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Labor and Finance: The Effect of Bank Relationships

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Abstract

We investigate whether firms' number of credit relationships with financial institutions affects labor market outcomes. Using 5 million observations on matched credit and labor panel data from Brazil, we estimate IV regressions, employing exogenous variation in firm-lender relationships due to nationwide bank M&A activity. Firms with more relationships employ more workers and pay higher wage bills. Credit availability, cost of credit, and financial institution heterogeneity are economic channels. The firm-level results translate into positive macroeconomic effects in municipalities and states. The evidence is novel and indicates the positive effects of multiple relationships on labor market outcomes in an emerging economy.

I. Introduction

Financial development is crucial for economic activity and growth (King and Levine (1993), Jayaratne and Strahan (1996), Rajan and Zingales (1998), and Beck, Levine, and Loayza (2000)). However, economic frictions such as transaction costs and asymmetric information, which are severe for emerging economies and SMEs, impede the link between financial and economic development. Banks play a special role as they help to reduce these frictions (Beck, Demirgüç-Kunt, and Martinez Peria (2007), Beck, Demirgüç-Kunt, Laeven, and Levine (2008)). Bank relationships reduce asymmetric information and improve firms' access to finance and the

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terms of finance (Petersen and Rajan (1994), Berger and Udell (1995), Cole (1998), Cole, Goldberg, and White (2004), Berger, Miller, Petersen, Rajan, and Stein (2005), Kysucky and Norden (2016), and Beck, Degryse, De Haas, and Van Horen (2018)).

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, dilute private information, 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? Do any ensuing microeconomic effects translate into macroeconomic output? These questions are, because of the elevated level of economic frictions, especially relevant for SMEs and emerging economies.

In this article, we seek to provide evidence on whether firms' number of credit relationships with financial institutions (termed bank relationships hereinafter) 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. 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), and Pagano (2020)) or labor hoarding (Giroud and Mueller (2017)). Moreover, multiple bank relationships may reduce firms' financial constraints and create higher flexibility in labor market decisions (Garmaise (2008)). Furthermore, we investigate whether 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, and Richiardi (2018), Benmelech, Frydman and Papanikolaou (2019), and Whited (2019)). Berger and Roman (2017) show the bank rescue program in the U.S. (TARP/CPP) positively affected firms' 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 are seen as further obstacles to 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 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. Our study is based on the formal banking and labor sector because we do not have similar high-quality data for the informal sectors. Nonetheless, we expect our findings to extend to informal finance and labor sectors (which are both smaller than the formal sectors in Brazil) since economic activity in these informal sectors tends to be similar to one of the formal micro-entrepreneurs and SMEs that account for the vast majority of firms in our sample.

In our main tests, we perform panel data regression analysis of two fundamental labor market outcomes (employment and wages) on a firm's number of bank relationships. A key challenge in our analysis is that the number of bank relationships and labor market outcomes might be endogenous because of an omitted variable that jointly affects these two variables, or because of potential reverse causality. We tackle this issue in two ways. First, we saturate the regression models with different sets of fixed effects to mitigate concerns about omitted variables. Second, we estimate instrumental variable (IV) regressions, in which we employ exogenous decreases in the number of bank relationships due to M&A activity in the Brazilian banking industry as an instrument. This instrument should fulfill the exclusion restriction as the literature has shown that M&A activity in the banking industry is often not related to purely economic motives. Moreover, even if some bank M&A activity is driven by economic motives, the latter relates to the national or international levels in our setting as we do not consider local bank M&As. We show empirically that this instrument has the expected significantly negative impact on firms' number of bank relationships.

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 wage bills. The saturated panel data regression models display a relatively high goodness of fit, mitigating concerns about potential problems due to omitted variables. The findings are also not driven by firm size, that is, the number of bank relationships has a significantly positive impact on employment and wages for firms in different size categories, or by bank competition. We then show that higher credit availability, lower cost of credit, and higher bank heterogeneity are channels through which firms' number of bank relationships affects labor market outcomes.

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 or bankruptcy law enforcement. We also show that firms' number of bank relationships

has a positive impact on different macroeconomic outputs at the state level. Our findings provide novel evidence that suggests multiple bank relationships have significantly positive real effects. These findings inform policymakers about how to promote competition in the financial system and facilitate access to finance, especially for SMEs (e.g., the Central Bank of Brazil's Agenda BC#; https://www.bcb.gov.br/en/about/bcbhashtag).

We contribute to the following two strands of literature. First, we add to the growing literature on labor and finance (e.g., Whited (2019)). 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 precrisis 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 precrisis 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 by credit constraints of small firms. Hombert and Matray (2016) show that bank lending relationships influence firm innovation and the distribution of innovative human capital in the United States. 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% and average wages by 1.8%. 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. 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 toward more productive firms. Alfaro, García-Santana, and Moral-Benito (2021) 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. Benmelech, Bergman, and Seru (2021) employ three quasi-experiments to show that firms' maturing long-term debt negatively affects employment, banking deregulation reduces state-level unemployment, and negative credit supply shocks reduce firm employment. Ayyagari, Juarros, Martinez Peria, and Singh (2021) analyze data from 22 developing countries during 2004–2011 and find that increased access to finance, due to the introduction of credit bureaus, results in higher employment growth.

Some studies examine the effects of finance on labor in Brazil. For example, Carvalho (2014) documents the positive real effects of credit from the national development bank on employment in politically attractive regions in Brazil. Van Doornik, Gomes, Schoenherr, and Skrastins (2021) show that access to credit through lotteries for participants in a group-lending mechanism for investment in motorcycles increases formal employment rates and salaries. Fonseca and Van Doornik (2022) show that constrained firms in Brazil increase employment and wages after the

bankruptcy reform of 2005 that strengthened creditor rights and led to an expansion of credit.

