Labor and finance: the effect of bank relationships*

Patrick Behr

Lars Norden**

Raquel Oliveira***

Abstract

We investigate whether and how firms' number of bank relationships affects labor market outcomes. We base our analysis on more than 5 million observations on matched credit and labor data from Brazilian firms during 2005-2014. We find that firms with more bank relationships employ significantly more workers and pay significantly higher wages. Moreover, increases (decreases) in the number of bank relationships result in positive (negative) effects on employment and wages. These results are robust for strictly exogenous changes in the number of bank relationships due to nationwide bank M&A activity and independent of firm size. The effects are due (but not limited) to higher credit availability, lower cost of credit, higher heterogeneity in firms' bank relationships and robust for different levels and changes in local bank competition. Importantly, the firm-level results consistently translate into positive macroeconomic effects at the municipality and state levels. The evidence is novel and suggests positive effects of multiple bank relationships on labor market outcomes in an emerging economy.

Keywords: Credit, banks, real effects, employment, wages, credit registry
JEL Classification: G21, J21, O10

Banco Central do Brasil, Working Paper No. 534, September 2020. This version: October 29, 2020

*Corresponding author: Lars Norden, Brazilian School of Public and Business Administration, Getulio Vargas Foundation, Rua Jornalista Orlando Dantas 30, 22231-010 Rio de Janeiro, RJ, Brazil. Phone: +55 21 3083 2431. E-mail Lars Norden: lars.norden@fgv.br. Lars Norden acknowledges financial support from *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq) under grant no. 422229/2016-4.

** Brazilian School of Public and Business Administration, and EPGE Brazilian School of Economics and Finance, both Getulio Vargas Foundation, Brazil.

*** Departamento de Estudos e Pesquisas, Banco Central do Brasil e FECAP.

1. Introduction

Financial development is crucial for economic activity and growth (Beck, Levine and Loayza, 2000; Rajan and Zingales, 1998; Jayaratne and Strahan, 1996; King and Levine, 1993). However, economic frictions such as transaction costs and asymmetric information impede the link between financial and economic development. Banks have a special role as they help to reduce these frictions (Beck, Demirgüç-Kunt, Laeven and Levine, 2008; Beck, Demirgüç-Kunt and Martinez Peria, 2007). A key question about bank finance is whether firms should raise finance from one or more banks. Theory has shown a trade-off between the financial costs and benefits of multiple bank relationships (Detragiache, Garella and Guiso, 2000; Carletti, Cerasi and Daltung, 2007). Evidence suggests multiple bank relationships reduce hold-up risk, improve access to finance and financing terms and provide diversification benefits (Bonfim, Dai and Franco, 2018), but they may also increase transaction costs and create negative externalities between banks that offset the benefits (Degryse, Ioannidou and von Schedvin, 2016). The literature has not studied whether the number of bank relationships affects real economic activity, especially labor markets. Do firms with multiple versus single bank relationships make different decisions in labor markets and what are the effects? Do any ensuing microeconomic effects translate into macroeconomic output? These questions are, because of the elevated level of economic frictions, especially relevant for small and medium-sized firms and emerging economies.

In this paper, we seek to provide evidence on whether firms' number of bank relationships influences labor market outcomes. Specifically, we investigate whether firms with multiple bank relationships make different labor market decisions than firms with a single bank relationship and how changes in the number of bank relationships affect labor market outcomes. On the one hand, multiple bank relationships may provide firms with better access to finance, lower costs of finance and diversified financing sources, resulting in positive effects on employment and wages due to implicit contracting and insurance (Bailey, 1974; Azariadis, 1975; Pagano, 2019) or labor hoarding (Giroud and Mueller, 2017). On the other hand, multiple bank relationships may improve firms' access to finance, reduce financial constraints and therefore create higher flexibility in labor market decisions (Garmaise, 2008). Furthermore, we investigate whether and how potential firm-level effects carry over to the macroeconomic level. Recent studies document that negative shocks to banks in times of crisis are transmitted to firms, resulting in significantly lower employment (e.g., Chodorow-Reich, 2014; Berton, Mocetti, Presbitero, Richiardi, 2018; Benmelech, Frydman and Papanikolaou, 2019; Whited, 2019). Berger and Roman (2017) show the bank rescue program in the United States

(TARP/CPP) positively affected firms' net job creation and hiring decisions. However, none of these studies investigates whether and how the effects vary with firms' number of bank relationships. This is an important gap in the literature because bank relationships might amplify or diversify the transmission of economic shocks to (or from) firms.

We base our analysis on unique data from Brazil. As a large emerging economy and part of the BRICS countries, Brazil has the ninth-largest GDP in the world in 2019. The Brazilian financial system is bank-based and concentrated on the five largest banks (Cortes and Marcondes, 2018). 99% of all firms are SMEs or micro-entrepreneurs, many of which are plagued by severe financial constraints. The lack of competition in the credit market and the high level of interest rates for credit is seen as another obstacle for economic activity. Our sample consists of more than 5 million observations on matched credit registry and labor data from Brazilian firms during 2005-2014. Brazil is an ideal laboratory to study our research question because every firm is required to submit detailed information to the Ministry of Labor including the number of employees and the total of wages paid for all employees as of the end of each year. Moreover, all financial institutions have to submit monthly reports to the Central Bank of Brazil (Banco Central do Brasil) including detailed information on virtually all loans granted. We use the nationwide firm identifier (Cadastro Nacional de Pessoas Jurídicas, CNPJ) to match firms' credit and labor data. This setting enables us to observe labor market outcomes at the firm level, the firm's number and structure of bank relationships, and the corresponding credit data of the banks from which the firm borrows over time.

In our main tests, we perform panel data regression analysis of different labor market outcomes such as employment and wages on measures of firms' bank relationships. We saturate these regression models with different sets of fixed effects. We document a significantly positive effect of firms' number of bank relationships on real economic activity. Firms with a higher number of bank relationships employ more workers and pay higher wages. We further show firms increase (decrease) employment and wages in years when they increase (decrease) their number of bank relationships. The saturated panel data regression models display a relatively high goodness of fit, mitigating concerns about potential problems due to omitted variables. One issue that complicates the interpretation of these above results is that the number of bank relationships and labor market outcomes might be endogenously determined and potentially related to firm size. We address this issue by showing that our results remain robust for strictly exogenous decreases in a firm's number of bank relationships due to nationwide M&A activity in the Brazilian banking industry. The findings are also not driven by firm size, i.e., the number of bank relationships has a significantly positive impact

on employment and wages for firms in different size categories. We further show these positive real effects are due (but not limited) to higher credit availability, lower cost of credit and higher heterogeneity in firms' bank relationships and robust for different levels and changes in local bank competition.

In further tests, we analyze whether and how these results at the firm level translate into macroeconomic output. We document that these positive effects exist when we aggregate firms' number of bank relationships at the municipality level. In these tests, we add municipality (or state) and time fixed effects that control for any cross-sectional differences, for instance, due to local bank competition (e.g., Kysucky and Norden, 2016; Presbitero and Zazzaro, 2011) or bankruptcy law enforcement (e.g., Ponticelli and Alencar, 2016). We also show that firms' number of bank relationships has a positive impact on different macroeconomic outputs at the state level such as industrial production, sales and revenues. Our findings provide novel evidence that suggests multiple bank relationships have significantly positive real effects.

