummy, which takes the value one if the worker is no longer working in the same firm in August 2009, in our credit supply proxy, the level of education, and the interaction between the two. As before we add fixed effect controls of location and sector at firm level, and also use instrumental variables. The results are reported in Table `tab:WorkerEmp`. Our instrumental variables estimation indicate that a low skill worker in a firm that had their credit supply one standard deviation lower than the other had between 1.1% and 1.6% higher chance of being without a job one year after. However, if the worker has some college level education the effect is much smaller: about 0.2%. Thus, the credit crisis had a heterogeneous impact on workers, affecting more intensively low skill workers.

5 Conclusion

We study the impact of the credit shock in the financial crisis in Brazil on the formal labor market. Our results show that the credit crunch had an economic and statistically significant effect on firms' employment level and their wage bill. The adjustment in the employment level was made primarily by firing workers, rather than through a reduction in the number of new hirings. Firms with a large proportion of cash flow loans or loans maturing during the crisis were more affected. We show that effects are persistent. Our final result indicates that skilled workers had a lower probability of being fired as a result of their employee's credit restriction than unskilled workers.

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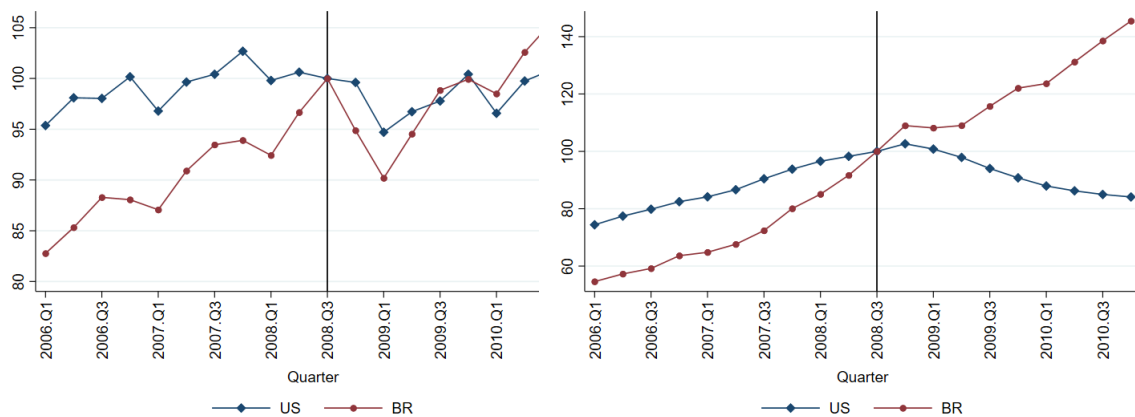
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Figures

Figure 1: Effect of the financial crisis: comparison Brazil and US

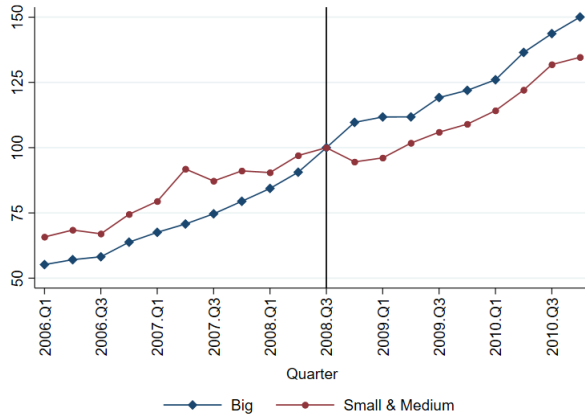


(a) Quarterly GDP

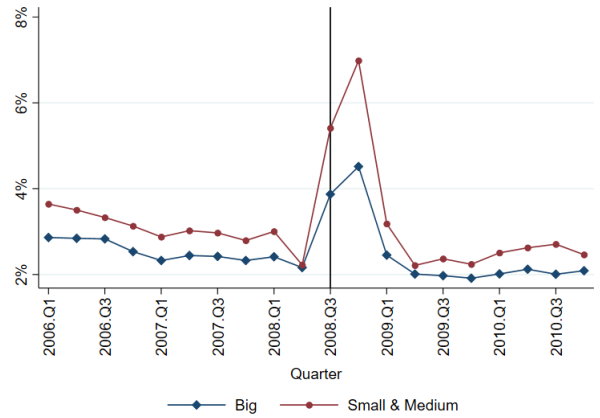
(b) Stock of bank loans to firms

Notes: Panel (a): quarterly real GDP, not seasonally adjusted. Panel (b): stock of bank loans to firms, not seasonally adjusted. For the US, loans to firms are obtained from the Board of Governors of the Federal Reserve System, H.8, and calculated as the sum of commercial and industrial loans and commercial real estate loans. For Brazil, loans to firms are obtained from the series number 20023, "credit operations in the financial system - Total - to legal entities", access <https://www3.bcb.gov.br/sgspub>. The vertical line in black represents the third quarter of 2008, which is the reference quarter (value=100). The crash of Lehman Brothers took place on September 15, 2008.

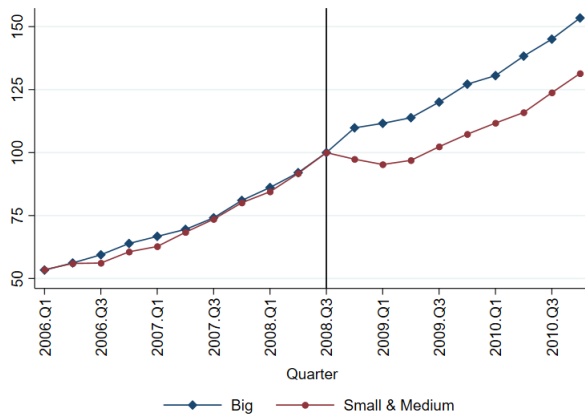
Figure 2: Effect of the financial crisis on the credit market



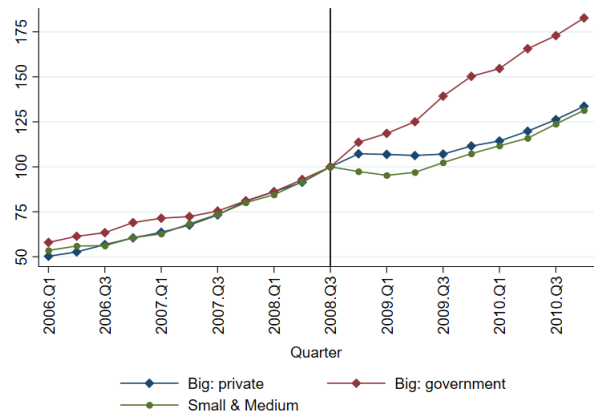
(a) Funding: big vs small & medium



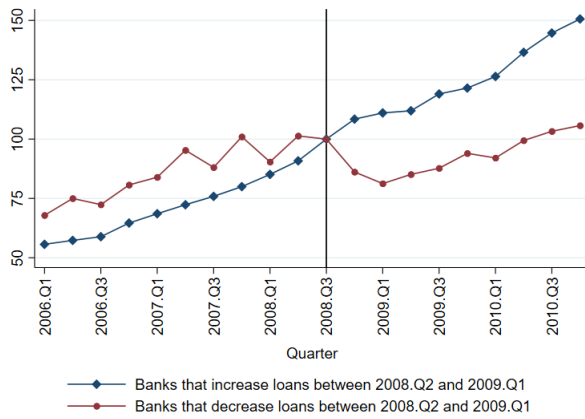
(b) Funding cost (%): big vs small & medium