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 (e.g., Ongena and Smith (1999), Farinha and Santos (2002), Gopalan, Udell, and Yerramilli (2011), and Bonfim, Dai, and Franco (2018)). Some studies focus on the effects of switching and find that firms obtain better loan terms from the new bank, but these benefits tend to be short-lived (Ioannidou and Ongena (2010), Ornelas, Silva, and Van Doornik (2020)). 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 (2021) find that firms that switch banks 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 article is organized as follows: In Section II, we describe the data and empirical strategy and provide summary statistics. In Section III, we present the results on the effect of firms' number of bank relationships on labor market outcomes at the firm level. In Section IV, we provide further evidence at the macroeconomic level. Section V concludes.

II. Data, Empirical Strategy, and Summary Statistics

A. Data Sources

We combine data from four different sources in our analysis. First, for the main analysis, we build a firm-level data set 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 on 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. The SCR data allow us to compute the number of firms' credit relationships with financial institutions per time unit. The main explanatory variable in our study is NO_OF_RELATIONSHIPS and captures a firm's average number of credit relationships

with financial institutions per year over time. We focus on credit relationships as we do not have information on other financial services. We define and discuss this variable in more detail in the next subsection.

Second, the main outcome variables are the firms' number of employees and wage bill. We retrieve this information from the Annual Social Information Report (Relação Anual de Informações Sociais, RAIS). As mentioned before, all tax-registered firms in Brazil must fill out the RAIS survey with information relative to Dec. 31. 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).

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 levels. For the latter, we gather data from a third source, the Brazilian Institute of Geography and Statistics (IBGE). 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.

Fourth, we collect banks' financial statements from the Central Bank of Brazil (Plano Contábil Das Instituções Do Sistema Financeiro Nacional, COSIF). We merge the bank financial statements database with the three data sets described above.

The sample spans the period from Jan. 2005 to Dec. 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 depend on particular stages of the business cycle.

To build our firm-level data, we focus on loans to nonfinancial 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 Jan. 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 noninclusion of very small or microloans in the SCR before Jan. 2012. We also drop loans that have floating interest rates to use a homogeneous sample. We further exclude from the data set 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 data set comprises 31,153,687 loans to 1,801,168 firms, granted by 1,102 financial institutions in the time period of 2005 to 2014. Since we keep one observation per firm and year in our final data set to match the annual frequency of the labor market data, there are around 5 million observations, indicating that each firm appears approximately 3 times in the

data set. Each firm in the sample has at least one employee and a positive amount of credit in at least 1 month per year. Banks grant 87.5% of the loans and nonbank financial institutions, such as credit unions and finance companies, the remaining 12.5%.

B. Empirical Strategy

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

$$F_{it} = \beta_0 + \beta_1 \text{NO\_OF\_RELATIONSHIPS}_{it} + \gamma \mathbf{X} + e_{it}, \quad (1)$$

where F_{it} is either the natural log of the number of employees (EMPLOYEES) per firm i and per end of December in year t or the natural log of total wages paid (WAGE_BILL) per firm i and per end of December in year t, as retrieved from RAIS. The variable NO_OF_RELATIONSHIPS measures a firm's average number of credit relationships with financial institutions per year. To create this variable, we use the monthly loan-level data set and sum up the number of financial institutions with which a firm has outstanding credit 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 wage bill. Hence, a significant and positive β_1 would indicate positive real effects of bank relationships.

As mentioned before, a key challenge in our analysis is the potential endogeneity of the firm's labor outcomes and NO_OF_RELATIONSHIPS. The endogeneity may be present because of an omitted variable that affects both variables simultaneously and because of potential reverse causality. We address the first concern by saturating the model with the vector **X** that contains different sets of fixed effects such as year-fixed effects, firm, and interacted industry-state fixed effects. The last two control for any unobservable time-invariant effects of firm characteristics and industry-specific geographic differences in labor markets. In this model, we identify the average effect on labor market outcomes through changes in firms' number of bank relationships over time. This identification strategy is similar to Cerqueiro and Penas (2017) except that they analyze time-variation within states, while we do within firms.

We address the concern of potential reverse causality by conducting an IV regression analysis, that exploits mergers and acquisitions (M&A) of nationwide banks. Reverse causality may exist if firms that intend to hire more workers or face increased hiring opportunities scale up by simultaneously adding more bank relationships. In our setting, the instrument must be exogenous and directly affect a firm's number of relationships without directly affecting the labor outcomes other than through the number of relationships. We employ M&A_MUNICIPALITY as an instrument, which equals 1 if there is at least one loan in a municipality and year for which the lender changed due to a national M&A transaction. This instrument is well-suited to address our research question for the following reasons. First, it is based on M&A transactions of nationwide banks that are likely exogenous to characteristics of local banking markets (municipalities) and characteristics

of the individual firms. The exogeneity holds for banks' motives to engage in national M&A transactions as well as for the firms in our sample, most of which are small and operate only in one municipality. Second, nationwide M&A transactions directly reduce the number of bank relationships if a firm had a bank relationship with the acquiring and target bank before the M&A transaction. Third, nationwide M&A transactions reduce the potential number of bank relationships available to firms in any affected municipality because acquirers integrate the target's countrywide branch networks after the M&A (e.g., Degryse, Masschelein, and Mitchell (2011), Bonfim, Nogueira, and Ongena, (2021)). Stated differently, the exogenous variation due to nationwide M&A reduces the likelihood of firms having multiple bank relationships and adding new bank relationships. These direct and indirect effects suggest that the instrument is relevant. In the empirical analysis, we estimate a two-stage least squares regression model with M&A_MUNICIPALITY as an instrument for NO_OF_RELATIONSHIPS. The regressions of both stages include firm fixed effects and interacted industry-state fixed effects, consistent with our baseline analysis.