We contribute to the literature on labor and finance and banking and finance. First, we seek to contribute to the growing research on labor and finance. Campello, Graham and Harvey (2010) provide survey evidence that credit constrained firms cut their investment and employment more than unconstrained firms in times of crisis. Pagano and Pica (2012) show that financial development promotes employment growth in developing countries. However, during banking crisis, employment grows less in external finance-dependent industries and in more developed countries. Chodorow-Reich (2014) finds that small and medium-sized firms in the United States that had pre-crisis relationships with less healthy banks were less likely to obtain credit following the Lehman bankruptcy, paid higher interest rates, and reduced the number of employees more compared to pre-crisis borrowers of healthier banks. Duygan-Bump, Levkov and Montoriol-Garriga (2015) show that the rise of unemployment in the United States during the 2007-2009 recession can be explained with credit constraints of small firms. Popov and Rocholl (2018) show that German firms borrowing from banks affected by the U.S. subprime mortgage crisis reduce their employment by 1.5 percent and average wages by 1.8 percent. Berton, Mocetti, Presbitero and Richiardi (2018) analyze detailed firm-level labor and credit data from one region in Italy and document that the firms' sensitivity of employment to changes in credit supply is 0.36. Murro, Oliviero and Zazzaro (2019) investigate survey data from Italy and show that firms that borrow from a relationship bank fire significantly less employees after a negative sales shock than other firms. Bai, Carvalho and Phillips (2018) show that the geographic banking deregulation in the United States has increased employment of

young local firms with relatively high productivity, which is due to increased credit supply and labor reallocation towards more productive firms. Alfaro, García-Santana and Moral-Benito (2019) combine bank-firm loan data from Spain with firm-specific measures of credit exposure and document sizable downstream propagation effects on employment, output and investment.

Some studies examine the effects of finance on labor in Brazil. For example, Carvalho (2014) documents positive real effects of credit from the national development bank on employment in politically attractive regions in Brazil. Van Doornik et al. (2018) show that the provision of credit for lottery-assigned vehicles in Brazil promotes mobility, employment, income and entrepreneurship. Fonseca and Van Doornik (2019) show that constrained firms in Brazil increase employment and wages, especially of high-skilled workers after the bankruptcy reform of 2005 that strengthened creditor rights and led to an expansion of credit. For comparison, in our study, we zoom in on the effects of firms' number of bank relationships on labor market outcomes. We show that employment and wages of Brazilian firms increase by 8 percent when they add one bank relationship. Moreover, various indicators of macroeconomic output at the municipality and state level increase when the average number of bank relationships is higher.

Second, our study contributes to the strand of literature in banking and finance that investigates the number, structure and switching of bank relationships. Theoretical work has analyzed the effects of exclusive versus multiple bank relationships on finance and financing conditions, considering the benefit of greater diversification versus the costs of free-riding and duplicated monitoring (e.g., Detragiache, Garella and Guiso, 2000; Carletti, Cerasi and Daltung, 2007). Multiple-bank lending is more likely when banks have lower equity, firms are less profitable and monitoring costs are high. Related empirical work has investigated the impact of the number of bank relationships on credit availability and loan terms. Ongena and Smith (1999) show that firms have more bank relationships in countries with inefficient judicial systems and poor enforcement of credit rights. Farinha and Santos (2002) show that Portuguese firms increase the number of bank relationships when they mature. Gopalan, Udell and Yerramilli (2011) document that firms form new bank relationships to expand their access to credit and capital market services. They interpret their finding as an important cost of exclusive banking relationships. Bonfim, Dai and Franco (2018) find that small firms with a higher number of bank relationships pay lower loan rates. Some studies focus on the effects of switching. Ornelas, Silva and Van Doornik (2020) and Ioannidou and Ongena (2010) investigate how price and non-price terms of loans change when firms switch to new banks. They find that firms obtain better loan terms from the new bank, but these benefits are short-

lived. Degryse, Masschelein and Mitchell (2011) show that single-relationship borrowers of target banks are most likely to be dropped by the acquirer and their performance deteriorates subsequently. Bonfim, Nogueira and Ongena (2018) show that firms that had to switch their bank because of branch closures of their previous bank do not receive discounts in loan rates. Degryse, Ioannidou and von Schedvin (2016) show that a firm's first bank reduces its credit supply when the firm adds a second bank. This negative externality suggests that adding bank relationships does not necessarily increase the total credit available to a firm.

The remainder of this paper is organized as follows. In Section 2, we describe the data, empirical strategy and provide summary statistics. In Section 3, we present the results on the effect of firms' bank relationships on labor market outcomes at the firm level. In Section 4, we provide further evidence at the macroeconomic level. Section 5 concludes.

2. Data, empirical strategy, and summary statistics

2.1. Data sources

We combine data from four different sources in our analysis. For the main tests, we build a firm-level dataset based on monthly loan-level data from the Brazilian Credit Information System (Sistema de Informações de Crédito, SCR). This confidential database is owned and managed by the Central Bank of Brazil and includes monthly information of virtually all loans to firms made by the financial sector in Brazil. Specifically, all registered financial institutions have to report individual information of their outstanding loans whenever a borrower's total liability is equal to or above the regulatory threshold. The report includes loan-specific information, such as the loan amount outstanding, the interest rate, and the credit rating. The data also include borrower level information, such as firms' industry codes and locations of headquarters (municipality) but no firm balance sheet data. As in the study of Ponticelli and Alencar (2016), the location of the borrower is essential to our analysis. The SCR data allow us to capture the dynamics of bank-firm credit relationships over time by computing the number of relationships with financial institutions per time unit. The main explanatory variables in our study capture the number of bank-firm relationships and their changes over time. We define and discuss these variables in the next subsection.

The two main outcome variables are the number of employees per firm and total wages paid per firm. We retrieve this information from the Annual Social Information Report (Relação Anual de Informações Sociais, RAIS). In Brazil, it is mandatory for each firm, independently of the legal form or the firm size, to report these data to RAIS by December 31 each year. The database is confidential and owned and managed by the Ministry of Labor.

These two firm-level outcomes enable us to study the firm-level real effects of the number of bank relationships. We match the variables from RAIS with the SCR data using the unique identification number for firms in Brazil (CNPJ).

The third source of data is information provided by the IBGE. While most of our analyses are firm-level tests and therefore use firm-level variables, we also perform additional aggregate tests at the municipality and state level. For the latter, we collect monthly data from the IBGE for the outcome variables State industrial production, State sales volume, and State nominal revenue. All three variables are expressed as indices with a base value of 100 in 2011 for the variables State sales volume and State nominal revenue and a base value of 100 in 2012 for the variable State industrial production. The fourth source of data is the bank financial statements database of the Central Bank of Brazil (Plano Contábil Das Instituções Do Sistema Financeiro Nacional, COSIF). We merge the bank financial statements database with the three datasets described above.

The sample spans the period from January 2005 to December 2014. In this 10-year period, the Brazilian economy went through four monetary policy cycles (Banco Central do Brasil, 2018), which allows us to examine periods of economic upturns and downturns. We therefore can rule out that the effects we document below depend on particular stages of the business cycle.

To build our firm-level data, we focus on loans to non-financial private firms with a minimum value of BRL 5,000 (USD 2,000 at the end of 2014). We apply this filter to exclude loans to very small or micro firms as these may not be comparable to the other firms in the sample. Furthermore, the regulatory threshold for submitting individualized loan-level information to the SCR was BRL 5,000 for most of the years in our sample period. In January 2012, this threshold was lowered to BRL 1,000. By focusing on loans above a minimum of BRL 5,000, we avoid introducing any bias that might stem from the non-inclusion of very small or microloans in the SCR before January 2012. We also drop loans that have floating interest rates to use a homogeneous sample. We further exclude from the dataset firms that borrow from banks that failed at some time during the sample period to avoid confounding exogenous reasons for changes in firms' bank relationships. Finally, we exclude firms that borrow from investment banks because these offer a different array of services and products.

After applying these filters, our final dataset comprises 31,153,687 loans to 1,801,168 firms, granted by 1,102 financial institutions in the time period 2005-2014. Since we keep one observation per firm and year in our final dataset to match the annual frequency of the labor market data, there are around 5 million observations, indicating that each firm appears

approximately three times in the dataset. Each firm in the sample has at least one employee and a positive amount of credit in at least one month per year. Banks grant 90.5% of the loans and non-bank financial institutions, such as credit unions and finance companies, the remaining 9.5%.

