

# Interventions in Credit Markets and Effects on Economic Activity: Evidence from Brazil

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## Abstract

Looking at Brazilian bank branch-level data, I examine effects of the government policy from March 2012, intended to increase credit supply through public banks, on competition in the banking sector and economic activity. I find that the policy was successful in increasing overall credit supply as increased lending of public banks did not crowd-out private lending. On the other hand, there is no evidence of significant client-switching between private and public banks. However, the effects of the policy on economic activity were very limited and even negligible. I conducted a series of robustness checks to further examine this puzzling result. I find evidence that increased lending led to significant increases in deposits, suggesting that loans were taken at the moment of high availability of funds and saved for future use.

## 1 Introduction

In this paper, I try to explore how a government policy, intended to increase credit supply, affected competition in the banking sector and economic activity. I study this question from the perspective of an unexpected policy, announced by the Brazilian government in March 2012, with the goal of extending credit supply across the Brazilian economy through public banks.<sup>1</sup> This provides a clean setting to understand effects such intervention can have on the economy and competition in the banking sector, as the policy was not coinciding with an impending crisis, so there were no other external shocks that could affect outcomes of interest.<sup>2</sup>

I address research questions through several stages of empirical analysis. In the first set of results, employing the data set containing balance sheet information on individual branches of Brazilian banks, I document that public banks complied with the intervention and increased their credit supply. Looking at trends in loan origination, I observe that public banks substantially increase loan amounts across all, broadly defined loan categories. In particular, *Caixa Economica Federal* drives the increase in personal credit and mortgages, while *Banco do Brasil* increases the supply of agricultural loans. Moreover, both banks are contributing to tripling of investment loans in the period after March 2012.

The next set of results examines what was the response of private banks to the increased lending activity of public banks. The concern is that public banks issued loans to households and firms that would have otherwise been issued by their private competitors. Utilizing the fixed-effects regression analysis where I regress newly originated loans of private banks on loans issued by public banks, I do not find evidence that increases in public bank lending were significantly offset by decreased lending activity of private banks.

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<sup>1</sup>Throughout the paper, I use terms like *government banks*, *state-owned banks*, and *public banks* interchangeably. These terms refer to banks that are owned by the government, either entirely or the government being the major shareholder if a bank is publicly listed. Brazilian government uses these banks to extend lending to firms and households directly. Banks whose majority shareholder is not the Brazilian government I refer to as *private banks*.

<sup>2</sup>The policy was implemented over the fears of an economic slowdown though.

Apart from testing for evidence of crowding-out, I also discuss how the policy affected competition in Brazilian banking market, in particular assessing competition over bank clients. I utilize data on deposits from individual bank branch balance sheets to construct a proxy for the size of bank's clientele. For example, one would expect that if an individual takes a mortgage with CEF, she would also switch her checking account to CEF. Using fixed-effects regressions, I find no evidence of significant client-switching from private toward public banks.

Given the established result that the government intervention substantially increased credit supply in the economy, in the next set of results I examine whether this supply of additional funds had an effect on economic activity. To conduct this analysis, I merge the data set containing information on bank loans with the data on municipality-level GDP and formal employment.<sup>3</sup>

To estimate effects, I run a series of panel data regressions, regressing logarithms of GDP and employment on the logarithm of total lending. However, the big threat to identification is that total lending is exogenous as I observe only loans that are actually issued, hence, this variable carries both information on credit supply and credit demand. I deal with this issue in two ways. First, I add variables that are supposed to control for changes in credit demand, like government transfers to municipalities and average municipality payroll. In spite of the inclusion of variables controlling for changes in credit demand, there may still be some unobserved heterogeneity across municipalities that biases the estimates. To test for this, I also take the second approach, in which I construct a control variable that picks up the portion of increase in total lending attributable to credit demand, and then estimate the coefficient of interest including this synthetic control variable in the regression.<sup>4</sup> Using both approaches, I obtain very similar results, indicating that the effect of the government intervention on economic activity was negligible in the short term.

I run a series of robustness checks intended to shed some light on the puzzling result that a substantial increase in credit supply had virtually no effects on economic activity. First, I constrain the analysis to a subset of municipalities that have access to only one type of banks, either public or private. In spite of obtaining the effect that is twice as big compared to the analysis of the whole sample, it still remains economically insignificant. Second, I examine what the effects were within individual sectors of the economy. For example, it is very unlikely that a person travels to a different municipality to have a haircut, and thus focusing on the services sector can provide additional evidence if the increase in lending had an effect at the local level. However, I still do not find a significant, measurable effect. Third, I pursue the possibility that the effect is not visible at the very local level, rather that it is observable only at the level of economically integrated municipalities. For example, it could be that people who took personal loans were spending them outside of the municipality where loans were taken, say, by visiting a shopping mall in a municipality nearby. To account for these potential spillovers, I conduct the analysis at the higher level of geographical aggregation.<sup>5</sup> Even at these levels of aggregation, I find no evidence that increased lending had a significant effect on economic activity in the formal sector, confirming the original result that the policy, in spite of being effective in increasing credit supply, had a negligible effect on economic outcomes.

Finally, I conduct the analysis to explore the possibility that borrowers saved the portion of increased lending in their deposit accounts. Surprisingly, running fixed-effects regressions of deposits on total lending, I find that the significant portion of loans ended up in deposit accounts. The effect amounts to R\$230 that ended up as deposits out of a R\$1,000 loan, suggesting that households and firms took loans at the time of their high availability and saved the funds for future

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<sup>3</sup>Municipality-level GDP data is coming from the Brazilian Institute of Geography and Statistics (IBGE). Employment data is compiled from annual reports that have to be filed by companies and covers only formal employment.

<sup>4</sup>For this approach, I follow the estimation procedure suggested by Imbens and Newey (2009), which uses an instrumental variable estimation to construct a synthetic control variable.

<sup>5</sup>I use definitions of micro- and meso-regions as provided by IBGE.

use. This means that the effects of the policy on economic activity are likely spread over a longer time horizon.

**Literature review.** This paper contributes to the strand of the literature analyzing Brazilian banking sector and competition between public and private banks in general. Sanches et al. (2018) examine what are the effects of privatization on bank presence in small and isolated markets in Brazil. Their main finding is that privatization negatively affects access to banks in small markets. Fonseca et al. (2022) study how financial development affects economic activity and wage inequality, using the government intervention in Brazil from the beginning of the century aimed at providing access to banking services in small municipalities as a quasi-experiment. They find that bank entry, in municipalities that previously had no bank presence, fosters economic growth, but that these benefits are not shared equally in the population. Finally, my results are in line with Coelho et al. (2013) who suggest that presence of public banks in a municipality does not affect conduct of their private competitors. Sapienza (2004) documents that public and private banks target different clients.

This paper sheds some light on the opposing views in the literature discussing the potential effects of government interventions in credit markets. While, on one side, part of the literature highlights the benefits of such interventions (Stiglitz (1994), Tirole (2012), Philippon and Skreta (2012)), others are emphasizing a negative role the government can play in credit markets (Bertrand et al. (2007), Acharya et al. (2019), Acharya et al. (2021)). Moreover, this paper complements the literature that empirically analyzes government interventions in credit markets. Joaquim et al. (2023) study the same government intervention as I do, using the credit registry data and concentrating on a very particular type of lending - working capital loans. Their main findings are that increased lending led to increased rates of default on debt, with increased lending having very limited benefits on employment at the firm level, but a larger effect at the regional level. Bazzi et al. (2023) find that the credit supply expansion in Brazil lead to greater firm turnover with no short-term effects on growth of formal employment. Garber et al. (2021) showed that the same government intervention led to a substantial increase in households' debt burden. Moreover, Schmitz (2020) finds that the government's intervention expanding credit in Brazil significantly impacted credit allocation to SMEs. Studying a different intervention of a small, new credit facility of a Spanish state-owned bank during the crisis, Jimenez et al. (2019) document that the supply of public credit causes large positive real effects to financially-constrained firms as well as crowding-in of new private bank credit.