In the municipality-level analysis, we estimate the following regression model:

$$(2) \quad M_{jt} = \beta_0 + \beta_1 \text{MUNICIPALITY\_NO\_OF\_RELATIONSHIPS}_{jt} + \gamma \mathbf{Z} + e_{jt},$$

where M_{jt} is the natural log of average number of employees or the natural log of average wage bill paid over all firms in municipality j and per end of December of year t. The main explanatory variable is $\text{MUNICIPALITY\_NO\_OF\_RELATIONSHIPS}_{jt}$. It measures the average number of credit relationships with financial institutions across all firms in municipality j and year t. To define this variable, we use the firm-level data set and compute the mean of the variable NO_OF_RELATIONSHIPS per year using the municipality of each firm. The number of municipalities increased throughout the sample period, from 4,545 in 2005 to 5,467 in 2014. The vector **Z** includes fixed effects for municipality and year. Standard errors in these regressions are clustered on the municipality level.

In the state-level analysis, we estimate the following regression model:

$$(3) \quad S_{km} = \beta_0 + \beta_1 \text{STATE\_NO\_OF\_RELATIONSHIPS}_{km} + \gamma \mathbf{W} + e_{km},$$

where S_{km} is one of the three state-level outcomes: 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 $\text{STATE\_NO\_OF\_RELATIONSHIPS}_{km}$ that measures the average number of credit relationships with financial institutions for all firms in state k and month m. To create this variable, we use the monthly loan-level data set and compute the mean of the variable NO_OF_RELATIONSHIPS by a firm's state and month. There are 27 federal states (one is a federal district for the capital Brasilia) 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 each quarter. Standard errors in these regressions are clustered on the state level.

C. Summary Statistics

Panel A of Table 1 reports summary statistics of variables used in the firm-level analyses, including the number of employees, the wage bill, and the number of relationships with financial institutions based on yearly data.

The average firm employs 11 workers and the 95th percentile of workers is 34, both numbers reflecting that the data set includes mainly small companies. As we have more than 1.8 million firms in the data set, this is not surprising, given that most 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. On average, firms have slightly more than one relationship with financial institutions (1.11).[1] The dispersions in loan volumes and interest rates are high, suggesting these firms have different levels of credit constraints. The mean of the effective annual loan interest rate is 42.42% the 95th percentile is 90.00%. The mean and median credit risk ratings correspond to loans that are less than 15 days past due, and the 95th percentile of the credit risk rating is 5.8, indicating that less than 5% of them are nonperforming loans.

Panel B of Table 1 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 wage bill averaged across all firms in each municipality is around 50% smaller than the average wage bill by each firm independent of the municipality. For this reason, we control for municipality-fixed effects in the

TABLE 1

Summary Statistics

Table 1 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 are shown in the Appendix.

	Variable Name					
	No. of Obs.	Mean	Std. Dev.	p5	Median	p95
Panel A. Variables in Firm-Level Analyses						
EMPLOYEES	5,571,670	11.61	79.05	1	4	34
WAGE_BILL (in Brazilian Real, BRL)	5,571,670	13,861	191,752	618	3488	38,357
NO_OF_RELATIONSHIPS	5,571,670	1.11	0.84	0.08	1	2.83
M&A_MUNICIPALITY (Instrument for NO_OF_RELATIONSHIPS)	5,571,670	0.18	0.38	0.00	0.00	1.00
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	0.66	0.00	0.00	2.00
Panel B. Variables in Aggregate Analyses						
MUNICIPALITY_NO_OF_EMPLOYEES	50,784	7.93	15.47	1.50	5.78	18.50
MUNICIPALITY_WAGE_BILL	50,784	6,857.93	16,246.25	850.00	4,370.78	17,774.93
MUNICIPALITY_NO_OF_RELATIONSHIPS	50,784	1.03	0.36	0.42	1.04	1.58
STATE_NO_OF_RELATIONSHIPS	3,315	1.81	0.26	1.40	1.82	2.23
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

[1]The average number of bank relationships per firm and year is very close to its maximum because many firms have only one bank relationship per year and the vast majority has less than three relationships (>95% of the firm-year observations).

regressions at the municipality level. In contrast, the state-level average number of relationships is larger than at the firm and municipality levels. 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.

III. Empirical Analysis

A. Baseline Results

Table 2 presents the results of our baseline analysis with ln(EMPLOYEES) and ln(WAGE_BILL) as dependent variables. We saturate the panel regression model adding different combinations of firm, 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. Columns 1–4 show the baseline regressions using the variable NO_OF_RELATIONSHIPS, columns 5–7 show the first and second stage IV regression results using M&A_MUNICIPALITY as an instrument for NO_OF_RELATIONSHIPS.

In column 1 of Table 2, we include firm-fixed effects and year-fixed effects. The coefficient of the variable NO_OF_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 the regression model includes firm fixed effects, this finding suggests positive (negative) real effects due

TABLE 2

The Effect of the Number of Relationships with Financial Institutions on Employment and Wages

Table 2 reports the results of panel data regressions with the ln(EMPLOYEES) and ln(WAGE_BILL) as the dependent variables. Columns 1–4 report the results of fixed effects panel data regressions. Columns 5–7 report the results of the instrumental variable regressions with M&A_MUNICIPALITY as the instrument for NO_OF_RELATIONSHIPS. Variables are defined in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. *p*-values based on standard errors clustered at the firm level are shown in parentheses. The Kleibergen–Paap test is for underidentification and tests for the full rank of the reduced-form coefficient matrix following Kleibergen and Paap (2006).