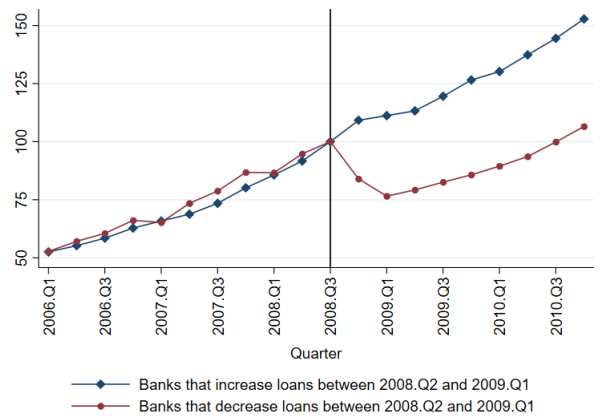
(c) Loans: big vs small & medium



(d) Loans: big (private vs government-owned) vs small & medium



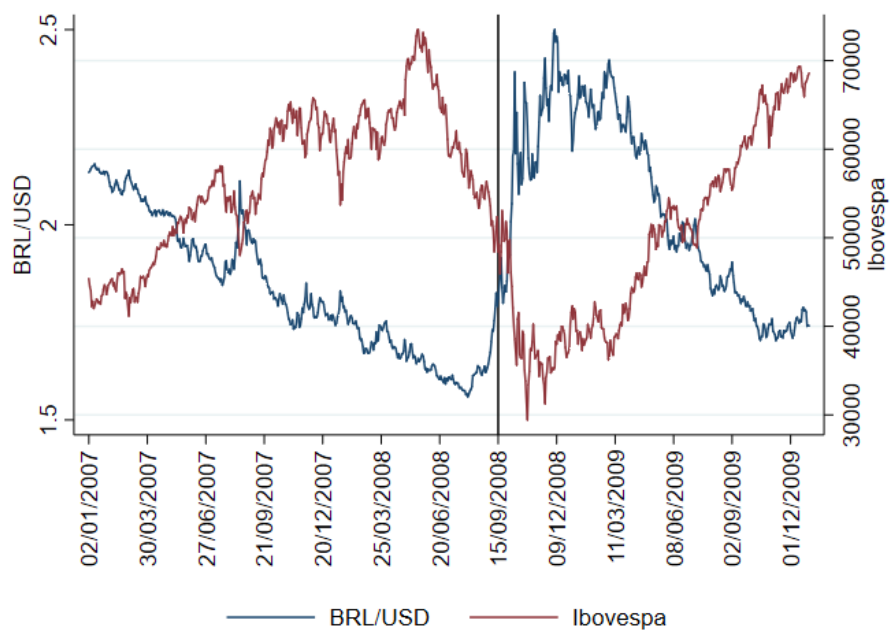
(e) Funding: banks that increased versus banks that decreased credit



(f) Loans: banks that increased versus banks that decreased credit

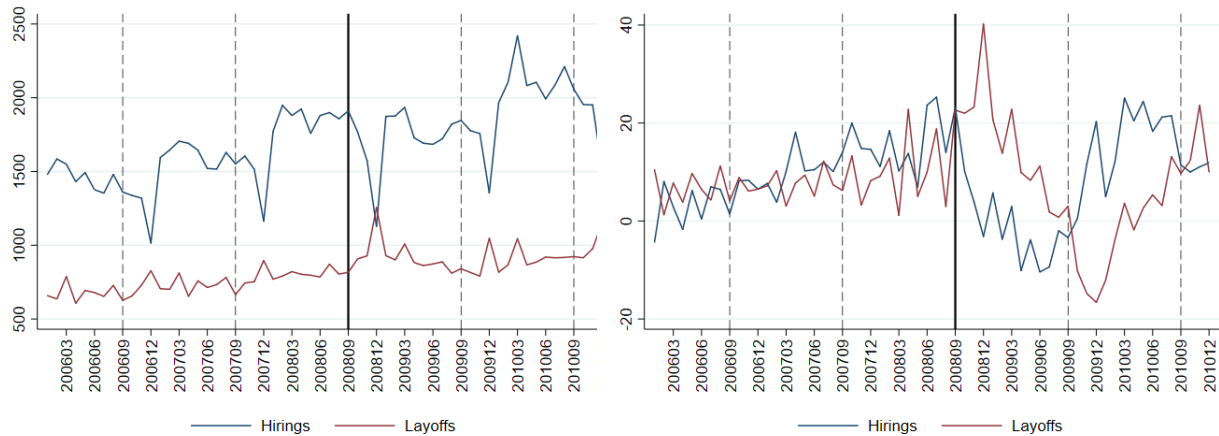
Notes: Private big banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC. Government-owned big banks: Banco do Brasil, BNDES, Caixa Econômica Federal, and Banco Nossa Caixa (bought by Banco do Brasil in 2009). Total funding comprises demand, time and savings deposits, as well as debt securities sold to the public domestically and abroad. Funding costs are defined by the total interest payments in a quarter divided by funding measured in the preceding quarter. The vertical line in black represents the third quarter of 2008, which is the reference quarter (value=100). The crash of Lehman Brothers took place on September 15, 2008. Source: IF.data, Central Bank of Brazil.

Figure 3: Exchange rate BRL/USD and stock market index (Ibovespa)



Notes: Daily values of the exchange rate between 1 US dollar and Brazilian reais and the Brazilian stock market index (Ibovespa). The vertical line in black represents the day of the Lehman Brothers crash: September 15, 2008.