2.2. Empirical strategy

For our main tests, we estimate multivariate panel data regressions at the firm-year level. The regression model has the following specification:

$$F_{it} = \beta_0 + \beta_1 Bank\ relationships_{it} + \gamma X + e_{it}\ , \qquad (1)$$

where F_{it} is either the natural log of the number of employees per firm i and per end of December in year t or the natural log of total wages paid per firm i and per end of December in year t, as retrieved from RAIS. The variable *Bank relationships* measures a firm's average number of bank relationships per year. To create this variable, we use the monthly loan-level dataset and sum up the number of financial institutions with which a firm has active relationships each month and divide that number by 12. It is our main explanatory variable and its coefficient β_1 indicates whether firms with more bank relationships have a higher number of employees or pay a higher total of wages. Hence, a significant and positive β_1 would indicate positive real effects of bank relationships. We saturate the model with the vector X that contains different sets of fixed effects such as firm fixed effects, year fixed effects, bank fixed effects, interacted industry-state fixed effects that control for industry-specific geographic differences in labor markets, and interacted bank-year fixed effects that control for cross-sectional and time-varying heterogeneity across banks to mitigate potential problems due to omitted variables. The saturation of the models with different sets of fixed effects also mitigates concerns about potential endogeneity between the dependent variables F and the main test variable Bank relationships. In particular, the fixed effects control for any influence of firm size and bank size. We present the baseline regression results using different combinations of fixed effects. In all further analyses at the firm level, we estimate our main specification using firm and bank-year fixed effects. We cluster standard errors in these regressions at the firm level.

For the regressions at the municipality and the state level, we use two different specifications. In the municipality-level regressions, we estimate the following OLS regression model:

$$M_{jt} = \beta_0 + \beta_1 \, Municipality\ bank\ relationships_{jt} + \gamma Z + e_{jt} \quad , \qquad (2)$$

where M_{jt} is the average number of employees or average total of wages paid over all firms in municipality j and per end of December of year t. The main explanatory variable is *Municipality bank relationships*$_{jt}$. It measures the average number of bank relationships across all firms in municipality j and year t. To define this variable, we use the firm-level dataset and compute the mean of the variable *Bank relationships* per year using the municipality of each firm. The number of municipalities increases throughout the sample period, from 4,545 in 2005 to 5,512 in 2014. The vector Z includes fixed effects for municipality and year. Standard errors in these regressions are clustered on the municipality level.

For the analyses on the state-level, we estimate the following specification:

$$S_{km} = \beta_0 + \beta_1 State\ bank\ relationships_{km} + \gamma W + e_{km} \quad , \qquad (3)$$

where S_{km} is one of the four state-level outcomes number of employees computed as the average number of employees across all firms in federal state k and month m, the industrial production index, the sales volume index, and the nominal revenues index in a given state k-month m combination. The main variable of interest is *State bank relationships*$_{km}$ that measures the average number of bank relationships for all firms in state k and month m. To build this variable, we use the monthly loan-level dataset and compute the mean of the variable *Bank relationships* by firm's state and month. There are 27 federal states in Brazil and all of them are included in our data. The vector W contains fixed effects for the state k, the month m and interacted state-quarter fixed effects. The inclusion of state-quarter fixed effects controls for supply-side shocks that may affect all firms operating in the same state in a given quarter. Standard errors in these regressions are clustered on the month level.

2.3. Summary statistics

Table 1, Panel A reports summary statistics of variables used in the firm-level analyses, including the number of workers, the wage bill, and several bank relationships indicators based on yearly data, such as the average number of financial institutions with which a firm has a loan relationship, its respective change in the number of loan relationships (increases and decreases), and dummies for yearly increases and decreases in the number of loan relationships.

(Insert Table 1 here)

The average firm employs 11 workers and the 95-percentile of workers is 34, both numbers reflecting that the dataset includes mainly small and medium-sized companies. As we have more than 1.8 million firms in the dataset, this is not surprising, given that the vast majority of firms in any economy are small and medium-sized firms. The average wage bill in December of each year is BRL 13,861 and its 95th percentile is BRL 38,357, again reflecting that the vast majority of the firms are small and medium-sized enterprises. On average, firms have slightly more than one bank relationship (1.11) and 5.70 percent (6.40 percent) of all firms increase (decrease) the number of bank relationships per year during the sample period.

Table 1, Panel B reports the variables used in aggregate analyses. The summary statistics at the municipality level are lower than the ones at the firm level. For example, the total wages paid as of December in a given year, averaged across all firms in each municipality is around 50 percent smaller than the average wages paid by each firm independent of the municipality. For this reason, we control for municipality fixed effects in the regressions at the municipality level. Moreover, the average number of bank relationships at the state level is larger than the corresponding variable at the firm level. As in the case of the municipality level regressions, we control for state fixed effects to account for these differences. Finally, the mean and median of the indices for State industrial production, State sales volume and State nominal revenues are all below their base values of 100, indicating that in the sample period, economic activity was slightly below the reference year.

3. Empirical analysis

We start the analysis with a set of baseline regressions, in which we investigate the effect of bank relationships on employment and wages in saturated panel data regression models at the firm-year level. We then analyze how changes (increases and decreases) in a firm's number of bank relationships affect labor outcomes. Importantly, in addition to all changes we consider strictly exogenous changes due to nationwide bank M&A activity. Additionally, we examine firm size effects. Finally, we provide evidence about channels that explain how the number of bank relationships affects labor market outcomes.

3.1. Baseline results

Table 2 presents the results of our baseline analysis. Panel A presents the estimation results for equation (1) with the natural log of the number of employees as dependent variable for the sample with over 5 million firm-level observations. We saturate the panel regression model using different combinations of firm, bank, time, state and industry fixed effects as controls to mitigate potential problems due to omitted variables. These sets of fixed effects absorb any unobserved time-invariant and/or time-varying heterogeneity across and within firms.

(Insert Table 2 here)

In column (1) of Table 2, Panel A, we first add firm fixed effects and year fixed effects. The coefficient of the variable Bank relationships is positive and highly significant. This result indicates that firms with a higher number of bank relationships have a significantly higher number of employees. As this specification includes firm fixed effects, this finding suggests a positive real effect of the number of bank relationships independent of any time-invariant firm characteristics. In column (2), we additionally include bank fixed effects. The coefficient size and significance remain unchanged, implying that the positive real effect of the number of bank relationships is also not a bank-specific result, but a general result across firm- and bank-types. In column (3), we include firm and interacted industry-state fixed effects. The industry-state fixed effects account for industry- and region-specific differences between firms' economic activity. They also control for industry shocks in certain regions that can affect firms differently. The size of the coefficient is almost unchanged and it remains highly significant. Finally, in column (4) we estimate our main specification that includes firm and interacted bank-year fixed effects. As before, the firm fixed effects control for the demand-side of bank financing. The bank-year fixed effects, on the other hand, control for supply-side driven differences, i.e., for the fact that banks may change their lending behavior over time and that this is the driver of the positive real effects of bank-firm relationships that we document. The size of the coefficient is unchanged compared to the other specifications and it remains highly significant. Besides the high statistical significance, our findings are also economically significant. The coefficient size in column (4) of the table indicates that a firm with one more bank relationship has 8 percent more employees. Evaluated at the mean of employees per firm (11.61), this corresponds to an increase in the workforce of the average firm of almost one

worker. In all specifications we find an adjusted R2 of 0.83, suggesting that the saturation of the models with fixed effects effectively mitigates potential problems due to omitted variables.

Table 2, Panel B reports the results for the natural log of the total wages paid per firm and year as the dependent variable. We estimate several specifications of equation (1) using the same combinations of fixed effects as in Panel A. The results of all four regressions are positive and highly significant, indicating a positive effect of the number of bank relationships on how much in total firms pay their workforce per year. While an overall higher payroll is consistent with an increase in the average wage per worker, the more obvious explanation is that payroll costs increase because of the higher number of employees documented in the previous tests. The coefficient size indicates a 9 percent higher payroll of a firm with one more bank relationship, again suggesting a large economic effect.