The rest of the paper is organized as follows: Section 2 lists data sources, describes characteristics and facts about Brazilian banking sector, and provides an overview of the government intervention. The following section describes the empirical strategy and threats to identification. Section 4 presents trends in loan origination. In section 5 I discuss the effects the policy had on economic activity. Finally, the last section provides steps in the future analysis that are supposed to provide explanations for results that I obtain.

## 2 Data and Brazilian banking market

In this section, I provide an overview of data sets that I am using for the analysis, facts as well as some summary statistics about the Brazilian banking sector, and specifics of the government intervention from March 2012.

## 2.1 Data sources

The main data set I am going to base my analysis on comes from the Monthly Bank Statistics by Municipality (ESTBAN). ESTBAN is a panel data set containing information about balance sheets of individual branches of all Brazilian banks at monthly frequency. It contains information about individual branch assets and liabilities. On the asset side it contains information about personal credit, investment and durable goods loans, agricultural loans (distinguishing between farming and livestock loans), real estate loans, and other credits. On the liabilities side, the data set distinguishes between different types of deposits (checking, savings, term, interbank deposits) and other types of liabilities. Moreover, ESTBAN contains information about the municipality in which individual branches operate, hence allowing for identification of entry and exit of banks in a municipality.

For the analysis, I am augmenting this data set with a series of publicly available data sets containing information about changes in the Brazilian economy (consumption, employment and wages, agricultural activity, government transfers to municipalities, etc.) at the municipality level at yearly frequency.<sup>6</sup> These data sets are coming from the Brazilian Institute of Geography and Statistics (IBGE). More precisely, I am utilizing the municipality-level GDP data that contains information on total GDP and GDP broken into different sectors (industry, services, agriculture, and public administration), taxes, contribution of municipality GDP to overall GDP at different levels of aggregation (federation, grand region, meso-region, micro-region). Data set on employment comes from RAIS and contains information about total number of employed workers as well as the average wage at the municipality level, but also broken down by different sectors.<sup>7</sup> Data on agricultural activity contains information about yields of various crops, together with information about planted and harvested area. Data on government transfers contains information about transfers from the government to municipalities on a monthly level. In discussion of informal employment I utilize the National Household Survey (PNAD) data to construct a measure of employment in the informal sector.

## 2.2 Brazilian banking market

Brazilian banking market is quite large, with 151 distinct banks operating across 3701 municipalities in the period 2008-2018. There are several important characteristics about Brazilian banking market that need to be pointed out. First, some municipalities are very large with various banks operating with many branches in them. On the other side, there are municipalities that are substantially smaller and having access to only a few banks opening at most a few branches. Some municipalities have access only to a single bank operating with a single branch, while others either have no access to banking services or experienced bank entry only in this period.<sup>8</sup> These small municipalities could prove useful for mitigating the potential competition effects between public and, particularly, between private banks. Therefore, I am constraining the analysis to the subset of the municipalities where at most several branches operate.

Second, Brazilian banks can be separated into public (state-owned) banks and private banks. In addition to competing in providing financial services to consumers and firms, there are some fundamental differences between public and private banks. Public banks are legally mandated to provide service to market segments that are not necessarily profitable for private banks, like agriculture sector loans provided by *Banco de Brasil* (BB) or real estate loans by *Caixa Economica*

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<sup>6</sup>For all data that is at yearly frequency, observations are recorded at the end of the year.

<sup>7</sup>RAIS covers formal employment. This data set is constructed based on annual reports that have to be filed by companies and includes detailed information on their payroll and headcount.

<sup>8</sup>For example, looking at the period January 2011 - March 2014, about 200 municipalities experienced bank entry only in this period. This bank entry into new municipalities was mainly driven by public banks opening their branches.

Loan category	Public Banks		Private Banks	
	Amount	% total	Amount	% total
Personal Credit	178,309.8 (523,410.7)	40.88%	29,638.1 (403,654.9)	78.80%
Investment Loans	63,326.4 (254,192.0)	12.09%	5,530.1 (228,385.1)	3.98%
Agricultural Loans	216,359.1 (946,357.6)	26.78%	11,081.5 (533,934.6)	15.03%
Mortgages	139,868.7 (432,065.5)	23.73%	0.0 (0.0)	-
Other Credits	26,757.6 (1,834,143.0)	-2.86%	569.4 (86,994.2)	2.19%
N	99,060	80,772	85,029	48,439

Table 1: Loan origination and the structure of new loans by bank type over the period Jan 2011 - Mar 2014.

*Federal* (CEF), and these banks could be used by the Brazilian government as an instrument for promoting and implementing various policies.<sup>9</sup> On the other hand, private banks are profit maximizers.

Third, even though there are numerous banks competing in Brazilian banking sector, the market is dominated by only several of them. In particular, according to the number of operating branches in March 2012 more than 85% of the market is controlled by 5 largest banks and these are *Banco de Brasil* (public bank; market share 24.63%), *Banco Bradesco* (private bank; 21.58%), *Itau Unibanco* (private bank; 17.90%), *Banco Santander* (private bank; 11.76%), and *Caixa Economica Federal* (public bank; 10.97%). Hence, I will further constrain the analysis to the subset of municipalities where only these 5 largest banks operate. This means that my sample includes municipalities in which all of these five banks operate, but also those municipalities where only some of them have operating branches, or the ones that are monopolized by a single of those five banks.

Fourth, certain banks specialize in issuing certain types of loans. For example, BB issues a substantial amount of agricultural loans (in addition to personal and investment loans), while CEF specializes in real estate loans (in addition to large amounts of personal loans). On the other hand, private banks specialize in personal loans, with some of them also issuing investment and agricultural credit. It is important to note that private banks are not issuing real estate loans in Brazil. (Structure of the asset side of bank balance sheets and its evolution over the period 2011-2013 is presented in Figure 9 in the Appendix.)

Summary statistics of new loan origination, calculated over the period January 2011 - March 2014, presented in Table 1 illustrate some of these differences between public and private banks. We can see that public banks issue all types of credit, while private banks specialize in issuing personal loans (taking up almost 80% of their new loan origination) with some agricultural and investment loans (and no mortgages). Furthermore, we can observe that public banks are issuing substantially greater amounts of new loans on a monthly level compared to private banks, on average. Though this might simply mean that public banks are issuing larger-sized loans, this also probably reflects the fact that they are issuing more loans, i.e., have more clients who borrow from them than private banks. Finally, we can see that there is a high heterogeneity in loan origination across municipalities, which will be examined later.

<sup>9</sup>For example, Coleman and Feler (2015) document how Brazilian government used public banks in a countercyclical manner during the 2008-2009 crisis.