	Dependent Variable						
	ln(EMPLOYEES)	ln(EMPLOYEES)	ln(WAGE_BILL)	ln(WAGE_BILL)	IV First Stage	IV Second Stage ln(EMPLOYEES)	IV Second Stage ln(WAGE_BILL)
	1	2	3	4	5	6	7
NO_OF_RELATIONSHIPS	0.082*** (0.001)	0.087*** (0.001)	0.088*** (0.001)	0.204*** (0.001)		0.439*** (0.010)	2.311*** (0.030)
M&A_MUNICIPALITY (Instrument for NO_OF_RELATIONSHIPS)					−0.083*** (0.001)		
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	No	Yes	No	No	No	No
Industry-state fixed effects	No	Yes	No	Yes	Yes	Yes	Yes
Kleibergen–Paap test (*p*-value)					0.000		
No. of obs.	5,043,102	5,042,520	5,043,102	5,042,520	5,042,520	5,042,520	5,042,520
Adj. R^2	0.831	0.831	0.842	0.818	0.433		

to increases (decreases) in firms' number of relationships. In column 2, we include firm and interacted industry-state fixed effects. The industry-state fixed effects account for industry- and state-specific differences between firms' economic activity. They also control for industry shocks in certain states that can affect firms differently. The size of the coefficient is almost unchanged and it remains highly significant. The coefficient size in column 1 indicates that a firm with one more bank relationship has 8% 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 these specifications we find an adjusted R^2 of 0.83, suggesting that the saturation of the models with fixed effects works well. In columns 3 and 4, we show the corresponding models for ln(WAGE_BILL) and obtain positive and highly significant coefficients for NO_OF_RELATIONSHIPS.

In column 5, we report the first stage of the IV regression. The coefficient of M&A_MUNICIPALITY is negative and highly significant. We examine underidentification using the Kleibergen and Paap (2006) test. It checks the rank of the matrix of reduced-form coefficients and tests whether the instrument is sufficient to identify the endogenous variable. The p-value of the Kleibergen-Paap test rejects under identification at the 1% level. In columns 6 and 7, we report the second stage of the IV regression based on the variation in firms' number of bank relationships due to national bank M&A activity. The coefficient of NO_OF_RELATIONSHIPS is significantly positive in both second-stage regressions. The economic magnitude of the estimated coefficients (0.439; 2.311) is approximately 5–10 times larger than in the fixed effects regressions. This finding is plausible since the instrument M&A_MUNICIPALITY captures strong local average treatment effects (LATE), as discussed by Jiang (2017), indicating a large and significant impact on firms in the affected municipalities but no impact on firms in the unaffected municipalities.

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.

B. Results by Firm Size

We now examine whether the positive effect of the number of bank relationships on labor market outcomes depends 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. Nevertheless, 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 effects" and are therefore purely mechanical, we split our sample of more than 5 million observations into four subsamples according to firm size: micro, small, medium, and large. These categories are related to taxable income and based on the official firm size definition used in the Brazilian credit registry (SCR) of the Central Bank of Brazil (Complementary Law number 123 of Dec. 14, 2006, and Law number 11638 of

Dec. 28, 2007). All financial institutions must report the size category to the Central Bank of Brazil based on the borrower's most recent taxable income and according to the official firm size definition used in the Brazilian credit registry (SCR) (Complementary Law number 123 of Dec. 14, 2006, and Law number 11638 of Dec. 28, 2007). Because financial institutions may have more of less updated versions of a firm's income statement, we use the mode of the size categories reported to the Central Bank of Brazil for a firm in a given month, and we build these subsamples accordingly. Most of our sample is comprised of small firms (58%), followed by micro and medium-sized firms; less than 0.5% are large firms.

We estimate regressions by size category using the IV regression model from Table 2. Table 3 reports the results.

For small and medium-sized firms, the effect of NO_OF_RELATIONSHIPS is consistently positive and significant for both labor market outcomes. For large firms, although the coefficient signs are consistent, the number of observations is low, and we do not have statistical significance in any of the models. For micro firms, surprisingly, we find a negative impact on ln(EMPLOYEES) in column 2 but a positive impact on ln(WAGE_BILL) in column 3.

C. Loan Volume and Loan Rates

In Tables 4–6, we investigate key elements that relate to the channels through which more bank relationships translate into increases in the number of employees and wage bill.

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 afford higher wage bills. To test this hypothesis, we reestimate the IV regression models from Table 2 with the LOAN_VOLUME and LOAN_RATE as dependent variables, respectively. As before, we saturate the regression models with firm fixed effects and interacted industry-state fixed effects. Table 4 reports the results.

We find that NO_OF_RELATIONSHIPS is related to a significantly positive impact on LOAN_VOLUME (columns 2 and 3) and a significantly negative impact on LOAN_RATE (columns 4 and 5). In columns 3 and 4, we find that the results hold when we control for the firms' average rating in the same year, which is deemed a key determinant of the loan approval and pricing. These findings suggest that the positive real effects of multiple bank relationships may be due (but not necessarily limited) to higher credit availability and/or lower cost of credit.

Our findings so far indicate the benefits of multiple bank relationships, but there might be the concern that the number of 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 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. In unreported analyses, we regress the labor

TABLE 3

Effects by Firm Size

Table 3 reports the results of panel data and instrumental variable regressions with ln(EMPLOYEES) and ln(WAGE_BILL) as dependent variables by firm size category. We adopt the mode of the size categories reported to the Brazilian credit registry (SCR) according to Complementary Law number 123 of Dec. 14, 2006, and Law number 11638 of Dec. 28, 2007. Columns 1–3 refer to micro firms, columns 4–6 to small firms, columns 7–9 to medium-sized firms, and columns 10–12 to large firms. The variable M&A_MUNICIPALITY is the instrument for NO_OF_RELATIONSHIPS. Variables are defined in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. *p*-values based on standard errors clustered at the firm level are shown in parentheses. The Kleibergen–Paap test is for underidentification and tests for the full rank of the reduced-form coefficient matrix following Kleibergen and Paap (2006).