Our baseline results indicate that a firm's number of bank relationships is an important determinant of employment and wages. To the best of our knowledge, this result has not been documented in the literature yet.

3.2. Increases and decreases of the number of bank relationships

In the baseline analysis, we show that a firm's number of bank relationships has a significantly positive impact on employment and wages paid. We now investigate effects due to changes in the number of relationships throughout the year. Firms can either add one or more new banks (increases in bank relationships) or turn away from one or more banks (decreases in bank relationships). We first consider any increase and decrease of a firm's number of bank relationships and then we consider strictly exogenous changes due to nationwide M&A activity in the banking industry.

We define the indicator variable Increase of bank relationships, which equals one if a firm increased the number of bank relationships from one year to the other, and otherwise zero. As our sample has a fixed starting point, we cannot compute that indicator for the start year of our observation period. Hence, the first time we compute that indicator is from 2005 to 2006. This reduces our sample by the observations from 2005. Specifically, we examine whether the same firm had more bank relationships at the end of 2006 than at the end of 2005. If this was the case, the indicator variable takes on the value of one in that year and for that firm. We proceed similarly for the alternative case, i.e., a firm reduces its number of bank relationships, and create the indicator variable Decrease of bank relationships. We then regress both the natural log of the number of employees per firm and year and the natural log wages paid per

firm and year on these indicator variables and fixed effects as controls. Table 3 reports the results for employment (Panel A) and wages (Panel B).

(Insert Table 3 here)

Table 3, Panel A shows positive and highly significant effects of the indicator variable Increase of bank relationships in year t on the number of employees in year t in column (1). This finding provides evidence that not only the level of the number of bank relationships matters, but also changes of that level. In column (2) we add the lag of Increase of bank relationships and obtain similar effects: Employment increases in the year when a firm's number of bank relationships increases and in the subsequent year. In column (3) and (4) we report the corresponding results for the indicator variable Decrease of bank relationships. Here, we find a significantly negative effect in the same year and the subsequent year. These findings are fully consistent with our baseline results.

One issue that complicates the interpretation of these above results is that the number of bank relationships and labor market outcomes might be endogenously determined. We address this issue in column (5) and (6), where we consider strictly exogenous decreases in a firm's number of bank relationships. The indicator variable Decrease of bank relationships due to M&A equals one for firm-year observations where a firm's number of bank relationships decreases and at least one of the firm's banks was a target in a nationwide M&A transaction in the same year, and zero otherwise. We consider only nationwide M&A transactions because these events are unrelated to municipality or state level economic conditions that might affect firms' labor market decisions. Remember that the vast majority of the firms in our sample are small and operate only in one municipality. The variable captures strictly exogenous variation, which helps to mitigate endogeneity concerns and establish a causal effect of a firm's bank relationships on employment. Joaquim, Van Doornik and Ornelas (2019) employ a similar identification strategy to study the effects of bank competition at the municipality level in Brazil. In this analysis, we find significantly negative coefficients for the exogenous decreases in the number of bank relationships, as shown in column (5) and (6). Interestingly, the lagged effect of Decrease of bank relationships due to M&A in column (6) is substantially larger than the lagged effect of Decrease of bank relationships in column (4), suggesting that the estimates shown in columns (3) and (4) underestimate the real effect.

Table 3, Panel B reports the corresponding results for ln(Wages paid) as dependent variable. The results on wages are similar to those on employment. Hence, the analysis of

changes in the number of bank relationships confirms our baseline analysis for both labor market variables. Importantly, the results hold for strictly exogenous changes in a firm's number of bank relationships.

3.3. Results by firm size

We examine whether the positive effects of the number of firm-bank relationships on real economic activity depend on the size of the firm. In all previous analyses, we have already considered firm fixed effects that control for time-invariant unobservable heterogeneity between firms, including average size effects, but there might be the concern that our results can be explained by time-varying firm size effects such as differential growth and investment opportunities. Moreover, one might argue that it is easier for large firms to hire or fire new workers than for small firms simply because in absolute terms they have more financial resources. This, in turn, might increase their total payroll costs. To rule out that our findings can be explained by "growth effects" or "large firm-size effects" and are therefore purely mechanical, we split our sample of more than 5 million observations into three subsamples, according to firm size. Although firm balance sheet information is not available, the financial institutions report to the Central Bank of Brazil their assessment of each borrower's size (among the categories small, medium, large, and very large). The Central Bank of Brazil then creates a variable that is the mode of the size categories reported by all the banks for a firm in a given month, and we build these subsamples accordingly. Because there are relatively few very large firms in our sample, we include them in the group of large firms.

We estimate regressions by size category using our main specification from column (4) in Table 2 and cluster the standard errors by firm. Table 4 reports the regression results.

(Insert Table 4 here)

For both outcome variables and all six regressions across the different size categories, we find positive and highly significant results. This finding indicates that the positive effect of the number of bank relationships on firms' real economic activity is not driven by the size of the firm, in particular, it suggests that the effect is not a "large firm effect". We also find that the coefficient sizes increase with the firm size. This is an intuitive result because it should be easier for large firms to scale up and down the workforce than for small firms, therewith also leading to a bigger increase of employment and payroll costs.

3.4. Channels: Loan volume, loan rates, heterogeneity of bank relationships, and bank competition

We now examine potential channels through which firms might realize gains when they borrow from more than one bank. Firms can diversify their access to credit across banks, obtain more favorable price and non-price credit terms over time and shield themselves against negative credit supply shocks. Local bank competition might affect access to credit and the terms of credit. Any of these potential channels provides explanations for the positive real effects we have documented beforehand.

For this purpose, we re-estimate the baseline models from column (4) in Table 2 with the loan volume and loan rates as dependent variables, respectively. If a higher number of bank relationships increases the overall credit availability to firms (loan volume) and/or lowers the overall cost of credit (loan rate), then firms have more flexibility to employ more workers and/or pay higher salaries. As before, we saturate the regression models with firm fixed effects and interacted bank-year fixed effects. Table 5 reports the results.

(Insert Table 5 here)

We find that a firm's number of bank relationships has a significantly positive impact on the loan volume (columns 1 and 2) and a significantly negative impact on the mean loan rate (columns 3 and 4). In columns (2) and (4) we control for the firms' average rating in the same year, which is a key determinant of the loan approval decisions and loan pricing. The results hold when firm risk is controlled for. These findings suggest that the positive real effects of multiple bank relationships are due to (but not necessarily limited to) a credit availability channel and a cost of credit channel. While our setting does not enable us to determine which of these two channels is the more important driver of the documented real effects, the results indicate that both channels are statistically and economically significant.

Our findings so far indicate benefits of multiple bank relationships, but there might be the concern that the number of bank relationships just captures a loan volume effect. The higher the number of banks from which a firm borrows, the higher the total credit available to the firm, resulting in the positive effects on employment documented above. This reasoning is plausible, but it may not capture the full picture for the following reasons. First, the recent study of Degryse, Ioannidou and von Schedvin (2016) documents important negative externalities of additional bank relationships. Second, the positive real effects we document above are likely to be the product of various gains from multiple bank relationships and not

exclusively due to a pure credit volume effect. To examine this, we regress the labor outcome variables on the number of bank relationships and the mean loan volume and, alternatively, the orthogonalized mean loan volume to mitigate confounding effects due to the positive correlation between both variables. The orthogonalized mean loan volume is obtained as the residuals from a regression of the firm's mean loan volume per year on the number of bank relationships in the same year plus firm and bank-time fixed effects. Table 6 reports the results.

(Insert Table 6 here)

We find that, for both labor outcomes and in both specifications, the positive effect of the number of bank relationships remains large and highly significant. Interestingly, in the specifications with the orthogonalized mean loan volume (columns 2 and 4), where we eliminate potential problems due to multicollinearity, the coefficient of the number of bank relationships more than doubles. The size of these coefficients in the regressions with the orthogonalized loan volume as control variable is almost identical to the size of the coefficients in column (4) of Table 2. These additional analyses confirm that there are positive effects of firms' bank relationships on employment and wages that go beyond pure credit volume effects.