### 2.3 Government intervention

In March 2012, Brazilian government announced its intention to promote credit supply through the state-owned (public) banks - *Banco do Brasil* and *Caixa Economica Federal*. This increase in credit supply was targeted at both consumers and firms. Even though this was not a period of crisis,<sup>10</sup> the government had fears over a slowdown in economic activity. This is very important as the policy was not coinciding with any negative economic shock that could have affected public and private banks in different ways. Moreover, this setting represents a fruitful ground for studying how and to what extent the economic policy promoting increased credit supply can affect real outcomes in the economy.

The biggest concern is whether this policy was truly exogenous from economic activity. A first argument that speaks in favor of exogeneity is that this policy was not introduced as a response to a (forecasted) economic crisis. In the literature it is documented that the quarterly GDP growth in Brazil was above 1.7% throughout the period 2011-2013, and, moreover, GDP forecasts remained stable by June 2012 (Joaquim et al., 2023). Second, same authors show that the credit supply expansion was not driven by political concerns or motives - they find that funds were not disproportionately allocated to municipalities with mayors from the party of the president. This reduces concerns that the allocation of public loans was systematically driven by political capture, and consequently suggests that the intervention was truly exogenous and can be used as a quasi-experiment in assessing the effects of increased credit supply on economic activity. With the aim of keeping the analysis clean of other external shocks in the economy, I will constrain it to the period 2011-2013.

## 3 Empirical strategy

My empirical strategy consists of two stages. In the first stage, I want to show that the government intervention actually led to an increase in total credit supply. Once this is established, I will turn to the second stage and assess to what extent this government intervention affected economic activity, considering the change in banks credit supply to be a mediator of this policy.

In the first stage, the first question that needs to be discussed is whether public banks complied with the prescribed government policy of increasing credit supply across various loan categories. To do this, I turn to examination of trends in loan origination by public banks. In the second step, I assess whether and to what extent the changes in public banks' lending crowded out loans issued by private banks. Apart from looking at trends in private banks' loan origination and drawing descriptive conclusions by comparing them to trends of public banks, for a more formal approach I also estimate regressions of the following form:

$$newloans_{i,m,t}^{priv} = \beta_0 + \beta_1 newloans_{i,m,t-1}^{pub} + \mu_t + \mu_{im} + \xi_{i,m,t}$$

where  $i$  denotes a bank,  $m$  denotes a municipality, and  $t$  denotes time. *priv* refers to a private bank, while *pub* refers to a public bank.  $newloans_{i,m,t}^{priv}$  refers to a new monthly amount that is loaned out by a private bank  $i$  in municipality  $m$  at time  $t$  in one of its loan categories.  $newloans_{i,m,t-1}^{pub}$  is actually a set of explanatory variables giving the (average) monthly amount that public banks issue across their branches in municipality  $m$  at time  $t - 1$  (explanatory variables are lagged, following Sanches et. al. 2018), one for each loan category. Also included are time fixed-effects  $\mu_t$  and, in some specifications, municipality-bank fixed-effects  $\mu_{im}$  (also following Sanches et. al. 2018). Finally,  $\xi_{i,m,t}$  represents the error term. Inclusion of the municipality-bank fixed effect accounts for a specific characteristics of a bank in each municipality, for instance, branches of

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<sup>10</sup> Joaquim et al. (2023) document that the economic recovery that Brazil experienced after the financial crisis in 2008-2009 was fast.

CEF may specialize solely in issuing new mortgages when other banks have operational branches within the same municipality.

Two biggest concerns for assessing whether the intervention resulted in an increase in total credit supply are crowding out of private loans and changes in credit demand, say, due to increased economic activity leading to higher wages. The first concern really means that, after the intervention, public banks are now issuing loans that would have been issued by private banks without the intervention. I will try to mitigate this concern by looking at relationships between different loan categories of public and private banks. As for the second concern, this can be mitigated by controlling for an increased credit demand by taking into account changes in wages and/or government transfers to municipalities.

In the second stage I want to address the extent to which this policy, through the change in credit supply, translates into economic activity and real economic outcomes. In order to do this, I want to estimate the following equation:

$$\log y_{m,t} = \beta_0 + \beta_1 \log TL_{m,t-1} + \mu_m + \mu_t + \xi_{m,t}$$

where  $y_{m,t}$  is the outcome of interest (municipality-level GDP, employment, agricultural production, etc.),  $TL_{m,t-1}$  is the total lending in municipality  $m$  in period  $t - 1$ ,  $\mu_m$  and  $\mu_t$  are municipality and time fixed effects, and  $\xi_{m,t}$  is the error term.

However, the big concern here is the endogeneity of total lending,  $TL_{m,t}$ . Namely, this variable contains the change in total lending that is, not only the result of the government intervention, but also the result of changes in credit demand. For example, if the economic activity of municipality  $m$  started heating up, say due to the development of the municipality, employment and wages would have gone up, leading also to the increase in credit demand. This heterogeneity enters the error term, and as it is related to changes in total lending, causes the endogeneity issue. Partially, I can mitigate this problem by controlling for some observable heterogeneity between municipalities, like wages and government transfers, that should proxy for changes in demand. However, the concern remains due to unobserved heterogeneity that I cannot control for.

Therefore, to mitigate this problem, I will follow the approach from Imbens and Newey (2009). That is, I will try to retrieve the effects of the policy on economic outcomes with a 2-step procedure. The main regression that I want to estimate is:

$$\log y_{m,t} = \gamma(X_m) \times \log TL_{m,t-1} + \mu_m + \mu_t + u_{m,t}$$

where  $\gamma(X_m)$  represents functions of the pre-policy variables controlling for observable heterogeneity between municipalities, and these controls are interacted with total lending. Because of the previously described endogeneity problem with total lending, I will use an instrument in the first step of the procedure to “extract” the portion of total lending that is attributable to changes in credit demand. To do this, I will use the following first step regression:

$$\log TL_{m,t} = \gamma(X_m) \times Post_t + \mu_m + \mu_t + \varepsilon_{m,t}$$

My instrument consists of interactions between functions of variables controlling for observable heterogeneity between municipalities with the indicator variable  $Post_t$  that takes the value 1 for all periods after March 2012.<sup>11</sup> Assuming that the exclusion restriction is satisfied, and estimating the last equation, I can obtain the residuals  $\hat{\varepsilon}_{m,t}$  that should represent the change in total lending that is not attributable to government intervention (constructed control variable). The critical step in doing this is assuming the orthogonality between total lending  $TL_{m,t}$  and the error term from the main regression  $u_{m,t}$  conditional on  $\hat{\varepsilon}_{m,t}$ ,  $TL_{m,t} \perp u_{m,t} | \hat{\varepsilon}_{m,t}$ .

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<sup>11</sup>The validity of this instrument requires a discussion.