Figure 4: Effect of the financial crisis on the aggregate employment



(a) Hiring and layoff flows in thousands

(b) Hiring and layoff flows: year-over-year growth (%)

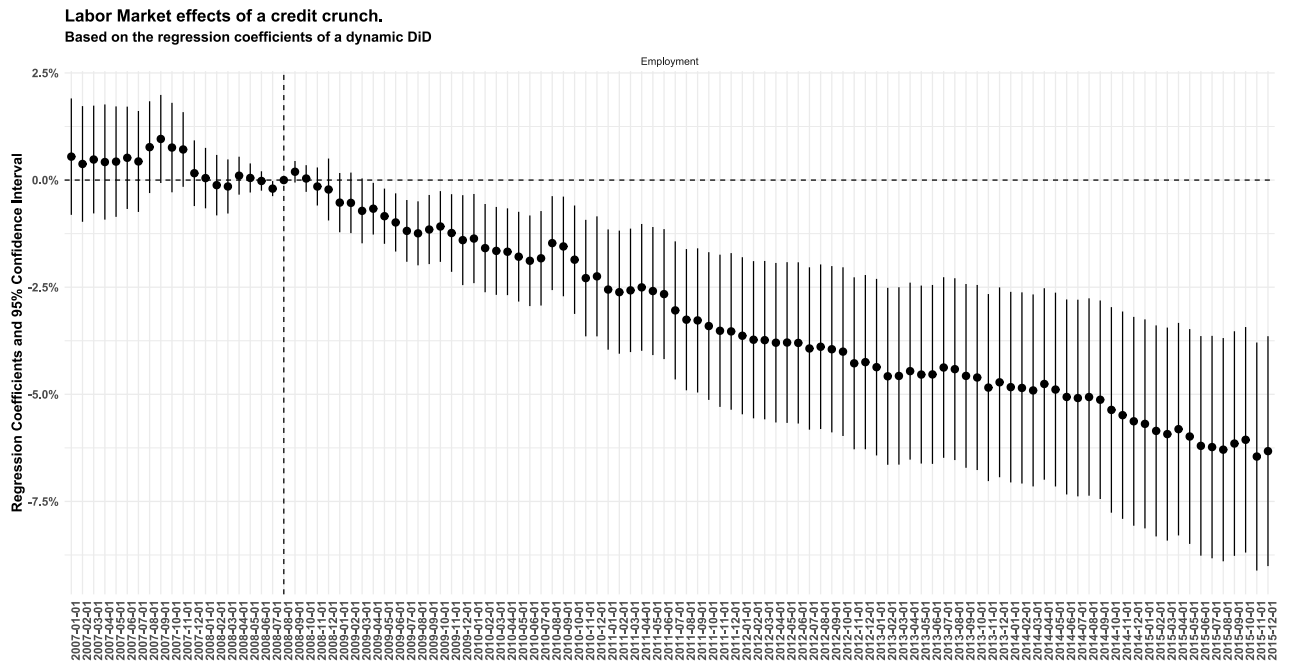


(c) Unemployment rate (%)

(d) Unemployment rate: year-over-year growth (%)

Notes: Panel (a) plots the monthly flows in thousands of hirings and layoffs. Panel (b) plots the growth in a given month in comparison to the same month in the previous year. Panels (c) plots the monthly unemployment rate, while Panel (d) plots the growth of the unemployment rate in a given month in comparison to the same month in the previous year. The sample of panels (a) and (b) is comprised of the population of formal firms obtained in the RAIS data. The sample of panels (a) and (b) comes from the Monthly Employment Survey (*Pesquisa Mensal de Emprego, PME*), which covers labour earnings in the six main metropolitan areas (São Paulo, Rio de Janeiro, Belo Horizonte, Salvador, Recife and Porto Alegre). Unlike RAIS, the PME includes the informal sector of the economy. The thick vertical line in black represents the month of September in 2008 (the month when Lehman Brothers crashed), while the dashed lines represent the month of September of the other years.

Figure 5: Persistence of the effects: employment



Notes: We present results of the following regression

$$\log(1 + N_i) = \beta_t \times (\Delta L_i^s T) + \gamma X_i + \alpha_i + \alpha_{t,l} + \alpha_{t,d} + \epsilon_i$$

where α_i , $\alpha_{t,l}$, and $\alpha_{t,d}$ are Firm, Time \times Sector, and Time \times State fixed effects, respectively, and T is a vector of month-year dummy variables. Standard errors are clustered at the firm level. We present the results of the variation contained in the IQR of the credit supply shock ($-\beta \times IQR$).

Tables

Table 1: Sample: RAIS & SCR

	(1)	(2)	(3)	(4)	(5)
	No credit	All firms	Only L&G	S&M & L&G	Only S&M
Number of firms	1,632,495	809,142	704,411	80,751	18,232
Pre-crisis credit		681.8 (15,600)	251.5 (8,073)	1789.8 (13,597)	283.5 (1,994)
Credit(Δ)		-0.15 (0.73)	-0.15 (0.74)	-0.07 (0.46)	-0.36 (0.94)
Credit supply proxy (Δ)		0.13 (0.1)	0.15 (0.07)	0.07 (0.12)	-0.10 (0.22)
AA-A risk rating (%)		0.29	0.30	0.13	0.66
B-C risk rating (%)		0.57	0.57	0.67	0.26
Non-performing loans (%)		0.01 (0.1)	0.01 (0.1)	0.01 (0.07)	0.01 (0.1)
Default rate (%)		0.01 (0.1)	0.01 (0.1)	0.01 (0.07)	0.02 (0.11)
Bank relationship		60.6 (95.17)	61.1 (98.36)	59.8 (73.62)	33.6 (42.92)
Maturing loans (%)		0.40 (0.31)	0.41 (0.31)	0.36 (0.25)	0.37 (0.34)
Number of employees	9.6 (289)	29.6 (675)	19.3 (652)	66.4 (463)	24.5 (130)
Employment (Δ)	-0.31 (0.83)	-0.23 (0.77)	-0.24 (0.78)	-0.15 (0.65)	-0.14 (0.67)

Notes: The sample excludes financial firms, those with import and export related loans, those with outstanding BNDES loans in either August 2008 or January 2009, and those that are not in the RAIS data or report zero employees. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal; small & medium banks: the complement of the previous set. The category *Only L&G* is comprised of firms that only borrow from large private and government-owned banks in August 2008; the category *S&M & L&G* is comprised of firms that borrow from large private and government-owned banks and small and medium banks in August 2008; the category *only S&M* is comprised of firms that only borrow from small and medium banks in August 2008. Change (Δ) of a given variable X is defined as $2(X_{Aug2009} - X_{Aug2008}) / (X_{Aug2009} + X_{Aug2008})$. The variable pre-crisis credit is the total amount of outstanding loans in August 2008 measured in 1,000 BRL. The variable credit supply shock is defined in Equation 1. Banks classify borrowers into 9 categories ranging from AA (best) to H (worse).