Next, we investigate whether the positive impact of the number of bank relationships is driven by heterogeneity across banks. If firms' banks differ in important dimensions, it is likely that their lending behavior differs. Bank lending behavior can differ across time, types of credit and lending technologies, and across types of borrowers. Similar to diversification in portfolios, higher heterogeneity across banks might reduce the risk that a firm is hit by negative credit supply shocks, allowing the firm to hire more workers and pay higher wages.

We measure the heterogeneity of firms' bank relationships in each year along the following key dimensions that we gather from the bank financial statements database of the Central Bank of Brazil (Plano Contábil Das Instituções Do Sistema Financeiro Nacional, COSIF): an indicator for very large banks (dummy that equals one if total assets exceed the 95th percentile, and zero otherwise), profitability (dummy that equals one if ROA exceeds the median), capitalization (dummy that equals one if the regulatory capital ratio exceeds the median), leverage (dummy that equals one if book leverage exceeds the median), and ownership (dummy that equals one if the bank is state-owned, and zero if it is privately owned). We then compute for each of the five dimensions the mean of the dummies and create an indicator variable that is one if the mean is larger than zero and smaller than one, and zero otherwise. Afterwards, we sum the five indicators to obtain Heterogeneity total that takes

values from 0 (lowest) to 5 (highest). Heterogeneity total equals one or higher (zero) for more than 22% (78%) of the observations in our sample. The mean of this variable is 0.36 and the 95th percentile is 2. The correlation between the Number of bank relationships and Heterogeneity total is 0.56. This positive correlation is expected because of diversification effects, i.e., the higher the number of bank relationships the more likely it is that heterogeneity across banks increases.

To investigate the impact of heterogeneity, we take the baseline model from Table 2 and replace the number of bank relationships by Heterogeneity total and, alternatively, indicator variables for the outcomes of Heterogeneity total (with the outcome of zero as reference category). In a second analysis, we take the model from Table 3 and replace the indicator variables Increase of bank relationships (Decrease of bank relationships) by Increase of heterogeneity (Decrease of heterogeneity). The latter equal one if Heterogeneity total increases or decreases, respectively, and zero otherwise. Table 7 reports the results.

(Insert Table 7 here)

In Panel A we find a significantly positive effect of Heterogeneity total on employment and wages paid. Moreover, in columns (2) and (4) we find that the effect increases substantially when Heterogeneity total becomes larger. For instance, column (2) shows that when Heterogeneity total equals three (four) the coefficient is 0.14 (0.15), which is more than the double of the average effect (0.06) shown in column (1). In unreported analyses, we added the constituents of Heterogeneity total separately to the regression model and find that the heterogeneity indicators for all five dimensions are positive and highly significant. We find the largest coefficients on the indicators for heterogeneity in bank size (big bank) and bank ownership (state-owned vs. privately owned). Furthermore, in Panel B we find that employment and wages increase (decrease) when the heterogeneity of firms' bank relationships increases (decreases). These effects are more than twice as large than those from Table 3. In addition, in unreported analyses we re-estimated the models from Table 4 with Heterogeneity total and find that, similar to the number of bank relationships, the effect is significant in all size categories but it increases monotonically from small to large firms. The impact of heterogeneity of bank relationships on labor market outcomes for large firms is about twice as large as for small firms, which can be explained by the fact that larger firms exhibit more bank relationships and, importantly, their bank relationships are more heterogeneous (mean of Heterogeneity total = 0.51) than those of smaller firms (= 0.21). These results indicate that

heterogeneity in firms' bank relationships is an important mechanism that explains the positive effect of the number of bank relationships on labor market outcomes.

In a final test, we investigate whether variation in bank competition at the municipality level can explain our results. This test addresses the concern that our results can be explained by differing levels or changes of bank competition rather than the number of bank relationships. For this test, we compute the cross-sectional median of bank competition by municipality and year and split the sample into municipalities of high (above median) and low (below median) bank competition. We measure local bank competition using the number of different banks per municipality and year. We then re-estimate the baseline regressions for the subsamples with high and low competition. Table 8 reports the results.

(Insert Table 8 here)

In column (1) and (2), the coefficients of our main variable, the number of bank relationships, are highly significant and similar in size for the high and low competition subsample. The estimates are also similar in magnitude to our baseline analysis. In columns (3) and (4), we investigate the effect on employment for increases in the number of bank relationships and in columns (5) and (6) for decreases. Again, the coefficients are highly significant and similar in size. We obtain similar results when we use wages as dependent variable. In two further analyses (not reported here to conserve space), we repeated the analysis for municipalities where local bank competition increases, remains stable or decreases compared to the previous year and, alternatively, for municipalities where the binary classification into high and low competition based on the yearly median changes from one year to another. These additional analyses confirm that our main result is not driven by levels or changes in local bank competition.

In sum, the effect of the number of bank relationships on labor market outcomes remains robust in municipalities with different levels and changes in local bank competition.

4. From Micro to Macro: results at the municipality and state level

In the analyses based on matched credit and labor data at the firm level, we document that the number of bank relationships positively affects employment and wages. We now examine the same question at the macroeconomic rather than the microeconomic level. Silva, Tabak and Laiz (2019) find that credit at the municipality level positively affects economic growth. Our analysis informs us whether the number of bank relationships does only entail

positive real effects for the individual firm or if the effect carries over to the municipality and state level in Brazil. For these regressions at the macro-level, we collect additional data and create variables both at the level of the municipality and at the level of the federal state.

4.1. Aggregate results at the municipality level

For the regressions at the municipality level, we create the new variable Municipality bank relationships. As mentioned above, this variable indicates the mean number of bank relationships averaged over all firms in one of the municipalities in a given year. Using the RAIS database, we compute the average number of employees across all firms and the total payroll costs across all firms located in a municipality and for a given year and take the natural logarithm of these variables. We then estimate equation (2) by regressing Municipality bank relationships on both municipality-level outcome variables. In these regressions, we include municipality and year fixed effects and cluster standard errors by municipality. The number of observations in these regressions is much smaller than in the firm-level regressions as it corresponds to the product of the number of years and the number of municipalities. Table 9 displays the results.

(Insert Table 9 here)

We find positive and highly significant coefficients for municipality mean bank relationships in both cases. In the first case, the coefficient is 0.20, significant at the 1% level and indicates an increase in employment of 11.6% when evaluated at the mean. In the second case, the coefficient is 0.21, significant at the 1% level and corresponds to an increase of payroll costs of 2.6%. These results provide evidence that the positive effect of multiple bank relationships not only exists at the level of the individual firm but also at the level of the municipality the firms are headquartered in. By including municipality fixed effects, we can also rule out two alternative explanations. First, the effects are not driven by differences between relatively poor and rich municipalities. Second, and as important, the effects are not due to issues related to the legal environment, in particular not due to cross-sectional variation in the enforcement of the bankruptcy law in Brazil, as shown by Ponticelli and Alencar (2016).

4.2. Aggregate results at the state level

For the analysis at the level of the federal state, we gather data for three additional outcome variables that indicate real economic activity. First, we create the new variable State

bank relationships that measures the average number of bank relationships across all firms in a given state-month combination. This becomes the main explanatory variable in the state-level regressions. We then retrieve information from IBGE about the industrial production, sales volume, and nominal revenue, which is available for each state on a monthly level. We then estimate equation (3) by regressing these three state-level outcomes of real economic activity on State bank relationships. To saturate the model, we include observation month, state, and state-quarter fixed effects. Standard errors are clustered by observation month. The number of observations is further reduced and corresponds to the product of the number of observation months and the number of states for which we were able to gather data. Note that this analysis is different not only because of its higher aggregation level but also because of the monthly (and not yearly) data frequency. Table 10 presents the results.