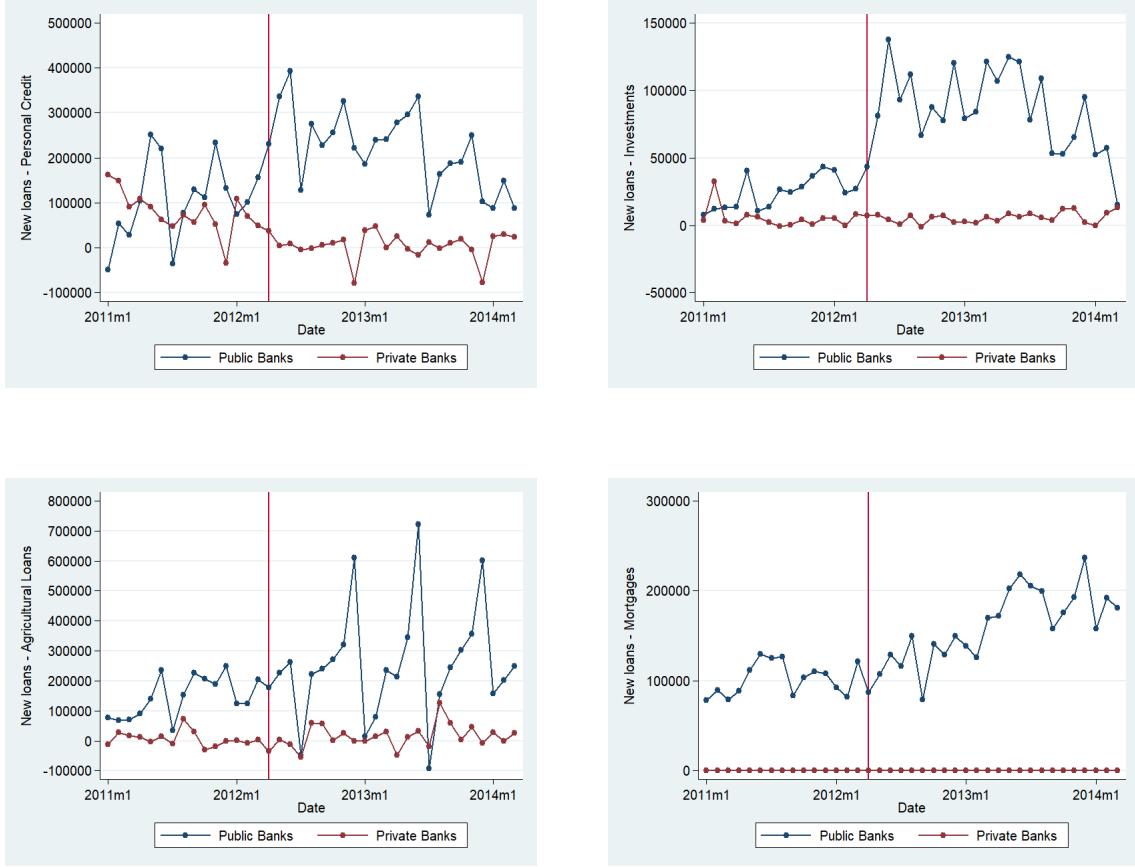


Figure 1: Trends in loan categories across public and private banks.

If this assumption is satisfied, I can then go to the second step and estimate the effect the government intervention had on economic outcomes using the following regression:

$$\log y_{m,t} = \gamma(X_m) \times \log TL_{m,t-1} + \delta_1(X_m) \times \hat{\varepsilon}_{m,t} + [\delta_2(X_{1m}) \times \hat{\varepsilon}_{m,t}^2 + ]\mu_m + \mu_t + u_{m,t}$$

Introducing the constructed control variable  $\hat{\varepsilon}_{m,t}$  into the regression (and also its non-linear form), if the assumption holds, means that this term takes care of changes in total lending that is due to the changes in credit demand, so I can estimate the desired effect.

## 4 Trends in loan origination

The government intervention introduced in March 2012 had a goal of increasing credit supply to consumers and firms. In this section I want to assess to which extent this policy was successful in increasing total credit supply. I will analyze this by looking at the effects in two stages: (i) changes in credit supply of public banks (direct effect), and (ii) resulting changes in new credit origination of private banks, especially the extent of potential crowding out of loans (indirect effect).

I start assessing the effects of government intervention on total credit supply, I first examine the evolution of new loans across loan categories for public and private banks. This is presented in Figure 1. The first observation is that public banks have, on average, increased credit supply across all loan categories after March 2012, and they did so in substantial amounts. Amounts of new personal loans almost doubled, new investment loans more than tripled, while average



amounts of new agricultural loans and mortgages increased by about 75% and 60%, respectively. This is confirmed in Table 16 in the Appendix. Secondly, private banks' activity seems to be similar before and after government intervention, suggesting that, even if there was crowding out of loans, it was only very partial. This is clear for investment loans (which are issued at about the same rate before and after) and mortgages (which are not issued at all by private banks). In the case of agricultural loans, we can even observe a slight increase in private banks' agricultural credit supply after March 2012, which amplifies increased agricultural lending by public banks. Finally, a small concern about potential crowding out is in the case of personal credit as private banks lowered the amounts of new personal loans after March 2012. However, although private banks decreased new personal lending by R\$70,000 on average, public banks increased it by an average of R\$110,000, which suggests a significant but only partial crowding out of private banks' personal loans by public banks.

To understand what exactly drives the increase in credit supply after March 2012, I also look at new loan origination for each individual bank across loan categories. Trends in individual banks' new loan issuance is presented in Figure 2.<sup>12</sup>

When it comes to personal loans, we can observe that the increase in personal credit is mainly driven by new personal loans issued by CEF. Looking at Panel A, we can see that CEF increased issuance of new personal loans by substantial amounts. This increase is observed both in municipalities where CEF had existing branches (middle panel), as well as across new branches of CEF that needed to establish new relationships with clients. On the other hand, other banks experienced about the same level of demand for personal loans pre- and post-policy (with maybe an exception of *Banco Santander* whose level of demand of personal loans was decreasing over the period). The latter is important as it mitigates the problem of potential crowding out of loans, as the overall amount of new personal loans is increasing.

When it comes to investment loans, we can observe from Panel B that the increase in the amount of investment loans was driven by the increase in newly issued investment loans of public banks. On the other hand, we can see that the newly issued investment loans are at about the same level pre- and post-policy for private banks. Hence, it seems safe to conclude that there was no crowding out of investment loans, especially observing that *Banco Santander* was issuing new investment loans in significant amounts in the post-policy period.

The pattern for agricultural loans shown in Panel C is similar to the one I observed when distinguishing only between public and private banks since new agricultural loans are driven by *Banco do Brasil* for public banks, and by *Banco Bradesco* and *Banco Santander* for private banks, with the latter two showing a pattern similar to one another for new agricultural loans. However, there is a huge variability in new agricultural loans, that likely has to do with seasonality. Namely, we can observe a spike in new agricultural loans towards the end of each year, which is the period of year that corresponds with high costs that farmers incur for planting and growing their crops. Also, there are spikes mid-year when farmers need to do final work in the fields to prepare the land for winter and probably make investments into their machinery.

Finally, in Panel D, mortgages are shown for *Caixa Economica Federal* as this the only bank issuing new mortgages.<sup>13</sup> Even though it looks like that there was no increase in mortgages after the policy from the left panel, it is necessary to make a distinction between CEF's branches that were operational before March 2012 and the newly opened ones. By making this distinction, I document that both across already opened branches before the policy was introduced and across

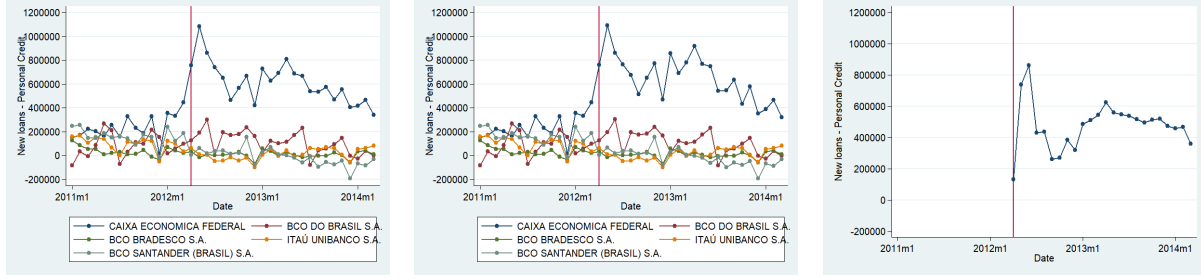
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<sup>12</sup>It is important to note here that CEF was the only bank actively opening new branches after the policy was introduced in March 2012. To account for this, I present trends in new loan origination of those branches separately for personal credit and mortgages, the two types of loans that new branches of CEF focused on issuing.