Table 2: Firm level database: descriptive statistics

	Obs	Mean	Std. Dev.	Min	Max
Size (employees)	98,984	59.13	423.24	1	67,678
AA-A risk rating (%)	98,984	0.231	0.421	0	1
B-C risk rating (%)	98,984	0.592	0.491	0	1
Non-performing loans (%)	98,984	0.029	0.107	0	1
Bank relationship (months)	98,984	54.95	69.74	0	1309.8
Maturing loans (%)	98,984	0.361	0.266	0	1
Credit supply proxy	98,984	0.034	0.155	-0.752	1.382
Credit(Δ)	98,984	-0.120	0.593	-2	1.99
Employees(Δ)	98,984	-0.147	0.653	-2	1.98
Hirings(Δ)	98,984	0.570	0.743	0	82.5
Firings(Δ)	98,984	0.681	0.824	0	83.5
Wage(Δ)	91,694	0.089	0.217	-2	2

Notes: The sample excludes firms that are in the financial sector, have import or export related loans, have outstanding BNDES loans in either August 2008 or January 2009, are not in the RAIS data or report zero employees, and only have relationships with large private and government-owned banks. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal. The variable credit supply shock is defined in Equation 1. Banks classify borrowers into 9 categories ranging from AA (best) to H (worse).

Table 3: Loan growth and credit supply shock

	Dependent Variable: Δ Credit			
	(1)	(2)	(3)	(4)
ΔL_i^s	0.427*** (0.011)	0.388*** (0.011)	0.402*** (0.093)	0.399*** (0.095)
Firm Controls	No	Yes	Yes	Yes
Firm Type FE	No	No	No	Yes
State FE	No	No	Yes	No
Sector FE	No	No	Yes	No
State \times Sector FE	No	No	No	Yes
Cluster	No	No	Sector	Sector
Observations	98,984	98,984	98,984	98,984
R ²	0.016	0.043	0.081	0.195

Notes: The sample excludes firms that are in the financial sector, have import or export related loans, have outstanding BNDES loans in either August 2008 or January 2009, are not in the RAIS data or report zero employees, and only have relationships with large private and government-owned banks. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal. The variable credit supply shock, ΔL_i^s is defined in Equation 1. Firm type is defined by the type of business organization. Regressions are weighed by the number of employees in August 2008. Firm controls (all measured in August 2008): share of non-performing loans, dummies for 9 categories of credit risk that banks report to the credit registry, share of loans due in 90 days, share of loans denominated in local currency, share of loans from top 3 banks, length of the firm-bank relationship, dummy if the firm has loans from more than one bank, firm size (dummies for quintiles of number of employees), and credit limit.

Table 4: Employment and credit supply shock

	Dependent Variable:						
	Δ Employment	Δ Inflows	Δ Outflows	Δ Layoffs	Δ Quits	Δ Wage Bill	Δ Wage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ΔL_i^s	0.102*** (0.032)	0.058 (0.036)	-0.041 (0.039)	-0.062** (0.027)	-0.002 (0.015)	0.047**	-0.027
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Sector	Sector	Sector	Sector	Sector	Sector	Sector
Observations	98,984	92,370	92,370	92,370	92,370	91,694	91,694
R ²	0.217	0.390	0.389	0.391	0.410	0.251	0.236

Notes: The sample excludes firms that are in the financial sector, have import or export related loans, have outstanding BNDES loans in either August 2008 or January 2009, are not in the RAIS data or report zero employees, and only have relationships with large private and government-owned banks. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal. The variable credit supply shock, ΔL_i^s is defined in Equation 1. Firm type is defined by the type of business organization. Regressions are weighed by the number of employees in August 2008. Firm controls (all measured in August 2008): share of non-performing loans, dummies for 9 categories of credit risk that banks report to the credit registry, share of loans due in 90 days, share of loans denominated in local currency, share of loans from top 3 banks, length of the firm-bank relationship, dummy if the firm has loans from more than one bank, firm size (dummies for quintiles of number of employees), and credit limit.

Table 5: Employment and credit supply shock: heterogeneity by share of loans maturing at the peak of the financial crisis

	Dependent Variable:						
	Δ Employment	Δ Inflows	Δ Outflows	Δ Layoffs	Δ Quits	Δ Wage Bill	Δ Wages
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\Delta L_i^s \times$ Maturing Q1 (0;0.15)	0.058 (0.077)	0.024 (0.073)	0.001 (0.058)	0.027 (0.032)	-0.009 (0.017)	-0.036 (0.052)	-0.019 (0.017)
$\Delta L_i^s \times$ Maturing Q2 (0.15;0.28)	0.047 (0.073)	0.066 (0.058)	0.023 (0.066)	0.010 (0.049)	-0.010 (0.024)	-0.006 (0.086)	-0.016 (0.021)
$\Delta L_i^s \times$ Maturing Q3 (0.25;0.52)	0.099 (0.076)	0.144 (0.108)	0.042 (0.135)	0.023 (0.081)	-0.029 (0.053)	0.072 (0.091)	-0.066 (0.082)
$\Delta L_i^s \times$ Maturing Q4 (0.52;1)	0.143** (0.065)	0.039 (0.063)	-0.112 (0.070)	-0.157** (0.071)	0.014 (0.016)	0.094** (0.042)	-0.021 (0.022)
Full Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Sector	Sector	Sector	Sector	Sector	Sector	Sector
Observations	98,984	92,370	92,370	92,370	92,370	91,694	91,694
R ²	0.217	0.390	0.389	0.392	0.410	0.251	0.236

Notes: The sample excludes firms that are in the financial sector, have import or export related loans, have outstanding BNDES loans in either August 2008 or January 2009, are not in the RAIS data or report zero employees, and only have relationships with large private and government-owned banks. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal. The variable credit supply shock, ΔL_i^s is defined in Equation 1. Firm type is defined by the type of business organization. Regressions are weighed by the number of employees in August 2008. Firm controls (all measured in August 2008): share of non-performing loans, dummies for 9 categories of credit risk that banks report to the credit registry, share of loans due in 90 days, share of loans denominated in local currency, share of loans from top 3 banks, length of the firm-bank relationship, dummy if the firm has loans from more than one bank, firm size (dummies for quintiles of number of employees), and credit limit.