(Insert Table 10 here)

All three coefficients of interest are positive and statistically significant. Measured at their respective means, the coefficients for State industrial production, State sales volume and State nominal revenue reflect increases of the index values between 5.6 percent (State industrial production) and 28.5 percent (State sales volume).

Overall, the results provide further evidence that the positive effects of bank relationships on labor that we document at the firm and municipality level carry over to positive real effects at the state level. As we include state fixed effects, the latter findings are not driven by differences between states. This point deserves special attention because the south and southeast of Brazil are much more economically active than the west, north and northeast. The specification of our regression model accounts for these regional economic imbalances within Brazil. All the documented effects are statistically and economically significant.

5. Conclusion

In this study, we document that the number of firms' bank relationships has positive effects on labor market outcomes. Firms with a higher number of bank relationships employ significantly more workers and incur higher payroll costs. An increase in the number of bank relationships entails the same effects, while a decrease results in less workers and lower payroll costs. Importantly, these results also hold when we consider strictly exogenous decreases in the number of bank relationships due to nationwide M&A activity in the banking industry. The finding that the number of bank relationships positively affects labor market outcomes is novel

in the literature. We show that these positive real effects are due (but not limited) to higher credit availability, lower cost of credit and higher heterogeneity in bank relationships. We also rule out that the results are driven by differences or changes in local bank competition. Finally, we investigate whether these real effects at the firm level carry over to the municipality and state level and find consistent evidence that they do. We also show that firms' number of bank relationships positively influences monthly macroeconomic output at the state level, such as industrial production, sales and revenues.

Our findings extend and complement evidence from earlier studies showing that firms improve their access to finance and their financing terms when they have multiple bank relationships and/or switch their bank relationships. To the best of our knowledge, our study is the first that shows positive effects of the number of bank relationships on employment and wages. Furthermore, our findings imply that firms realize gains that go beyond pure financial effects. Firms employ more workers, which leads to an increase in their overall personnel expenses. This effect, in turn, stimulates the labor market and increases macroeconomic output. Because more workers become formally employed, consumption and overall economic activity increases. Finally, our results based on matched credit and labor data contribute to the policy debate about real effects of bank competition. We shed new light on the real benefits of bank competition as multiple bank relationships at the firm level can only exist if there is sufficient competition between banks.

Appendix A1: Variable descriptions and data sources

This table shows descriptions of all variables used in the regression analyses and the data sources. Panel A contains the variables used in the firm-level analyses and Panel B contains the variables used in the aggregate level analyses.

Panel A: Variables used in firm-level analyses

Variable name	Definition	Data Source
Number of employees	Number of employees per firm as of December 31 per year	RAIS
Wages paid	Total amount of wages paid per firm as of December 31 per year	RAIS
Bank relationships	Sum of the number of bank relationships in each month of a year / 12	SCR
Mean banks per municipality	Number of banks licensed and operational per municipality	UNICAD
Increase of bank relationships	Dummy variable that takes on the value of one if the number of bank relationships increases	SCR
Decrease of bank relationships	Dummy variable that takes on the value of one if the number of bank relationships decreases	SCR
Decrease of bank relationships due to M&A	Dummy variable that takes on the value of one if the number of bank relationships decreases in a year in which at least one of the firm's banks is a target in an M&A transaction	
Loan volume	Mean loan amount outstanding per firm and year	SCR
Loan volume^{Orthog}	Orthogonalized mean loan amount per firm and year, i.e the mean loan amount outstanding that is not explained by the mean number of bank relationships per firm and year	SCR
Loan rate	Mean loan rate per firm and year	SCR
Rating	Mean rating for all loans per firm and year	SCR
Heterogeneity total	Heterogeneity of bank relationships measured by an index from 0 (lowest) to 5 (highest) considering the dimensions bank size, profitability (ROA), capitalization, leverage and ownership (state vs. privately owned)	COSIF

Panel B: Variables used in aggregate level analyses

Variable name	Definition	Data Source
Municipality bank relationships	Municipality mean of the number of bank relationships in each month across all firms / 12	SCR, IBGE
State bank relationships	State mean of the number of bank relationships in each month across all firms / 12	SCR, IBGE
State industrial production	Index of industrial production in a given month and federal state; base value of 100 in 2012	IBGE
State sales volume	Index of sales volume in a given month and federal state; base value of 100 in 2011	IBGE
State nominal revenue	Index of nominal revenues in a given month and federal state; base value of 100 in 2011	IBGE

References

Alfaro, L., García-Santana, M., Moral-Benito, E., 2019. On the Direct and Indirect Real Effects of Credit Supply Shocks. No 25458, NBER Working Papers.

Azariadis, C., 1975. Implicit contracts and underemployment equilibria. *Journal of Political Economy* 83, 1183-1202.

Bai, J., Carvalho, D., Phillips, G., 2018. The Impact of Bank Credit on Labor Reallocation and Aggregate Industry Productivity. *Journal of Finance* 73, 1139-1182.

Bailey, M., 1974. Wages and employment under uncertain demand. *Review of Economic Studies* 41, 27-50.

Banco Central do Brasil, 2018. Evolution of the credit market in monetary policy easing cycles. *Inflation Report* March 2018, 41-47.

Beck, T., Demirgüç-Kunt, A., Laeven, L., Levine, R. 2008. Finance, Firm Size, and Growth. *Journal of Money, Credit and Banking* 40, 1379-1405.

Beck, T., Demirgüç-Kunt, A., Martinez Peria, M., 2007. Reaching Out: Access to and Use of Banking Services across Countries. *Journal of Financial Economic*s 85, 234-66.

Beck, T., Levine, R., Loayza, N., 2000. Finance and the sources of growth. *Journal of Financial Economics* 58, 261-300.

Benmelech, E., Frydman, C., Papanikolaou, D., 2019. Financial frictions and employment during the Great Depression. *Journal of Financial Economics* 133, 541-563.

Berger, A., Roman, R., 2017. Did Saving Wall Street Really Save Main Street? The Real Effects of TARP on Local Economic Conditions. *Journal of Financial and Quantitative Analysis* 52, 1827-1867.

Bernanke, B., Gertler, M., 1995. Inside the Black Box: The Credit Channel of Monetary Policy Transmission. *Journal of Economic Perspectives* 9, 27-48.

Berton, F., Mocetti, S., Presbitero, A., Richiardi, M., 2018. Banks, Firms, and Jobs. *Review of Financial Studies* 31, 2113-2156.

Black, S., Strahan, P. 2002. Entrepreneurship and Bank Credit Availability. *Journal of Finance* 57, 2807-2833.

Bonfim, D., Dai, Q., Franco, F., 2018. The number of bank relationships and borrowing costs: The role of information asymmetries. *Journal of Empirical Finance* 46, 191-209.

Bonfim, D., Nogueira, G., Ongena, S., 2018. "Sorry, We're Closed" Loan Conditions When Bank Branches Close and Firms Transfer to another bank. Working Paper, July 2018.

Campello, M., Graham, J., Harvey, C., 2010. The Real Effects of Financial Constraints: Evidence from a Financial Crisis. *Journal of Financial Economics* 97, 470-487.

Carletti, E., Cerasi, V., Daltung, S., 2007. Multiple-bank lending: Diversification and free-riding in monitoring. *Journal of Financial Intermediation* 16, 425-451.

Carvalho, D., 2014. The Real Effects of Government-Owned Banks: Evidence from an Emerging Market. *Journal of Finance* 69, 577-609.

Chodorow-Reich, G., 2014. The employment effects of credit market disruptions: firm-level evidence from the 2008-09 financial crisis. *Quarterly Journal of Economics* 129, 1-59.

Cortes, G., Marcondes, R., 2018. The Evolution of Brazil's Banking System. *The Oxford Handbook of the Brazilian Economy*, 198-220.

Degryse, H., Ioannidou, V., von Schedvin, E., 2016. On the Non-Exclusivity of Loan Contracts: An Empirical Investigation. *Management Science* 62, 3510-3533.