Firm Size	Micro			Small			Medium			Large		
	Dependent Variable											
	IV First Stage	IV Second Stage	IV Second Stage	IV First Stage	IV Second Stage	IV Second Stage	IV First Stage	IV Second Stage	IV Second Stage	IV First Stage	IV Second Stage	IV Second Stage
		ln(EMPLOYEES)	ln(WAGE_BILL)		ln(EMPLOYEEs)	ln(WAGE_BILL)		ln(EMPLOYEES)	ln(WAGE_BILL)		ln(EMPLOYEES)	ln(WAGE_BILL)
	1	2	3	4	5	6	7	8	9	10	11	12
NO_OF_RELATIONSHIPS		−0.106**	3.352***		0.308***	1.866***		0.772***	2.595***		2.8727	6.945
		(0.024)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)		(0.178)	(0.179)
M&A_MUNICIPALITY (Instrument for NO_OF_RELATIONSHIPS)	−0.036***			−0.113***			−0.095***			−0.0322		
	(0.000)			(0.000)			(0.000)			(0.189)		
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-state fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen–Paap test (*p*-value)	0.000			0.000			0.000			0.177		
No. of obs.	1,166,963	1,166,963	1,166,963	3,012,120	3,012,120	3,012,120	620,642	620,642	620,642	11,121	11,121	11,121
Adj. R^2	0.347			0.396			0.504			0.697		

TABLE 4

Credit Volume, Loan Rates, and Number of Relationships

Table 4 reports the results of instrumental variable regressions for the ln(LOAN_VOLUME) and LOAN_RATE as dependent variables, respectively. The variable M&A_MUNICIPALITY is the instrument for NO_OF_RELATIONSHIPS. Variables are defined in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. *p*-values based on standard errors clustered at the firm level are shown in parentheses. The Kleibergen–Paap test is for underidentification and tests for the full rank of the reduced-form coefficient matrix following Kleibergen and Paap (2006).

	IV First Stage	IV Second Stage		IV Second Stage	
		Dependent Variable			
		ln(LOAN_VOLUME)		LOAN_RATE	
	1	2	3	4	5
NO_OF_RELATIONSHIPS		3.899***	4.258***	−23.435***	−28.825***
		(0.000)	(0.000)	(0.000)	(0.000)
M&A_MUNICIPALITY	−0.083***				
(Instrument for NO_OF_RELATIONSHIPS	(0.000)				
RATING			−0.241***		2.889***
			(0.000)		(0.000)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Industry-state fixed effects	Yes	Yes	Yes	Yes	Yes
Kleibergen–Paap test (*p*-value)	0.000				
No. of obs.	5,042,520	4,975,046	4,975,046	5,042,520	5,042,520
Adj. R^2	0.433				

outcome variables on the NO_OF_RELATIONSHIPS and LOAN_VOLUME and, alternatively, the orthogonalized loan volume to mitigate confounding effects due to the positive correlation between both variables. The orthogonalized loan volume is obtained as the residuals from a regression of the firm's loan volume per year on the number of bank relationships in the same year plus firm and industry-state fixed effects. We find that, for both labor outcomes and in both specifications, the positive effect of the NO_OF_RELATIONSHIPS remains large and highly significant. 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 columns 1–4 of Table 2. These additional analyses confirm that there are positive effects of firms' number of bank relationships on employment and wages that go beyond pure credit volume effects.

D. Heterogeneity of Bank Relationships

We now investigate whether the positive impact of the number of 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.

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 (COSIF): an indicator for big banks (dummy that equals 1 if the bank has more than 800 branches, and 0 otherwise), profitability (dummy that equals 1 if ROA exceeds the median), capitalization (dummy that

equals 1 if the regulatory capital ratio exceeds the median), leverage (dummy that equals 1 if book leverage exceeds the median), and ownership (dummy that equals 1 if the bank is state-owned, and 0 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 1 if the mean is larger than 0 and smaller than 1, and 0 otherwise. Afterward, we sum the five indicators to obtain HETEROGENEITY_TOTAL that takes values from 0 (lowest) to 5 (highest). HETEROGENEITY_TOTAL equals 1 or higher (0) 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 NO_OF_RELATIONSHIPS and HETEROGENEITY_TOTAL is 0.56. This positive correlation is expected because of diversification effects, that is, 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 fixed effects model from Table 2 and replace the NO_OF_RELATIONSHIPS with different measures of heterogeneity in relationships. Table 5 reports the results.

Panel A of Table 5 shows the results for HETEROGENEITY_TOTAL and, alternatively, indicator variables for the outcomes of HETEROGENEITY_TOTAL (with the outcome of 0 as reference category). We find a significantly positive effect of HETEROGENEITY_TOTAL on ln(EMPLOYEES) and ln(WAGE_BILL). Moreover, in columns 3 and 4 we find that the effect increases substantially as

TABLE 5

The Impact of Heterogenous Bank Relationships

Table 5 reports the results of panel data regressions with labor market outcomes as dependent variables. In Panel A, the explanatory variables are HETEROGENEITY_TOTAL or dummies for its outcomes from 1 to 5. Panel B reports the effects of each constituent of HETEROGENEITY_TOTAL that indicate heterogeneity of bank relationships related to bank size, profitability, capital, leverage, and ownership. The sample for Panel B is limited to firms with an average number of bank relationships bigger than one during the sample period. Variables are defined in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. *p*-values based on standard errors clustered at the firm level are shown in parentheses.