Table 6: Employment and credit supply shock by firm size

	Dependent Variable:			
	Δ Employment	Δ Hirings	Δ Firings	Δ Wage
	(1)	(2)	(3)	(4)
$\Delta L_i^s \times$ Size Q1 (1-5)	-0.1 (0.13)	0.08 (0.11)	0.16 (0.13)	-0.01 (0.04)
$\Delta L_i^s \times$ Size Q2 (6-10)	0.16* (0.09)	-0.24 (0.16)	-0.39** (0.18)	-0.004 (0.03)
$\Delta L_i^s \times$ Size Q3 (11-50)	0.2*** (0.07)	-0.1* (0.06)	-0.31*** (0.1)	0.02 (0.02)
$\Delta L_i^s \times$ Size Q4 (51-100)	0.15** (0.07)	-0.05 (0.04)	-0.23** (0.09)	-0.01 (0.01)
$\Delta L_i^s \times$ Size Q5 (> 100)	0.16 (0.1)	0.04 (0.06)	-0.12 (0.12)	-0.01 (0.01)
Full Firm Controls	Yes	Yes	Yes	Yes
State-Sector FE	Yes	Yes	Yes	Yes
Firm Type FE	Yes	Yes	Yes	Yes
Cluster	Sector	Sector	Sector	Sector
Observations	98,984	92,370	92,370	92,370
R ²	0.217	0.390	0.389	0.392

Notes: The sample excludes firms that are in the financial sector, have import or export related loans, have outstanding BNDES loans in either August 2008 or January 2009, are not in the RAIS data or report zero employees, and only have relationships with large private and government-owned banks. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal. The variable credit supply shock, ΔL_i^s is defined in Equation 1. Firm type is defined by the type of business organization. Regressions are weighed by the number of employees in August 2008. Firm controls (all measured in August 2008): share of non-performing loans, dummies for 9 categories of credit risk that banks report to the credit registry, share of loans due in 90 days, share of loans denominated in local currency, share of loans from top 3 banks, length of the firm-bank relationship, dummy if the firm has loans from more than one bank, firm size (dummies for quintiles of number of employees), and credit limit.

Table 7: Loan types and credit supply shock

	Dependent Variable: Δ Credit		
	(1)	(2)	(3)
$\Delta L_i^s \times Q(\text{Backed}) = 1$	0.908*** (0.028)	0.874*** (0.231)	0.744*** (0.212)
$\Delta L_i^s \times Q(\text{Backed}) = 2$	0.530*** (0.025)	0.526*** (0.121)	0.554*** (0.110)
$\Delta L_i^s \times Q(\text{Backed}) = 3$	0.245*** (0.025)	0.318*** (0.088)	0.324*** (0.085)
$\Delta L_i^s \times Q(\text{Backed}) = 4$	0.167*** (0.021)	0.227*** (0.061)	0.235*** (0.058)
$\Delta L_i^s \times Q(\text{Backed}) = 5$	0.143*** (0.024)	0.182 (0.133)	0.164 (0.126)
Full Firm Controls	Yes	Yes	Yes
Firm Type FE	No	No	Yes
State FE	No	Yes	No
Sector FE	No	Yes	No
State \times Sector FE	No	No	Yes
Cluster	No	Sector	Sector
Observations	85,419	85,419	85,419
R ²	0.041	0.083	0.254

Notes: We group firms into quintiles of the proportion of asset-backed loans in the total amount borrowed. Quintile 1 has the lowest proportion of asset-backed loans, while quintile 5 has the highest. The sample excludes firms that are in the financial sector, have import or export related loans, have outstanding BNDES loans in either August 2008 or January 2009, are not in the RAIS data or report zero employees, and only have relationships with large private and government-owned banks. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal. The variable credit supply shock, ΔL_i^s is defined in Equation 1. Firm type is defined by the type of business organization. Regressions are weighed by the number of employees in August 2008. Firm controls (all measured in August 2008): share of non-performing loans, dummies for 9 categories of credit risk that banks report to the credit registry, share of loans due in 90 days, share of loans denominated in local currency, share of loans from top 3 banks, length of the firm-bank relationship, dummy if the firm has loans from more than one bank, firm size (dummies for quintiles of number of employees), and credit limit.

Table 8: Employment and credit supply shock: heterogeneity by share of asset-backed loans

	Dependent Variable:					
	Δ Employment	Δ Inflows	Δ Outflows	Δ Layoffs	Δ Quits	Δ Wages
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta L_i^s \times Q(\text{Backed}) = 1$	0.218** (0.094)	0.062 (0.107)	-0.156 (0.132)	-0.222** (0.112)	0.008 (0.023)	-0.042 (0.072)
$\Delta L_i^s \times Q(\text{Backed}) = 2$	0.001 (0.067)	0.043 (0.080)	0.042 (0.100)	0.019 (0.077)	-0.010 (0.036)	-0.049 (0.071)
$\Delta L_i^s \times Q(\text{Backed}) = 3$	0.102** (0.048)	0.048 (0.041)	-0.054 (0.050)	-0.060 (0.038)	0.010 (0.018)	-0.025 (0.046)
$\Delta L_i^s \times Q(\text{Backed}) = 4$	0.089*** (0.033)	0.045 (0.041)	-0.044 (0.034)	-0.035 (0.025)	-0.003 (0.009)	0.017 (0.020)
$\Delta L_i^s \times Q(\text{Backed}) = 5$	-0.017 (0.050)	-0.050 (0.048)	-0.032 (0.058)	-0.010 (0.035)	-0.015 (0.025)	-0.025 (0.018)
Full Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
State-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Type FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Sector	Sector	Sector	Sector	Sector	Sector
Observations	85,419	85,419	85,419	85,419	85,419	82,271
R ²	0.274	0.460	0.461	0.417	0.452	0.201

Notes: We group firms into quintiles of the proportion of asset-backed loans in the total amount borrowed. Quintile 1 has the lowest proportion of asset-backed loans, while quintile 5 has the highest. The sample excludes firms that are in the financial sector, have import or export related loans, have outstanding BNDES loans in either August 2008 or January 2009, are not in the RAIS data or report zero employees, and only have relationships with large private and government-owned banks. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal. The variable credit supply shock, ΔL_i^s is defined in Equation 1. Firm type is defined by the type of business organization. Regressions are weighed by the number of employees in August 2008. Firm controls (all measured in August 2008): share of non-performing loans, dummies for 9 categories of credit risk that banks report to the credit registry, share of loans due in 90 days, share of loans denominated in local currency, share of loans from top 3 banks, length of the firm-bank relationship, dummy if the firm has loans from more than one bank, firm size (dummies for quintiles of number of employees), and credit limit.