Degryse, H., Masschelein, N., Mitchell, N., 2011. Staying, Dropping, or Switching: The Impacts of Bank Mergers on Small Firms. *Review of Financial Studies* 24, 1102-1140.

Detragiache, E., Garella, P., Guiso, L., 2000. Multiple vs. single banking relationships: Theory and evidence. *Journal of Finance* 55, 1133-1161.

Duygan-Bump, B., Levkov, A., Montoriol-Garriga, J., 2015. Financing constraints and unemployment: Evidence from the Great Recession. *Journal of Monetary Economics* 75, 89-105.

Farinha, L, Santos, J., 2002. Switching from single to multiple bank lending relationships: Determinants and implications. *Journal of Financial Intermediation* 11, 124-151.

Fonseca, J., Van Doornik, B., 2019. Financial Development, Labor Markets, and Aggregate Productivity: Evidence from Brazil. Working Paper, January 2019.

Garmaise, M., 2008. Production in entrepreneurial firms: The effects of financial constraints on labor and capital. *Review of Financial Studies* 21, 543-577.

Giroud, X., Mueller, H., 2017. Firm Leverage, Consumer Demand, and Employment Losses During the Great Recession. *Quarterly Journal of Economics* 132, 271-316.

Gopalan, R., Udell, G., Yerramilli, V., 2011. Why do Firms Form New Banking Relationships? *Journal of Financial and Quantitative Analysis* 46, 1335-1365.

Ioannidou, V., Ongena, S., 2010. "Time for a Change": Loan Conditions and Bank Behavior when Firms Switch Banks. *Journal of Finance* 65, 1847-1877.

Jayaratne, J., Strahan, P. 1996. The Finance-Growth Nexus: Evidence from Bank Branch Deregulation. *Quarterly Journal of Economics* 111, 639-670.

Jiménez, G., Ongena, S., Peydró, J.-L., Saurina, J., 2012. Credit Supply and Monetary Policy: Identifying the Bank Balance-Sheet Channel with Loan Applications. *American Economic Review* 102, 2301-2326.

Joaquim, G., Van Doornik, B., Ornelas, J., 2019. Bank Competition, Cost of Credit and Economic Activity: Evidence from Brazil. Banco Central do Brasil Working Paper No. 508, October 2019.

Kashyap, A., Stein, J., 2000. What Do A Million Observations on Banks Say About the Transmission of Monetary Policy? *American Economic Review* 90, 407-428.

King R., Levine R., 1993. Finance and Growth: Schumpeter might be right. *Quarterly Journal of Economics* 108, 717-737.

Kysucky, V., Norden, L., 2016. The Benefits of Relationship Lending in a Cross-Country Context: A Meta-Analysis. *Management Science* 62, 90-110.

Murro, P., Oliviero, T., Zazzaro, A., 2019. Relationship Lending on Employment Decisions in Firms' Bad Times. CSEF Working Paper No. 533, Centre for Studies in Economics and Finance, University of Naples, Italy.

Ongena, S., Smith, D., 1999. What Determines the Number of Bank Relationships? Cross-Country Evidence. *Journal of Financial Intermediation* 9, 26-56.

Ornelas, J., Silva, M., Van Doornik, B., 2020. Informational Switching Costs, Bank Competition and the Cost of Finance. Banco Central do Brasil Working Paper No. 512, January 2020.

Pagano, M., 2019. Risk Sharing within the Firm: A Primer. CSEF Working Paper No. 553, Centre for Studies in Economics and Finance (CSEF), University of Naples, Italy.

Pagano, M., Pica, G., 2012. Finance and employment. *Economic Policy* 27, 5-55.

Ponticelli, J., Alencar, L. S., 2016. Court Enforcement, Bank Loans, and Firm Investment: Evidence from a Bankruptcy Reform in Brazil. *Quarterly Journal of Economics* 131, 1365-1413.

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.

Presbitero, A., Zazzaro, A., 2011. Competition and relationship lending: Friends or foes? *Journal of Financial Intermediation* 20, 387-413.

Rajan, R., Zingales, L. 1998. Financial dependence and growth. *American Economic Review* 88, 559-586.

Silva, T., Tabak, B., Laiz, M., 2019. The Finance-Growth Nexus: The Role of Banks. Banco Central do Brasil Working Paper No. 506, September 2019.

Van Doornik, B., Gomes, A., Schoenherr, D., Skrastins, J., 2018. Mobility Constraints and Labor Market Outcomes - Evidence from Credit Lotteries. Working Paper, August 2018.

Whited, T., 2019. JFE special issue on labor and finance. *Journal of Financial Economics* 133, 539-540.

Table 1: Summary statistics

This table shows summary statistics of the main variables. Panel A displays variables used in the firm-level analysis. Panel B displays variables used in the aggregate analyses. All variable definitions shown in the Appendix A1.

Panel A: Variables used in firm-level analyses

Variable name	Number of obs.	Mean	St. Dev.	p5	Median	p95
Number of employees	5,571,670	11.61	79.05	1	4	34
Wages paid (in Brazilian Real, BRL)	5,571,670	13,861	191,752	618	3,488	38,357
Bank relationships	5,571,670	1.111	0.842	0.083	1	2.833
Number of banks per municipality	5,472,700	23	34	2	8	118
Increase of bank relationships	5,571,670	0.057	0.231	0	0	1
Decrease of bank relationships	5,571,670	0.064	0.246	0	0	1
Decrease of bank relationships due to M&A	5,571,670	0.0005	0.0231	0	0	0
Loan volume	5,571,670	80,133	1,146,503	540	17,761	262,636
Loan rate	5,571,670	42.42	133.60	11	30.44	90
Rating	5,571,670	2.65	1.23	1.00	2.18	5.80
Heterogeneity total	5,571,670	0.31	0.65	0	0	2

Panel B: Variables used in aggregate analyses

Variable name	Number of obs.	Mean	St. Dev.	p5	Median	p95
Municipality number of employees	50,803	7.93	15.47	1.50	5.78	18.50
Municipality wages paid	50,803	6,857	16,232	850	4,371	17,769
Municipality bank relationships	50,803	1.03	0.36	0.42	1.04	1.58
State bank relationships	3,315	1.95	0.25	1.58	1.95	2.40
State industrial production	1,596	97.55	12.20	75.80	98.60	116.00
State sales volume	3,240	89.80	23.84	54.50	89.10	131.20
State nominal revenue	3,240	88.31	32.73	45.05	83.95	143.75

Table 2: The effect of bank relationships on employment and wages

This table reports the results of panel data regressions with employment in Panel A and wages in Panel B as the dependent variables. Variables are defined in Appendix A1. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively. P-values based on standard errors clustered at the firm level are shown in parentheses.

Panel A: Employment

Dep. var.: ln(Number of employees)	(1)	(2)	(3)	(4)
Bank relationships	0.08***	0.08***	0.09***	0.08***
	(0.00)	(0.00)	(0.00)	(0.00)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	No	No
Bank fixed effects	No	Yes	No	No
Industry-state fixed effects	No	No	Yes	No
Bank-year fixed effects	No	No	No	Yes
Number of observations		5,043,034		
Adjusted R^2	0.831	0.832	0.831	0.832

Panel B: Wages

Dep. var.: ln(Wages paid)	(1)	(2)	(3)	(4)
Bank relationships	0.09***	0.09***	0.20***	0.09***
	(0.00)	(0.00)	(0.00)	(0.00)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	No	No
Bank fixed effects	No	Yes	No	No
Industry-state fixed effects	No	No	Yes	No
Bank-year fixed effects	No	No	No	Yes
Number of observations		5,043,034		
Adjusted R^2	0.842	0.842	0.818	0.842

Table 3: The effect of changes of bank relationships on employment and wages

This table reports the results of panel data regressions for employment in Panel A and wages in Panel B. Variables are defined in Appendix A1. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively. P-values based on standard errors clustered at the firm level are shown in parentheses.