Panel A. Effects of Heterogeneity Total

	Dependent Variable							
	ln(EMPLOYEES)				ln(WAGE_BILL)			
	1	2	3	4	5	6	7	8
HETEROGENEITY_TOTAL	0.066*** (0.000)	0.076*** (0.000)			0.072*** (0.000)	0.159*** (0.000)		
HETEROGENEITY_1			0.086*** (0.000)	0.105*** (0.000)			0.093*** (0.000)	0.238*** (0.000)
HETEROGENEITY_2			0.137*** (0.000)	0.154*** (0.000)			0.149*** (0.000)	0.293*** (0.000)
HETEROGENEITY_3			0.149*** (0.000)	0.165*** (0.000)			0.162*** (0.000)	0.364*** (0.000)
HETEROGENEITY_4			0.152*** (0.000)	0.167*** (0.000)			0.165*** (0.000)	0.343*** (0.000)
HETEROGENEITY_5			0.129*** (0.000)	0.141*** (0.000)			0.144*** (0.000)	0.322*** (0.000)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	No	Yes	No	Yes	No	Yes	No
Industry-state fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
No. of obs.	5,043,102	5,042,520	5,043,102	5,042,520	5,043,102	5,042,520	5,043,102	5,042,520
Adj. R^2	0.830	0.830	0.831	0.830	0.841	0.812	0.841	0.812

(continued on next page)

TABLE 5 (continued)
The Impact of Heterogenous Bank Relationships

Panel B. Effects of the Constituents of Heterogeneity Total

	Dependent Variable: ln(EMPLOYEES)				
	1	2	3	4	5
HETEROGENEITY_BANK_SIZE	0.0700*** (0.000)				
HETEROGENEITY_BANK_PROFITABLITY		0.0294*** (0.000)			
HETEROGENEITY_BANK_CAPITAL			0.0181* (0.054)		
HETEROGENEITY_BANK_LEVERAGE				0.0418*** (0.000)	
HETEROGENEITY_BANK_OWNERSHIP					0.0701*** (0.000)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
No. of obs.	1,676,578	1,676,578	1,676,578	1,676,578	1,676,578
R^2	0.890	0.890	0.890	0.890	0.890

HETEROGENEITY_TOTAL becomes larger. For instance, column 3 shows that when HETEROGENEITY_TOTAL equals two (three) the coefficient is 0.14 (0.15), which is more than the double of the average effect (0.06) shown in column 1.

In additional analyses, we decompose HETEROGENEITY_TOTAL into its five constituents, which indicate heterogeneity related to size, profitability, capital, leverage, and state ownership of the financial institution. Note that we can perform this analysis only for firms whose average number of relationships during the sample period is bigger than 1. We first examine bivariate correlations. We find that heterogeneity of relationships due to size (large vs. small bank) and ownership (state-owned vs. privately owned) are important drivers of our main results. Indeed, the index HETEROGENEITY_TOTAL is most strongly correlated with heterogeneity in size (0.81) and ownership (0.79). The correlations for heterogeneity related to profitability, capital and leverage are lower. Panel B of Table 5 reports the corresponding multivariate regression results for ln(EMPLOYEES). We find that all five constituents of HETEROGENEITY_TOTAL have a significantly positive effect on the number of employees. Consistent with the descriptive analysis above, we further find that the coefficients for heterogeneity in size and ownership are the largest ones among the five variables. In unreported analyses, we find similar results in the corresponding analysis for ln(WAGE_BILL). We note that these findings on heterogeneity in financial institution size and ownership make sense in the Brazilian context because lending policies, business models, and cyclicality differ along these dimensions and should therefore plausibly lead to positive financial and – as we show – real effects.

In further (unreported) analyses, we find that employment and wages increase (decrease) when the heterogeneity of firms' relationships increases (decreases). Moreover, we investigate the effects of HETEROGENEITY_TOTAL across the four firm size categories (micro, small, medium, and large) and find that, similar to the NO_OF_RELATIONSHIPS, the effect is significant in all size categories but it

increases from micro to large firms. The impact of heterogeneity of bank relationships on labor market outcomes for large firms is about twice as large as for micro firms, which can be explained by the fact that larger firms exhibit more bank relationships and, importantly, their relationships are more heterogeneous (mean of HETEROGENEITY_TOTAL = 0.42) than those of smaller firms (= 0.21). These results indicate that heterogeneity in firms' relationships with financial institutions is an important mechanism that explains the positive effect of the number of relationships on labor market outcomes.

E. Bank Competition

We investigate the role of bank competition at the municipality level. In this analysis, we address the concern that our results can be explained by different levels of competition rather than the number of bank relationships. Our proxy for the competition is the number of banks that have branches in a municipality. For this test, we compute the yearly cross-sectional median number of banks per municipality to assign a competition indicator (1/0) for high (above median) and low (below median) level of competition. We then estimate the IV regression models from Table 2 for high and low competition separately. Table 6 presents the results.

The first stage IV results in columns 1 and 3 show that the coefficients of the instrument are, as expected, negative and highly significant for the high and low competition subsamples. Importantly, the coefficients of NO_OF_RELATIONSHIPS in the second stage of the IV regression are positive, highly significant, and similar in magnitude in columns 2 and 4. In sum, these results indicate that our main findings are not driven by differences in competition at the level of municipality.

TABLE 6

High Versus Low Bank Competition

Table 6 reports the results of panel data regressions with ln(EMPLOYEES) as dependent variable. Variables are defined in the Appendix. 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% levels, respectively. *p*-values based on standard errors clustered at the firm level are shown in parentheses. The Kleibergen–Paap test is for underidentification and tests for the full rank of the reduced-form coefficient matrix following Kleibergen and Paap (2006).

Competition	High		Low	
	Dependent Variable: ln(EMPLOYEES)			
	First Stage IV	Second Stage IV	First Stage IV	Second Stage IV
	1	2	3	4
NO_OF_RELATIONSHIPS		0.411***		0.484***
		(0.000)		(0.000)
M&A_MUNICIPALITY (Instrument for NO_OF_RELATIONSHIPS)	−0.076***		−0.086***	
	(0.000)		(0.000)	
Firm fixed effects	Yes	Yes	Yes	Yes
Industry-state effects	Yes	Yes	Yes	Yes
Kleibergen–Paap test (*p*-value)	0.000		0.000	
No. of obs.	2,212,367	2,212,367	2,787,448	2,787,448
Adj. R^2	0.446		0.432	

F. Further Checks and Robustness Tests

In this section, we report results of further empirical checks and robustness tests related to variable definition (NO_OF_RELATIONSHIPS), model specification (additional controls), and database (municipalities).