Table 9: Employment and credit supply shock: heterogeneity by share of asset-backed loans when loans are maturing

	Dependent Variable:					
	Δ Employment	Δ Inflows	Δ Outflows	Δ Layoffs	Δ Quits	Δ Wages
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta L_i^s \times Q(\text{Backed}) = 1$	0.513*** (0.097)	-0.062 (0.120)	-0.574*** (0.145)	-0.468*** (0.151)	0.017 (0.028)	-0.006 (0.044)
$\Delta L_i^s \times Q(\text{Backed}) = 2$	0.142 (0.109)	0.026 (0.101)	-0.116 (0.158)	-0.090 (0.139)	-0.057* (0.031)	0.111 (0.086)
$\Delta L_i^s \times Q(\text{Backed}) = 3$	0.076 (0.049)	0.041 (0.031)	-0.035 (0.056)	-0.046 (0.037)	-0.006 (0.014)	0.045** (0.019)
$\Delta L_i^s \times Q(\text{Backed}) = 4$	0.033** (0.016)	-0.016 (0.042)	-0.050 (0.035)	-0.037 (0.027)	-0.001 (0.007)	0.003 (0.012)
$\Delta L_i^s \times Q(\text{Backed}) = 5$	0.084** (0.034)	-0.048 (0.054)	-0.132*** (0.044)	-0.035 (0.033)	-0.021 (0.013)	-0.085 (0.075)
Full Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
State-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm Type FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Sector	Sector	Sector	Sector	Sector	Sector
Observations	20,984	20,984	20,984	20,984	20,984	20,277
R ²	0.449	0.644	0.621	0.578	0.678	0.359

Notes: We group firms into quintiles of the proportion of asset-backed loans in the total amount borrowed. Quintile 1 has the lowest proportion of asset-backed loans, while quintile 5 has the highest. The sample excludes firms that are in the financial sector, have import or export related loans, have outstanding BNDES loans in either August 2008 or January 2009, are not in the RAIS data or report zero employees, and only have relationships with large private and government-owned banks. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal. The variable credit supply shock, ΔL_i^s is defined in Equation 1. Firm type is defined by the type of business organization. Regressions are weighed by the number of employees in August 2008. Firm controls (all measured in August 2008): share of non-performing loans, dummies for 9 categories of credit risk that banks report to the credit registry, share of loans due in 90 days, share of loans denominated in local currency, share of loans from top 3 banks, length of the firm-bank relationship, dummy if the firm has loans from more than one bank, firm size (dummies for quintiles of number of employees), and credit limit.

Table 10: Worker level database: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
layoff	5,737,654	.552	.497	0	1
wage(Δ)	4,864,510	.096	.302	-2	1.98
woman	5,737,654	.287	.452	0	1
young woman	5,737,654	.145	.352	0	1
young	5,737,654	.434	.495	0	1
middle age	5,737,654	.476	.499	0	1
age	5,737,654	33.79	10.58	10.26	107.65
white	5,737,654	.550	.497	0	1
secondary	5,737,654	.281	.449	0	1
high school	5,737,654	.511	.499	0	1
college	5,737,654	.097	.296	0	1
income (ln)	5,737,654	6.75	.59	4.77	11.04
tenure (ln)	5,737,654	2.97	1.08	-2.30	6.39
maturing loans	5,737,654	.403	.279	0	1

Table 11: Credit Supply Shock and Layoff Probability (LPM)

	Dep. dummy variable: 1 if fired until Aug-2009				
	(1)	(2)	(3)	(4)	(5)
CSP		-0.027*** (0.010)	-0.025*** (0.007)	-0.028*** (0.009)	-0.026*** (0.009)
Women	-0.030*** (0.004)	-0.030*** (0.004)	-0.031*** (0.004)	-0.031*** (0.004)	-0.032*** (0.004)
Young Women	0.019*** (0.005)	0.019*** (0.005)	0.019*** (0.005)	0.019*** (0.004)	0.017*** (0.004)
Young	-0.048*** (0.006)	-0.048*** (0.006)	-0.047*** (0.006)	-0.047*** (0.006)	-0.042*** (0.006)
Middle Age	0.000 (0.005)	0.000 (0.005)	0.000 (0.005)	0.001 (0.005)	0.002 (0.005)
Age	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
White	0.004* (0.002)	0.004* (0.002)	0.004* (0.002)	0.002 (0.002)	0.004** (0.002)
Secondary	-0.006 (0.004)	-0.006 (0.004)	-0.005 (0.004)	-0.005 (0.004)	0.003 (0.003)
High school	-0.017*** (0.006)	-0.017*** (0.006)	-0.016*** (0.006)	-0.014** (0.006)	-0.001 (0.004)
College	-0.036*** (0.010)	-0.036*** (0.010)	-0.034*** (0.009)	-0.029*** (0.010)	-0.002 (0.005)
Income (log)	-0.017*** (0.004)	-0.017*** (0.004)	-0.019*** (0.004)	-0.024*** (0.003)	-0.022*** (0.006)
Tenure (log)	-0.061*** (0.004)	-0.061*** (0.004)	-0.059*** (0.004)	-0.054*** (0.004)	-0.045*** (0.004)
Observations	5,737,654	5,737,654	5,737,654	5,737,654	5,737,654
R-squared	0.046	0.046	0.057	0.079	0.188
Firm Controls	Yes	Yes	Yes	Yes	Yes
Firm type FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	No	No	No
State FE	Yes	Yes	No	No	No
State-Sector FE	No	No	Yes	No	No
City-Sector FE	No	No	No	Yes	No
City-Sector-Occup FE	No	No	No	No	Yes
SE Cluster	Sector	Sector	Sector	Sector	Sector

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

Table 12: Credit Supply Shock and Layoff Probability: Worker Characteristics

	Dep. dummy variable: 1 if fired until Aug-2009						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CSP	-0.017 (0.016)	-0.012 (0.011)	-0.035*** (0.011)	-0.043* (0.023)	-0.017 (0.022)	-0.133 (0.091)	-0.070 (0.091)
CSP x Women		0.002 (0.013)					0.001 (0.013)
CSP x Young	-0.029* (0.015)	-0.031*** (0.012)					-0.035** (0.014)
CSP x Young Women		-0.013 (0.015)					-0.013 (0.015)
CSP x Middle Age	0.007 (0.015)						0.002 (0.014)
CSP x White			0.016** (0.007)				0.015** (0.007)
CSP x Secondary				0.020 (0.014)			0.022 (0.014)
CSP x High school				0.017 (0.019)			0.024 (0.020)
CSP x College				0.024 (0.020)			0.028 (0.022)
CSP x Tenure					-0.003 (0.006)		-0.009 (0.006)
CSP x Income						0.016 (0.013)	0.008 (0.013)
Observations	5,737,654	5,737,654	5,737,654	5,737,654	5,737,654	5,737,654	5,737,654
R-squared	0.188	0.188	0.188	0.188	0.188	0.188	0.188
Worker Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City-Sector-Occup FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Cluster	Sector	Sector	Sector	Sector	Sector	Sector	Sector

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table 13: Credit Supply Shock and Salaries