<sup>13</sup>BB is also issuing some mortgages, but this is not at any meaningful level for the analysis, especially relative to mortgages issued by CEF.

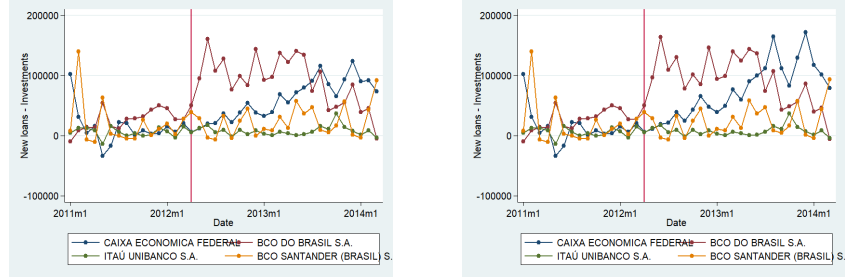
### Panel A. Trends in new personal credit

Notes: Left panel includes all branches of each bank. Middle panel includes all branches of individual banks that were operating prior to March 2012, while the right panel presents trends across newly opened branches of CEF following the government intervention.



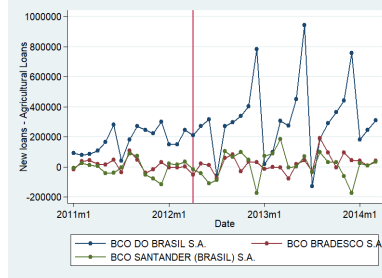
### Panel B. Trends in new investment loans.

Notes: Left panel includes all branches of each bank, while the right panel includes only branches that operated before the policy was introduced. *Banco Bradesco* excluded since investment loans represent a negligible part of its balance sheet.



### Panel C. Trends in new agricultural loans.

Notes: *Caixa Economica Federal* and *Itau* are excluded since agricultural loans represent a negligible part of their balance sheets.



### Panel D. Trends in new mortgages - *Caixa Economica Federal*.

Notes: *Caixa Economica Federal* is the only bank issuing mortgages. Top panel shows trends across all branches of CEF. Middle panel shows trends for branches present throughout the period, while the right panel shows this for newly opened branches of CEF.

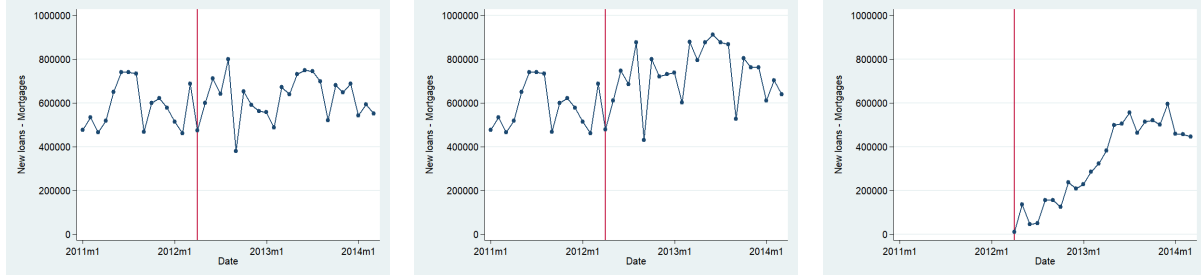


Figure 2: Trends in new loans by bank.

Loan category	Public Banks		Private Banks	
	Pre-policy	Post-policy	Pre-policy	Post-policy
Personal Credit	39.93%	41.34%	91.83%	70.42%
Investment Loans	5.38%	15.34%	1.79%	5.39%
Agricultural Loans	28.53%	25.93%	5.45%	21.19%
Mortgages	27.25%	24.51%	-	-
Other Credits	-1.08%	-7.11%	0.92%	3.00%
N	26,380	54,392	18,966	29,473

Table 2: The structure of new loans pre- and post-policy.

new branches we see an increase in issuance of mortgages relative to the pre-policy period (which is true by definition when looking at branches opened after March 2012 as their newly issued mortgages were equal to zero for all previous months).

Looking at the structure of new loans created by these banks, the striking thing is that the investment loans tripled their share in the structure of newly originated loans both across public and private banks. Given the nature of these loans, it is really important to understand whether this led to better outcomes for municipalities measured by GDP and employment, as this will provide some evidence on whether these loans were actually efficient. Furthermore, we can observe a relatively stable structure for other types of loans across public banks, while in the case of private banks we can see a substantial increase in new agricultural loans and a decrease in personal loans which were by far the biggest focus of private banks pre-policy.<sup>14</sup>

Finally, I can look at the intensity of this increase in lending by contrasting the amount of newly issued loans to municipality-level GDP. The evolution of loan intensity is presented in Figure 3. I also split municipalities according to their GDP level. I chose to contrast amounts of new loans to a fixed level of GDP from 2011.<sup>15</sup> First, it is important to note that new loans are 4.28% of GDP level on average.<sup>16</sup> This is relatively stable across the sample period, however, an increase in the intensity of newly issued loans is observed after the policy. This also confirms that banks were issuing greater amounts of new loans following the government intervention. Interestingly, the richest municipalities, constituting the fourth percentile of the sample according to GDP level from 2011, have a lower level of new loan intensity that is comparable with the poorest municipalities. Finally, from Figure 3 we can observe a certain level of seasonality in new loan origination, where greater amounts of loans are taken in the second and fourth quarter.

This evidence suggests that there was an increase in credit supply of public banks following the government intervention in March 2012, and, with just a mildly crowding out, if any, of private banks' loans, an increase in total credit supply. However, there are still two concerns that prevent me from making this conclusion. First, it could be that even without the intervention the credit supply would go up as private banks might have been issuing more loans if public banks have not attracted their existing and potential customers. For example, existing and potential customers might have applied for agricultural loans with *Banco Bradesco* had there been no intervention that led to better conditions for applying for a loan with *Banco do Brasil*. Second, even without

<sup>14</sup>The effect here is twofold: namely, I indeed observed a decrease in new personal loans issued by private banks when looking at trends. However, this drop in the share of personal loans in their loan structure is not solely due to this decrease, but also due to the observed increase in investment and agricultural loans.

<sup>15</sup>I divide the GDP level with 12 in order to obtain "monthly GDP", so that I can contrast average monthly amounts of new loans to a monthly measure of GDP.

<sup>16</sup>At the world level, new loans (net lending to private sector) accounted for 0.78%, according to the World Bank data (see <https://data.worldbank.org/indicator/FS.AST.PRVT.GD.ZS?end=2022&start=1960&view=chart>). I calculated this number as the change in domestic credit to private sector from 2011 to 2012.