First, we investigate whether our baseline results from Table 2 change if we focus on firms that have relationships only with commercial and universal banks during the sample period but not with finance companies, credit unions, or other nonbank lenders. Table 7 reports the corresponding results.

We find that all effects of the NO_OF_RELATIONSHIPS are similar to the baseline results in Table 2 in terms of sign, magnitude, and significance. We repeated the same analysis for the other main tables, where applicable, and find that the results do also not change. We do not present them here to save space, but they are available from the authors.

Second, we augment the baseline model specification with further controls. In particular, we add the firm credit rating as the main measure of BORROWER_RISK, a measure of BORROWER_SIZE (based on the official firm size categories used in Table 4), MUNICIPALITY_GDP_GROWTH as a time-varying local market characteristic, and fixed effects. Table 8 reports the results. Our main results from Table 2 are robust when we add these controls.

Finally, to check if our results are affected by changes in the composition of the group of municipalities during the sample period, we reestimate our main models for firms located in municipalities that exist in all years.[2] The results are also available from the authors and similar to the ones reported in Table 2, indicating that changes of municipalities do not influence our results.

TABLE 7

The Effect of the Number of Bank Relationships on Employment and Wages

Table 7 reports the results of panel data regressions with ln(EMPLOYEES) and ln(WAGE_BILL) as the dependent variables (same as in Table 2, but with a reduced sample of firms that borrow only from commercial and universal banks but not from other financial institutions such as finance companies or credit unions). Columns 1–4 report the results of fixed effects panel data regressions. Columns 5–7 report the results of the instrumental variable regressions with M&A_MUNICIPALITY as the instrument for NO_OF_RELATIONSHIPS. Variables are defined in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. *p*-values based on standard errors clustered at the firm level are shown in parentheses.

	Dependent Variable						
	ln(EMPLOYEES)	ln(EMPLOYEES)	ln(WAGE_BILL)	ln(WAGE_BILL)	IV First Stage	IV Second Stage ln(EMPLOYEES)	IV Second Stage ln(WAGE_BILL)
	1	2	3	4	5	6	7
NO_OF_RELATIONSHIPS	0.081*** (0.000)	0.086*** (0.000)	0.086*** (0.000)	0.209*** (0.000)		0.415*** (0.000)	2.305*** (0.000)
M&A_MUNICIPALITY (Instrument for NO_OF_RELATIONSHIPS)					−0.080*** (0.000)		
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	No	Yes	No	No	No	No
Industry-state fixed effects	No	Yes	No	Yes	Yes	Yes	Yes
No. of obs.	4,660,194	4,659,742	4,660,194	4,659,742	4,659,742	4,659,742	4,659,742
Adj. R^2	0.830	0.830	0.841	0.817	0.422		

[2]Totally, 99.5% of all observations are of firms located in the municipalities that exist throughout the whole sample period.

TABLE 8

Models with Additional Controls

Table 8 reports the results of panel data regressions with ln(EMPLOYEES) and ln(WAGE_BILL) as the dependent variables, additionally controlling for BORROWER_RISK (RATING), BORROWER_SIZE and MUNICIPALITY_GDP_GROWTH. Columns 1–4 report the results of fixed effects panel data regressions. Columns 5–7 report the results of the instrumental variable regressions with M&A_MUNICIPALITY as the instrument for NO_OF_RELATIONSHIPS. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. *p*-values based on standard errors clustered at the firm level are shown in parentheses.

	ln(EMPLOYEES)	ln(EMPLOYEES)	ln(WAGE_BILL)	ln(WAGE_BILL)	First Stage IV	IV Second Stage ln(EMPLOYEES)	IV Second Stage ln(WAGE_BILL)
	1	2	3	4	5	6	7
NO_OF_RELATIONSHIPS	0.083*** (0.000)	0.093*** (0.000)	0.089*** (0.000)	0.206*** (0.000)		0.589*** (0.000)	2.622*** (0.000)
BORROWER_RISK	−0.093*** (0.000)	−0.086*** (0.000)	−0.101*** (0.000)	−0.029*** (0.000)	0.097*** (0.000)	−0.135*** (0.000)	−0.270*** (0.000)
BORROWER_SIZE	−0.020*** (0.000)	−0.020*** (0.000)	−0.020*** (0.000)	−0.021*** (0.002)	−0.012 (0.107)	−0.015** (0.012)	0.008 (0.668)
MUNICIPALITY_GDP_GROWTH	0.017*** (0.000)	−0.011*** (0.000)	0.018*** (0.000)	−0.133*** (0.000)	−0.133*** (0.000)	0.060*** (0.000)	0.214*** (0.000)
M&A_MUNICIPALITY (Instrument for NO_OF_RELATIONSHIPS)					−0.073*** (0.000)		
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	No	Yes	No	No	No	No
Industry-state fixed effects	No	Yes	No	Yes	Yes	Yes	Yes
No. of obs.	5,042,397	5,042,385	5,042,397	5,042,385	5,042,385	5,042,385	5,042,385
Adj. R^2	0.833	0.833	0.844	0.818	0.437		

IV. 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.

A. Aggregate Results at the Municipality Level

For the regressions at the municipality level, we create the new variable MUNICIPALITY_NO_OF_RELATIONSHIPS. As mentioned above, this variable indicates the mean number of credit relationships with financial institutions averaged over all firms in municipalities per year. Using the RAIS database, we compute the average logarithmic of number of employees across all firms and logarithmic of wage bill across all firms located in a municipality each year. We then estimate equation (2) by regressing the municipality-level outcome variables on MUNICIPALITY_NO_OF_RELATIONSHIPS. 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

TABLE 9

Aggregate Results at the Municipality Level

Table 9 reports the results of panel data regressions for the average number of employees or wages paid across firms per municipality and year. Variables are defined in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. *p*-values based on standard errors clustered at the municipality level are shown in parentheses.