Panel A: Employment

Dep. var.: ln(Number of employees)	(1)	(2)	(3)	(4)	(5)	(6)
Increase of bank relationships$_{i,t}$	0.02***	0.03***				
	(0.00)	(0.00)				
Increase of bank relationships$_{i,t+1}$		0.03***				
		(0.00)				
Decrease of bank relationships$_{i,t}$			-0.04***	-0.04***		
			(0.00)	(0.00)		
Decrease of bank relationships$_{i,t+1}$				-0.01***		
				(0.00)		
Decrease of bank relationships due to M&A$_{i,t}$					-0.04***	-0.04***
					(0.00)	(0.00)
Decrease of bank relationships due to M&A$_{i,t+1}$						-0.07***
						(0.00)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations				4,784,166		
Adjusted R^2	0.834	0.834	0.834	0.834	0.834	0.831

Panel A: Wages

Dep. var.: ln(Number of employees)	(1)	(2)	(3)	(4)	(5)	(6)
Increase of bank relationships$_{i,t}$	0.03***	0.03***				
	(0.00)	(0.00)				
Increase of bank relationships$_{i,t+1}$		0.03***				
		(0.00)				
Decrease of bank relationships$_{i,t}$			-0.04***	-0.05***		
			(0.00)	(0.00)		
Decrease of bank relationships$_{i,t+1}$				-0.01***		
				(0.00)		
Decrease of bank relationships due to M&A$_{i,t}$					-0.04***	-0.04***
					(0.00)	(0.00)
Decrease of bank relationships due to M&A$_{i,t+1}$						-0.07***
						(0.00)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations				4,784,166		
Adjusted R^2	0.845	0.845	0.845	0.845	0.845	0.841

Table 4: Effects by firm size

This table reports the results of panel data regressions for different firm size categories for employment and wages as dependent variables. Variables are defined in Appendix A1. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively. P-values based on standard errors clustered at the firm level are shown in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. var.:	ln(Number of employees)			ln(Wages paid)		
	Small	Medium	Large	Small	Medium	Large
Bank relationships	0.053***	0.074***	0.105***	0.058***	0.080***	0.112***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,166,125	3,011,573	630,578	1,166,125	3,011,573	630,578
Adjusted R^2	0.779	0.794	0.842	0.786	0.805	0.852

Table 5: Credit volume, loan rates and bank relationships

This table reports the results of panel data regression for the ln(Loan volume) and the (average) Loan Rate as dependent variables, respectively. Variables are defined in Appendix A1. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively. P-values based on standard errors clustered at the firm level are shown in parentheses.

	(1)	(2)	(3)	(4)
Dep. var.:	Ln(Loan volume)		Loan rate	
Bank relationships	1.384***	1.394***	-1.975***	-2.086***
	(0.002)	(0.002)	(0.127)	(0.128)
Mean rating		-0.235***		2.430
		(0.001)		(0.099)
Firm fixed effects	Yes	Yes	Yes	Yes
Bank-year fixed effects	Yes	Yes	Yes	Yes
Number of observations	5,042,363	5,042,363	5,042,363	5,042,363
Adjusted R^2	0.5888	0.5978	0.3532	0.3534

Table 6: Results for employment and total wages controlling for credit volume

This table reports the results of panel data regressions with ln(Number of employees) and ln(Wages paid) as dependent variables. Variables are defined in Appendix A1. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively. P-values based on standard errors clustered at the firm level are shown in parentheses.

	(1)	(2)	(3)	(4)
Dep. Var.:	ln(Number of employees)		ln(Wages paid)	
Bank relationships	0.036***	0.081***	0.039***	0.087***
	(0.001)	(0.001)	(0.001)	(0.001)
ln(Loan volume)	0.032***		0.035***	
	(0.000)		(0.000)	
ln(Loan volume)^{Orthog}		0.032***		0.035***
		(0.000)		(0.000)
Firm fixed effects	Yes	Yes	Yes	Yes
Bank-year fixed effects	Yes	Yes	Yes	Yes
Number of observations	5,042,363	5,042,363	5,042,363	5,042,363
Adjusted R^2	0.8332	0.8332	0.8437	0.8437

Table 7: The impact of heterogenous bank relationships

This table reports the results of panel data regressions with ln(Number of employees) and ln(Wages paid) as dependent variables. The explanatory variables are Heterogeneity total or dummies for its outcomes 1-5. Variables are defined in Appendix A1. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively. P-values based on standard errors clustered at the firm level are shown in parentheses.

Panel A: Heterogeneity of firms' bank relationships

	(1)	(2)	(3)	(4)
Dep. Var.:	ln(Number of employees)		ln(Wages paid)	
Heterogeneity total	0.0660***		0.0717***	
	(0.000)		(0.000)	
Heterogeneity 1		0.0864***		0.0934***
		(0.000)		(0.000)
Heterogeneity 2		0.1366***		0.1487***
		(0.000)		(0.000)
Heterogeneity 3		0.1493***		0.1621***
		(0.000)		(0.000)
Heterogeneity 4		0.1520***		0.1651***
		(0.000)		(0.000)
Heterogeneity 5		0.1290***		0.1439***
		(0.000)		(0.000)
Firm fixed effects	Yes	Yes	Yes	Yes
Bank-year fixed effects	Yes	Yes	Yes	Yes
Number of observations	5,043,102	5,043,102	5,043,102	5,043,102
Adjusted R^2	0.830	0.831	0.881	0.881

Panel B: Changes in the heterogeneity of firms' bank relationships

	(1)	(2)	(3)	(4)
	ln(Number of employees)		ln(Wages paid)	
Increase of heterogeneity	0.0662***		0.0710***	
	(0.000)		(0.000)	
Decrease of heterogeneity		-0.0894***		-0.0930***
		(0.000)		(0.000)
Firm fixed effects	Yes	Yes	Yes	Yes
Bank-year fixed effects	Yes	Yes	Yes	Yes
Number of observations	5,043,102	5,043,102	5,043,102	5,043,102
Adjusted R^2	0.830	0.830	0.840	0.840

Table 8: High versus low local bank competition

This table reports the results of panel data regressions with ln(Number of employees) as dependent variable. Variables are defined in Appendix A1. In columns 1,3, and 5 the level of bank competition is high, in columns 2, 4, and 6 it is low. High competition is defined as municipalities with the number of banks per municipality above the yearly cross-sectional median. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively. P-values based on standard errors clustered at the firm level are shown in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: ln(Number of employees)	High	Low	High	Low	High	Low
Bank relationships	0.0767***	0.0826***				
	(0.000)	(0.000)				
Increase of bank relationships$_{i,t}$			0.0276***	0.0209***		
			(0.000)	(0.000)		
Decrease of bank relationships$_{i,t}$					-0.0416***	-0.0491***
					(0.000)	(0.000)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	2,463,930	3,107,740	2,463,930	3,107,740	2,463,930	3,107,740
Adjusted R^2	0.837	0.830	0.836	0.828	0.836	0.828

Table 9: Aggregate results at the municipality level

This table reports the results of panel data regressions at the municipality level. Variables are defined in Appendix A1. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively. P-values based on standard errors clustered at the municipality level are shown in parentheses.

	(1) Municipality number of employees	(2) Municipality wages paid
Municipality bank relationships	0.20***	0.21***
	(0.01)	(0.01)
Municipality fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Number of observations	50,752	50,752
Number of municipalities	5,513	5,513
Adjusted R^2	0.667	0.716

Table 10: Aggregate results at the state level

This table reports the results of panel data regressions at the federal state level. Variables are defined in Appendix A1. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively. P-values based on standard errors clustered at the state level are shown in parentheses.

	(1) State industrial production	(2) State sales volume	(3) State nominal revenue
State bank relationships	5.45*	25.61***	23.45***
	(0.08)	(0.00)	(0.00)
Year-month fixed effects	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes
State-quarter fixed effects	Yes	Yes	Yes
Number of observations	1,596	3,240	3,240
Adjusted R^2	0.671	0.932	0.967