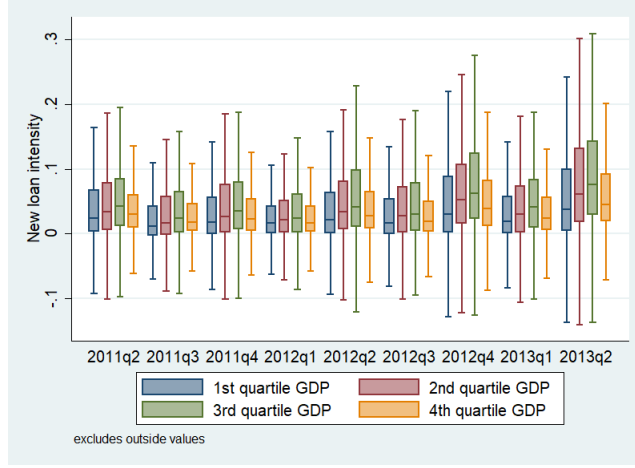


Figure 3: New loans relative to GDP

Notes: Newly issued loans are contrasted to the municipality level GDP from 2011. Municipalities are broken down into 4 groups according to their wealth, as measured by GDP.

the policy, the demand for credit might have increased, possibly due to higher economic activity and increase in wages. Hence, it could be that the observed increase in loan amounts was not driven by an increase and supply (due to government intervention), but only because there was an increase in demand for credit.

To address the first problem, I will look at complementarities between various loan categories of public and private banks next. As for the second problem, I will try to control for a change in demand once I start assessing the effects of increased lending on real outcomes in the economy.<sup>17</sup>

#### 4.1 Assessing the importance and extent of crowding out of private bank credit

In this section, I try to verify and establish potential complementarities between different loan categories of public and private banks that are observed in loan origination patterns above. In this way, I can assess the importance and extent of crowding out of private bank credit by their public competitors. In what follows, I will use the panel structure of the data to estimate several equations of the following form:

$$newloans_{i,m,t}^{priv} = \beta_0 + \beta_1 newloans_{i,m,t-1}^{pub} + \mu_t + \mu_{im} + \xi_{i,m,t} \quad (1)$$

where  $i$  denotes a bank,  $m$  denotes a municipality, and  $t$  denotes time. *priv* refers to a private bank, while *pub* refers to a public bank.  $newloans_{i,m,t}^{priv}$  refers to a new monthly amount that is loaned out by a private bank  $i$  in municipality  $m$  at time  $t$  in one of its loan categories.  $newloans_{i,m,t-1}^{pub}$  is actually a set of explanatory variables giving the (average) monthly amount that public banks issue across their branches in municipality  $m$  at time  $t - 1$  (explanatory variables are lagged, following Sanches et. al. 2018), one for each loan category. Also included are time fixed-effects  $\mu_t$  and, in some specifications, municipality-bank fixed-effects  $\mu_{im}$  (also following Sanches et. al. 2018). Finally,  $\xi_{i,m,t}$  represents the error term.

In the first set of regressions I regress new loans of individual private banks for different loan categories on average new loan amounts across branches of their public competitors within the municipality. Say that we are looking at the municipality, where one branch of *Banco Bradesco* is present together with two branches of *Banco do Brasil* and one branch of *Caixa Economica*

<sup>17</sup>An important consideration is that, although the policy was not introduced concurrently with economic crisis, the government intervened as it was worried about the potential economic slowdown, which speaks against the story that the increase in total credit supply was (solely) demand driven.

	Private: Personal (1)	Private: Investment (2)	Private Agricultural (3)
Public: Personal Credit	0.0133* (0.0079)	-0.0029 (0.0038)	-0.0128 (0.0138)
Public: Investment Loans	-0.0026 (0.0068)	0.017 (0.0088)	-0.0269* (0.0161)
Public: Agricultural Loans	-0.0001 (0.0021)	0.0010 (0.0017)	-0.0169* (0.0089)
Public: Mortgages	-0.0099 (0.0107)	0.0029 (0.0073)	0.0339 (0.0255)
Public: Other Credits	-0.0018 (0.0013)	0.0006 (0.0009)	-0.0125** (0.0057)
Time FE	Y	Y	Y
Municipality $\times$ Bank FE	Y	Y	Y
N	64,166	25,670	30,678

Table 3: Regression of newly issued loans by private banks on newly issued loans of public banks.

*Federal*. The set of explanatory variables will consist of average new loans across the three branches of *Banco do Brasil* and *Caixa Economica Federal*, one for each loan category. The results of these regressions are presented in Table 3.

Most of the coefficients in the regressions are non-significant. To a certain extent this confirms what is shown when evaluating trends in loan origination. There, I did not observe any particular positive relationship between newly issued loans of certain loan categories of private and public banks. However, there are a couple of points to make. First, there is a positive significant relationship between personal loan issuance of public and private banks that can be seen in specification (1). This is a bit counterintuitive when contrasted to conclusions derived when looking at trends in new personal loan issuance. However, when looking at trends in personal credit origination, I looked at averages across highly heterogeneous municipalities. It could simply be that the relationship between public and private new personal loans is indeed positive, with a very particular pattern - in municipalities where public banks increased personal loans, private banks did so by only a little, while in municipalities where public banks decreased personal loans, their private competitors decreased these loans substantially. In this way we would still observe a decrease in newly issued personal loans by private banks on average, but the relationship to personal credit supply of public banks would nevertheless be positive. Second, worth noting is a significant negative relationship between newly issued agricultural loans of public and private banks that can be seen in specification (3). This means that there is a low but significant crowding out effect for agricultural loans. To put it differently, this means that if in one period a public bank issues new agricultural loans, this will be followed by the decrease in agricultural loans of its private competitor(s) in the following period.

However, high heterogeneity across municipalities in the sample calls for a bit more detailed analysis of the data. In what follows, I will estimate a set of regressions similar to regression equation (1), trying to establish some relationships between particular loan categories in certain municipalities, referring to characteristics of various banks' balance sheets.

First, I will try to zoom in on the relationship between *Banco do Brasil* and *Banco Bradesco*, by

	Bradesco: Personal (1)	Bradesco Agricultural (2)
BB: Personal Credit	0.0134 (0.0100)	0.0213 (0.0183)
BB: Investment Loans	0.0009 (0.0049)	-0.0194 (0.0159)
BB: Agricultural Loans	-0.0015 (0.0033)	-0.0043 (0.0102)
Time FE	Y	Y
Municipality $\times$ Bank FE	Y	Y
N	14,955	6,464

Table 4: Relationship between loans issued by *Banco do Brasil* and *Banco Bradesco*.

	Private: Personal (1)	Private Investment (2)
CEF: Personal Credit	-0.0047 (0.0037)	0.0003 (0.0004)
CEF: Mortgages	0.0109 (0.0106)	-0.0030 (0.0050)
Time FE	Y	Y
Municipality $\times$ Bank FE	N	N
N	866	418

Table 5: Relationship between loans issued by *Caixa Economica Federal* and private banks.

looking at municipalities where only those two banks are operating. Furthermore, I will constrain the analysis only to certain loan categories given those banks' balance sheets - *Banco do Brasil* issues personal, investment and agricultural loans, while *Banco Bradesco* specializes in personal and agricultural loans. Results of these regressions are presented in Table 4.