	Dependent Variable	
	ln(MUNICIPALITY_NO_OF_EMPLOYEES)	ln(MUNICIPALITY_WAGE_BILL)
	1	2
MUNICIPALITY_NO_OF_RELATIONSHIPS	0.187***	0.200***
	(0.000)	(0.000)
Municipality fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
No. of obs.	50,742	50,742
Number of municipalities	5,470	5,470
Adj. R^2	0.542	0.601

regressions as it corresponds to the product of the number of years and the number of municipalities. Table 9 displays the results.

We find positive and highly significant coefficients for the MUNICIPALITY_NO_OF_RELATIONSHIPS in both cases. In the first case, the coefficient is 0.19 and significant at the 1% level. In the second case, the coefficient is 0.20 and significant at the 1% level. These results indicate 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).

B. Aggregate Results at the State Level

For the analysis at the state level, we gather data for three additional outcome variables that indicate real economic activity. Sales volume and nominal revenue are available monthly for all 27 federal states, whereas IBGE collects data on industrial production for only 14 states. We estimate equation (3) by regressing these three state-level outcomes on STATE_NO_OF_RELATIONSHIPS, which measures the average number of bank relationships across all firms in each state-month combination. 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 from previous ones not only because of its higher aggregation level but also because of the monthly (and not yearly) data frequency. Table 10 presents the results.

All three coefficients of interest are positive and the ones in columns 2 and 3 are highly statistically significant. These results indicate that the positive effects of

TABLE 10

Aggregate Results at the State Level

Table 10 reports the results of panel data regressions for the industrial production, sales volume, and nominal revenue per state and year-month. Variables are defined in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. *p*-values based on standard errors clustered at the state level are shown in parentheses.

	Dependent Variable		
	STATE_INDUSTRIAL_PRODUCTION	STATE_SALES_VOLUME	STATE_NOMINAL_REVENUE
	1	2	3
STATE_NO_OF_RELATIONSHIPS	4.872 (0.417)	26.579*** (0.002)	24.338*** (0.003)
Observation month fixed effects	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes
State-quarter fixed effects	Yes	Yes	Yes
No. of obs.	1,596	3,240	3,240
Adj. R^2	0.668	0.932	0.966

the number of bank relationships on labor market outcomes 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 and state-quarter 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.

V. Conclusions

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 have higher wage bills. Importantly, these results also hold in IV regressions, in which we employ exogenous decreases in firms' number of bank relationships due to national bank M&A activity as an instrument. The finding that the number of bank relationships positively affects labor market outcomes is novel in the literature. We show that a higher number of bank relationships relates to higher credit availability, lower cost of credit, two possible channels to explain our main results. We further find that higher heterogeneity in bank relationships is related to positive increases in labor market outcomes. We also rule out that the results are driven by differences in local bank competition. Finally, we investigate whether these real effects at the firm level carry over to the municipality level and find evidence that they do. We also show that firms' number of bank relationships positively influences monthly macroeconomic output at the state level, such as 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 real benefits that go beyond pure financial benefits. Firms employ more workers, and increase their overall personnel expenses. These effects are associated with increased macroeconomic output, possibly 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. Variable Descriptions and Data Sources

This appendix shows descriptions of all variables used in the regression analyses and the data sources.

Variables Used in Firm-Level Analyses

EMPLOYEES: Number of employees per firm as of Dec. 31 per year. Source: RAIS.

WAGE_BILL: Total amount of wages paid per firm as of Dec. 31 per year. Source: RAIS.

NO_OF_RELATIONSHIPS: Sum of the number of credit relationships with financial institutions in each month of a year/12. Source: SCR.

M&A_MUNICIPALITY: Indicator variable that equals 1 if there is at least one bank loan per municipality and year for which the lender changed due to a nationwide M&A transaction in Brazil, and 0 otherwise. Source: SCR, UNICAD.

LOAN_VOLUME: Loan amount outstanding per firm and year. Source: SCR.

LOAN_RATE: Mean loan rate per firm and year. Source: SCR.

RATING: Mean rating for all loans per firm and year. Brazilian banks must rate loans by risk category, namely, AA, A, B, C, D, E, F, G, and H, Resolution 2,682 from the Brazilian National Monetary Council states that loans 90 days overdue or more should be rated E or worse. We build a new loan rating numeric variable from 1 to 6, based on the risk categories. AA is 1, A, 2; B, 3; C, 4, D; 5 and E or worse are 6. Source: SCR.

HETEROGENEITY_TOTAL: Heterogeneity of Number of 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). Source: COSIF.

Variables Used in Aggregate-Level Analyses

MUNICIPALITY_NO_OF_RELATIONSHIPS: Municipality mean of firms' number of credit relationships with financial institutions in each month across all firms/12. Source: SCR, IBGE.

STATE_NO_OF_RELATIONSHIPS: State mean of firms' number of credit relationships with financial institutions in each month across all firms/12. Source: SCR, IBGE.

STATE_INDUSTRIAL_PRODUCTION: Index of industrial production in each month for 14 federal states; base value of 100 in 2012. Source: IBGE.

STATE_SALES_VOLUME: Index of sales volume in each month and federal state; base value of 100 in 2011. Source: IBGE.

STATE_NOMINAL_REVENUE: Index of nominal revenues in each month and federal state; base value of 100 in 2011. Source: IBGE.

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