	Dep. variable: Δ Wage				
	(1)	(2)	(3)	(4)	(5)
CSP		-0.002	0.000	-0.000	0.002
		(0.007)	(0.006)	(0.009)	(0.007)
Women	-0.015***	-0.015***	-0.015***	-0.015***	-0.012***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Young Women	-0.003	-0.003	-0.002	-0.002	-0.004***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Young	0.015***	0.015***	0.014***	0.013***	0.012***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Middle Age	0.011***	0.011***	0.011***	0.010***	0.010***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Age	0.000	0.000	0.000	0.000	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
White	0.006***	0.006***	0.007***	0.007***	0.004***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Secondary	0.006***	0.006***	0.004**	0.004**	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
High school	0.021***	0.021***	0.020***	0.020***	0.008***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.001)
College	0.066***	0.066***	0.064***	0.063***	0.031***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.003)
Income (log)	-0.080***	-0.080***	-0.082***	-0.084***	-0.143***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.008)
Tenure (log)	0.007***	0.007***	0.007***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	4,864,510	4,864,510	4,864,510	4,864,510	4,864,510
R-squared	0.025	0.025	0.043	0.070	0.190
Firm Controls	Yes	Yes	Yes	Yes	Yes
Firm type FE	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	No	No	No
State FE	Yes	Yes	No	No	No
State-Sector FE	No	No	Yes	No	No
City-Sector FE	No	No	No	Yes	No
City-Sector-Occup FE	No	No	No	No	Yes
SE Cluster	Sector	Sector	Sector	Sector	Sector

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

(H)

Table 14: Credit Supply Shock and Salaries by Worker Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CSP	-0.014 (0.010)	-0.003 (0.007)	0.002 (0.009)	-0.022 (0.016)	0.001 (0.020)	-0.057 (0.092)	-0.089 (0.092)
CSP x Women		0.017** (0.009)					0.015* (0.009)
CSP x Young	0.018* (0.010)	0.007 (0.007)					0.020*** (0.007)
CSP x Young Women		-0.019*** (0.006)					-0.018*** (0.006)
CSP x Middle Age	0.018*** (0.006)						0.015*** (0.005)
CSP x White			0.001 (0.011)				-0.002 (0.012)
CSP x Secondary				0.021* (0.012)			0.019 (0.012)
CSP x High school				0.026* (0.015)			0.022 (0.014)
CSP x College				0.039** (0.017)			0.031** (0.016)
CSP x Tenure					0.000 (0.006)		0.001 (0.005)
CSP x Income						0.009 (0.013)	0.008 (0.013)
Observations	4,864,510	4,864,510	4,864,510	4,864,510	4,864,510	4,864,510	4,864,510
R-squared	0.190	0.190	0.190	0.190	0.190	0.190	0.190
Worker Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City-Sector-Occup FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Cluster	Sector	Sector	Sector	Sector	Sector	Sector	Sector

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Appendix

A Tables

Table A.1: Quarterly real GDP, decomposition

	Agric.	Manuf.	Services	GDP	Consump.	Invest.	Exports	Imports
2006.Q1	94	78	85	83	83	69	79	58
2006.Q2	94	82	87	85	85	70	80	61
2006.Q3	91	88	89	88	87	74	96	69
2006.Q4	64	89	91	88	91	74	89	69
2007.Q1	98	81	89	87	88	74	83	70
2007.Q2	94	89	92	91	90	79	91	72
2007.Q3	95	94	94	93	92	85	97	82
2007.Q4	66	93	97	94	97	84	94	84
2008.Q1	102	87	94	92	94	83	82	80
2008.Q2	105	94	98	97	97	90	96	89
2008.Q3	100	100	100	100	100	100	100	100
2008.Q4	67	91	99	95	101	89	89	91
2009.Q1	101	78	95	90	96	75	70	70
2009.Q2	99	86	98	95	101	83	86	78
2009.Q3	93	94	101	99	104	96	91	88
2009.Q4	68	96	104	100	108	100	85	97
2010.Q1	108	90	101	98	104	97	81	97
2010.Q2	109	97	104	103	106	101	93	106
2010.Q3	98	102	107	106	110	111	101	121
2010.Q4	70	101	109	106	115	108	97	120

Table A.2: SCR sample

	All firms	Only L&G	S&M and L&G	Only S&M
Number of firms	1,275,600	1,143,762	101,573	30,264
Pre-crisis credit	472,031	189,854	3,706,672	280,072
	(1.30e+07)	(7,490,800)	(3.85e+07)	(2,043,877)
Credit(Δ)	-0.22	-0.23	-0.09	-0.43
	(0.79)	(0.80)	(0.49)	(0.93)
Credit supply proxy (Δ)	0.13	0.14	0.06	-0.11
	(0.09)	(0.07)	(0.12)	(0.21)
AA-A risk rating (%)	0.29	0.29	0.13	0.63
B-C risk rating (%)	0.52	0.52	0.64	0.25
Non-performing loans (%)	0.03	0.04	0.02	0.03
	(0.15)	(0.15)	(0.10)	(0.15)
Default rate (%)	0.02	0.03	0.01	0.03
	(0.14)	(0.14)	(0.08)	(0.14)
Bank relationship (months)	53.1	53.1	59.3	32.4
	(87.7)	(89.7)	(72.3)	(42.1)
Maturing loans (%)	0.38	0.39	0.35	0.35
	(0.31)	(0.32)	(0.25)	(0.33)

Notes: The sample excludes financial firms, those with import and export related loans, those with outstanding BNDES loans in either August 2008 or January 2009. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal; small & medium banks: the complement of the previous set. The category *Only L&G* is comprised of firms that only borrow from large private and government-owned banks in August 2008; the category *S&M & L&G* is comprised of firms that borrow from large private and government-owned banks and small and medium banks in August 2008; the category *only S&M* is comprised of firms that only borrow from small and medium banks in August 2008. Change (Δ) of a given variable X is defined as $2(X_{Aug2009} - X_{Aug2008}) / (X_{Aug2009} + X_{Aug2008})$. The variable pre-crisis credit is the total amount of outstanding loans in August 2008 measured in 1,000 BRL.

A.1 Unweighted regressions

Table A.3: Loan growth and credit supply shock (OLS)

	Dependent Variable: Δ Credit			
	(1)	(2)	(3)	(4)
ΔL_i^s	0.599*** (0.012)	0.403*** (0.013)	0.400*** (0.046)	0.402*** (0.045)
Full Firm Controls	No	Yes	Yes	Yes
Firm Type FE	No	No	No	Yes
State FE	No	No	Yes	No
Sector FE	No	No	Yes	No
State \times Sector FE	No	No	No	Yes
Cluster	No	No	Sector	Sector
Observations	98,984	98,984	98,984	98,984
R ²	0.025	0.098	0.104	0.140

Notes: The sample excludes firms that are in the financial sector, have import or export related loans, have outstanding BNDES loans in either August 2008 or January 2009, are not in the RAIS data or report zero employees, and only have relationships with large private and government-owned banks. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal. The variable credit supply shock, ΔL_i^s is defined in Equation 1. Firm type is defined by the type of business organization. Firm controls (all measured in August 2008): share of non-performing loans, dummies for 9 categories of credit risk that banks report to the credit registry, share of loans due in 90 days, share of loans denominated in local currency, share of loans from top 3 banks, length of the firm-bank relationship, dummy if the firm has loans from more than one bank, firm size (dummies for quintiles of number of employees), and credit limit.