Looking at Table 4, there is no significant effect. However, as for the sign on agricultural loans in column (2), I can say that it speaks to a partial, but non-significant crowding-out effect.

Second, I want to examine the effects of *Caixa Economica Federal*, which is the only bank issuing mortgages, on its private competitors. For this purpose, I constrain the regression analysis on the subset of municipalities where *Caixa* is the only public bank and there is at least one branch of at least one private bank in that municipality. The results of these regressions are presented in Table 5.

Looking at the results, we can observe that there is no significant relationship between *Caixa's* issuance of mortgages and private banks' issuance of new loans. However, the positive sign in specification (1) on new mortgages suggests that newly issued mortgages by *Caixa* are followed by an increase in new personal loans issued by its private competitors. On the other hand, increase in mortgage issuance is related to decreased amounts of investment loans issued by private banks. Still, neither of the effects is significant, which is also suggesting no crowding out.

Combined with the evidence from trends in new loans, the regression analysis speaks in favor

of government policy having an effect in increasing total credit supply. It seems safe to conclude that increased credit supply by public banks was not offset by the decreased credit supply of their private competitors. Moreover, as could be seen from the case of CEF, it could have slightly increased the demand for credit from private banks. The established relationships also mitigate the problem that public banks were issuing loans that would have been issued by private banks absent the policy. To further mitigate this problem, I will try to examine whether private banks manage to retain their clients after the government intervention using the deposits data as a proxy for clients.

## 4.2 Client retention

If public banks are lowering interest rates and attracting more clients, one consequence might be that those new clients used to have their checking and savings accounts at private banks and then switched to public banks as they obtained loans with them. To check for this, I will run regressions of changes in checking and savings deposits of private banks on new loan issuance by public banks. The regression equations is similar to that in equation (1):

$$\Delta deposits_{i,m,t}^{priv} = \beta_0 + \beta_1 newloans_{i,m,t}^{pub} + \mu_t + \mu_{im} + \xi_{i,m,t} \quad (2)$$

with only differences being that the dependent variable is the change in deposits, which proxies for the client retention, and the fact that I am not using lagged loan variables. The results are presented in Table 6. Even though the estimated relationships between new loans of public banks and deposits of private banks are mostly negative, there is no significant decrease in deposits created by private banks following the changes in credit supply of public banks. This is especially true for checking deposits. If we think of checking deposits as a proxy for where people receive their salaries, the evidence here suggests that people are not moving their checking accounts away from private banks after March 2012. For instance, I would have expected a significant number of people taking up new mortgages to move their checking accounts from private banks to CEF, however, this is not confirmed in Table 6. Therefore, this further mitigates the concern that, after March 2012, public banks were issuing loans that would have been otherwise issued by private banks, as private banks' clients are not switching to public banks significantly.

The results suggest that losing customers due to attractive loans offered by public banks could be a concern for private banks though. Even though all the coefficients in specification (1) are not significant, most of them have a negative sign suggesting a negative relationship between new loan issuance of public banks and deposit creation of private banks. On the other hand, in specification (2), I observe some significant relationship between deposits of private banks and loans of public banks. In particular, it seems that clients taking personal loans at public banks are moving their savings accounts away from private banks, which may be an important source of funding for private banks. Therefore, once public banks start increasing their credit supply following the government intervention, client retention should become one goal of profit maximizing private banks.

## 5 Effects on economic activity

Now that I have shown that the government intervention led to an increase in total lending, I want to assess the effects this increase had on economic activity as measured by GDP and employment. For this purpose, I am running regressions of the form:

$$\log y_{m,t} = \beta \times \log TL_{m,t} + \gamma X_{m,t-1} + \mu_m + \mu_t + u_{m,t} \quad (3)$$

	Private: Checking (1)	Private: Savings (2)
Public: Personal Credit	-0.0058 (0.0075)	-0.0196*** (0.0072)
Public: Investment Loans	0.0054 (0.0099)	0.0044 (0.0056)
Public: Agricultural Loans	-0.0041 (0.0046)	-0.0039*** (0.0019)
Public: Mortgages	-0.0080 (0.0122)	0.0096 (0.0080)
Public: Other Credits	0.0001 (0.0024)	0.0016 (0.0017)
Time FE	Y	Y
Municipality $\times$ Bank FE	Y	Y
N	66,056	66,056

Table 6: Relationship between change in deposits of private banks and loan origination of public banks.

where  $y_{m,t}$  is the outcome variable in municipality  $m$  at time  $t$ .  $TL_{m,t-1}$  is the total lending in municipality  $m$  at time  $t - 1$ . More precisely, it is defined as the average of total lending in municipality  $m$  over the year  $t - 1$ . I use the lag of total lending to allow for some time for the effects of lending to realize.

As there is a concern that total lending increased due to higher credit demand rather than increased credit supply, I introduce control variables to proxy for the greater demand for lending.  $X_{m,t-1}$  represents these control variables and includes payroll, government transfers to municipalities and the value of agricultural production. Moreover, I include a series of fixed effects (region, state, meso-region, municipality, urbanity) that are supposed to control for specific, fixed characteristics of a geographic area, like the size of municipality or the quality of land in a particular state or meso-region, for example. I also include time fixed effects.

I run the regressions on the sample that includes all the municipalities where only those 5 largest banks operate, irrespective of whether a municipality had an access to a bank before January 2011, or experienced bank entry from one of those 5 banks only after January 2011 (and had no bank access prior to this date). There are approximately 2400 municipalities in my sample.

The results are presented in Table 7. We can see that the effect is estimated to be negligible both for GDP and employment, although significant at the 5% level for employment. The results are stable across different specifications, that differ with respect to which variables controlling for the demand are included. According to these results, a 1% increase in total lending leads to an increase of 0.004% in GDP on average, while, on the other hand, it leads to an increase of 0.0352%, on average, in employment, that is, the effect of the increase in total lending virtually has no effect on economic activity.

Since a bank's decision to enter a new market, which had no bank access prior to January 2011, was likely endogenous and related to the current economic conditions in the municipality,<sup>18</sup> I redo the analysis by discarding municipalities that experienced bank entry for the first time only after

<sup>18</sup>For example, it could be that a municipality started developing and more funds were required, so banks saw the opportunity of extending their business to a new pool of clients and decided to enter the new market.



	GDP					Employment				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
log(TL)	0.0047 (0.0038)	0.0042 (0.0039)	0.0041 (0.0040)	0.0041 (0.0038)	0.0033 (0.0041)	0.0354** (0.0167)	0.0356** (0.0167)	0.0352** (0.0165)	0.0356** (0.0167)	0.0357** (0.0166)
log(TT)	-	Y	-	-	Y	-	Y	-	-	Y
log(wage)	-	-	Y	-	Y	-	-	Y	-	Y
log(agrpr)	-	-	-	Y	Y	-	-	-	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	6,682	6,655	6,628	6,634	6,553	6,667	6,640	6,629	6,619	6,554

Table 7: Effect of increase in total lending on GDP and employment

Notes: Standard errors are clustered at the municipality level. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	GDP					Employment				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
log(TL)	0.0036 (0.0113)	0.0026 (0.0115)	0.0043 (0.0113)	0.0025 (0.0114)	0.0027 (0.0115)	-0.0010 (0.0177)	-0.0007 (0.0179)	-0.0007 (0.0178)	0.0002 (0.0178)	0.0009 (0.0180)
log(TT)	-	Y	-	-	Y	-	Y	-	-	Y
log(wage)	-	-	Y	-	Y	-	-	Y	-	Y
log(agrpr)	-	-	-	Y	Y	-	-	-	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	6,524	6,497	6,476	6,478	6,403	6,509	6,482	6,477	6,463	6,404

Table 8: Effect of increase in total lending on GDP and employment (balanced panel).