Table A.4: Employment and credit supply shock (OLS)

	Dependent Variable:						
	Δ Employment	Δ Inflows	Δ Outflows	Δ Layoffs	Δ Quits	Δ Wage Bill	Δ Wage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ΔL_i^s	0.036* (0.021)	-0.023 (0.026)	-0.043** (0.020)	-0.013 (0.015)	-0.003 (0.006)	0.010 (0.018)	-0.005 (0.005)
Full Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	
State-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Sector	Sector	Sector	Sector	Sector	Sector	Sector
Observations	98,984	92,370	92,370	92,370	92,370	91,694	91,694
R ²	0.094	0.110	0.100	0.082	0.078	0.082	0.057

Notes: The sample excludes firms that are in the financial sector, have import or export related loans, have outstanding BNDES loans in either August 2008 or January 2009, are not in the RAIS data or report zero employees, and only have relationships with large private and government-owned banks. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal. The variable credit supply shock, ΔL_i^s is defined in Equation 1. Firm type is defined by the type of business organization. Firm controls (all measured in August 2008): share of non-performing loans, dummies for 9 categories of credit risk that banks report to the credit registry, share of loans due in 90 days, share of loans denominated in local currency, share of loans from top 3 banks, length of the firm-bank relationship, dummy if the firm has loans from more than one bank, firm size (dummies for quintiles of number of employees), and credit limit.

Table A.5: Employment and credit supply shock: heterogeneity by share of loans maturing at the peak of the financial crisis (OLS)

	Dependent Variable:						
	Δ Employment	Δ Inflows	Δ Outflows	Δ Layoffs	Δ Quits	Δ Wage Bill	Δ Wages
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\Delta L_i^s \times$ Maturing Q1 (0;0.15)	0.006 (0.032)	-0.027 (0.041)	-0.021 (0.031)	0.023 (0.021)	-0.005 (0.012)	-0.001 (0.025)	-0.005 (0.010)
$\Delta L_i^s \times$ Maturing Q2 (0.15;0.28)	0.016 (0.027)	0.012 (0.033)	-0.00005 (0.035)	-0.003 (0.023)	0.022* (0.011)	0.005 (0.021)	-0.013 (0.013)
$\Delta L_i^s \times$ Maturing Q3 (0.25;0.52)	-0.011 (0.037)	-0.059 (0.047)	-0.026 (0.046)	0.012 (0.031)	-0.016 (0.014)	-0.013 (0.025)	0.002 (0.009)
$\Delta L_i^s \times$ Maturing Q4 (0.52;1)	0.103** (0.042)	-0.024 (0.047)	-0.099*** (0.038)	-0.066** (0.030)	-0.012 (0.010)	0.036 (0.026)	-0.003 (0.007)
Full Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Sector	Sector	Sector	Sector	Sector	Sector	Sector
Observations	98,984	92,370	92,370	92,370	92,370	91,694	91,694
R ²	0.094	0.110	0.100	0.082	0.078	0.082	0.057

Notes: The sample excludes firms that are in the financial sector, have import or export related loans, have outstanding BNDES loans in either August 2008 or January 2009, are not in the RAIS data or report zero employees, and only have relationships with large private and government-owned banks. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal. The variable credit supply shock, ΔL_i^s is defined in Equation 1. Firm type is defined by the type of business organization. Regressions are weighed by the number of employees in August 2008. Firm controls (all measured in August 2008): share of non-performing loans, dummies for 9 categories of credit risk that banks report to the credit registry, share of loans due in 90 days, share of loans denominated in local currency, share of loans from top 3 banks, length of the firm-bank relationship, dummy if the firm has loans from more than one bank, firm size (dummies for quintiles of number of employees), and credit limit.

Table A.6: Employment and credit supply shock by firm size (OLS)

	Dependent Variable:						
	Δ Employment	Δ Inflows	Δ Outflows	Δ Layoffs	Δ Quits	Δ Wage Bill	Δ Wages
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\Delta L_i^s \times$ Size Q1 (1-5)	-0.055 (0.091)	0.154 (0.095)	0.306*** (0.107)	0.186** (0.086)	0.011 (0.023)	-0.002 (0.079)	-0.018 (0.024)
$\Delta L_i^s \times$ Size Q2 (6-10)	0.207** (0.081)	-0.180 (0.172)	-0.336* (0.192)	-0.095 (0.064)	-0.062** (0.031)	0.034 (0.050)	-0.022 (0.023)
$\Delta L_i^s \times$ Size Q3 (11-50)	0.221*** (0.033)	-0.107* (0.059)	-0.295*** (0.066)	-0.204*** (0.031)	-0.030** (0.013)	0.085*** (0.028)	0.014 (0.013)
$\Delta L_i^s \times$ Size Q4 (51-100)	0.190*** (0.030)	-0.039 (0.041)	-0.199*** (0.050)	-0.135*** (0.024)	-0.010 (0.008)	0.083*** (0.024)	0.004 (0.010)
$\Delta L_i^s \times$ Size Q5 (>100)	0.224*** (0.024)	0.084** (0.035)	-0.120*** (0.046)	-0.158*** (0.032)	0.010 (0.009)	0.074* (0.044)	-0.007 (0.009)
Full Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Sector	Sector	Sector	Sector	Sector	Sector	Sector
Observations	24,772	23,180	23,180	23,180	23,180	23,103	23,103
R ²	0.123	0.148	0.140	0.127	0.129	0.148	0.117

Notes: The sample excludes firms that are in the financial sector, have import or export related loans, have outstanding BNDES loans in either August 2008 or January 2009, are not in the RAIS data or report zero employees, and only have relationships with large private and government-owned banks. Large private and government-owned banks: Itau, Unibanco, Bradesco, ABN, Santander, HSBC, Banco do Brasil, and Caixa Econômica Federal. The variable credit supply shock, ΔL_i^s is defined in Equation 1. Firm type is defined by the type of business organization. Regressions are weighed by the number of employees in August 2008. Firm controls (all measured in August 2008): share of non-performing loans, dummies for 9 categories of credit risk that banks report to the credit registry, share of loans due in 90 days, share of loans denominated in local currency, share of loans from top 3 banks, length of the firm-bank relationship, dummy if the firm has loans from more than one bank, firm size (dummies for quintiles of number of employees), and credit limit.