Notes: Standard errors are clustered at the municipality level. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

January 2011. There are approximately 180 such municipalities in the sample. The results of regressions without those 180 municipalities are presented in Table 8.

The results for GDP are very similar, with effect being non-significant, and even closer to zero. Also, the effect on employment is virtually zero and it is not significant. This suggests that the policy, that led to an increase in total lending, did not really have real effects at the municipality level.

To shed some light on these results, and to understand where did the money from increased lending go, I will run a series of exercises to explore this question and provide some explanations. For example, one possibility that I want to examine is that this increase in lending had a spillover on adjacent municipalities rather than just enhancing local demand. This could be the case if, for instance, personal loans taken by consumers were used to increase their spending but not just locally (they may have used it for purchases in surrounding municipalities, that is, at the regional level). The availability of data will let me track down which micro- or meso-region each municipality belongs to, so it would be possible for me to run regressions at this level of aggregation.

## 5.1 Addressing the endogeneity of total lending

In spite of using the control variables in regressions above, the concern still remains that the endogeneity of total lending is not taken care of. To try to address this concern, I follow the procedure in Imbens and Newey (2009), with the goal of estimating:

$$\log y_{m,t} = \gamma(X_{1m}) \times \log TL_{m,t-1} + \delta_1(X_{1m}) \times \hat{\varepsilon}_{m,t} + \delta_2(X_{1m}) \times \hat{\varepsilon}_{m,t}^2 + \beta X_{2,m,t-1} + \mu_m + \mu_t + u_{m,t}$$

where  $\hat{\varepsilon}_{m,t}$  is controlling for the portion of  $TL_{m,t-1}$  that is endogenous, that is, control for the portion of increase in total lending that is attributable to changes in credit demand. This term,  $\hat{\varepsilon}_{m,t}$ , represents residuals coming from the first-stage regression of the form:

$$\log TL_{m,t-1} = \gamma(X_{1m}) \times Post_t + \beta X_{2,m,t-1} + \mu_m + \mu_t + \varepsilon_{m,t}$$

This approach relies on the assumption that  $\log TL_{m,t-1}$  becomes independent of  $u_{m,t}$  once I condition on  $\hat{\varepsilon}_{m,t}$  (and other control variables).

In the first-stage regression  $Post_t$ , interacted with  $X_{1m}$ , serves as an instrument for shifts in credit supply, and therefore the residual  $\hat{\varepsilon}_{m,t}$  is supposed to pick up changes in total credit that are due to the changes in credit demand. Variables that I include in  $X_{1m}$  are pre-policy log-levels of “income”, given by average municipality wage (recorded at the end of the year 2011), total government transfer to municipality (available at the monthly level), and the total value of agricultural production within municipality in 2011 (available at yearly frequency). Defined in this way, the instrument is supposed to pick up changes in credit supply, because it keeps the demand fixed to the pre-policy level by taking the pre-policy values of variables that serve as a proxy for changes in demand. The fact that the instrument contains variables from 2011 should also provide some level of exogeneity to economic activity in 2012 and 2013. In what follows, I also try to address whether the instrument satisfies these conditions, especially the relevance condition that is easier to test for.

On the other hand,  $X_{2,m,t-1}$  contains additional control variables like lagged wage, lagged total value of agricultural yearly production, lagged government transfers to municipality aggregated to yearly level, and more structural control variables - basically fixed effects for region, state, meso-region, municipality, whether the municipality is urban/rural/intermediate, and whether municipality is in the Amazon area. Additionally, I include the time fixed effects. These controls and a series of fixed effects is supposed to control for heterogeneity between the municipalities.

I use the same set of controls in the main regression, where I interact terms from  $X_{1m}$  with  $\hat{\varepsilon}_{m,t}$  that is supposed to control for the portion of changes in total lending attributable to shifts in credit demand.

I run several specifications of the regression, In specifications (1) and (2), I use the entire subsample (including both municipalities that had bank access prior to January 2011 as well as those that experienced a bank entry only after this date), while in specifications (3) and (4) the subsample is constrained to a balanced panel containing only those municipalities that had at least one operational bank branch prior to January 2011. Also, I distinguish between specifications that include only the linear term  $\hat{\varepsilon}_{m,t}$  controlling for changes in total lending attributable to changes in credit demand (specifications (1) and (3)), and the specifications that include the quadratic form of this term (specifications (2) and (4)).

The first thing to note is that, irrespective of what subsample I run the analysis on, the instrument is relevant, although not very strong. This is shown in the bottom panel of Table 9

	GDP				Employment			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Marginal effect	0.00184	0.00209	-0.00192	-0.00216	0.00347**	0.00367**	0.00325	0.00253
(p-value)	(0.2809)	(0.2295)	(0.6262)	(0.5913)	(0.0327)	(0.0267)	(0.1575)	(0.1685)
log(TT)	Y	Y	Y	Y	Y	Y	Y	Y
log(wage)	Y	Y	Y	Y	Y	Y	Y	Y
log(agrpr)	Y	Y	Y	Y	Y	Y	Y	Y
$\hat{\varepsilon}_{m,t}$	Y	Y	Y	Y	Y	Y	Y	Y
$\hat{\varepsilon}_{m,t}^2$	-	Y	-	Y	-	Y	-	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y	Y	Y
F-stat	0.92	1.38	0.34	0.66	7.48	4.34	1.97	1.47
(p-value)	(0.429)	(0.218)	(0.799)	(0.685)	(0.0001)	(0.0002)	(0.116)	(0.184)
N	6,553	6,553	6,403	6,403	6,554	6,554	6,404	6,404
<i>1st stage</i>								
F-stat	6.99	6.99	8.46	8.46	6.99	6.99	8.46	8.46
(p-value)	(0.072)	(0.072)	(0.037)	(0.0037)	(0.072)	(0.072)	(0.037)	(0.037)

Table 9: Effect of increase in total lending on GDP and employment (Imbens and Newey)

Notes: Standard errors are clustered at the municipality level. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

that shows the results of the F-test following the first step regression.<sup>1920</sup>

Secondly, the results show that the effect of the increase in total lending on economic activity is virtually zero, confirming the results obtained before. Namely, a 1% increase in total lending leads to a 0.002% increase in GDP, and to a 0.003% increase in employment, on average. The only significant effect is the effect total lending has on employment when I use the entire subsample. However, once I remove the 180 municipalities that experienced bank entry only after January 2011, this effect becomes insignificant.

Finally, it is important to note that the coefficients on  $\hat{\varepsilon}_{m,t}$ , and  $\hat{\varepsilon}_{m,t}^2$  in specifications where the quadratic term is included, are jointly zero.<sup>21</sup> This means that there is no selection on unobservables, especially in the case of GDP. To put it differently, it means that for two municipalities that experienced different levels of increase in total lending the change in GDP/employment was the same. This can be confirmed by looking at the evolution of GDP/employment across municipalities that experienced different levels of total lending.

To do this, I first separate municipalities into those that had bank presence throughout the sample period in 5 different bins (quintiles), according to the size of change in total lending they experienced after the government intervention, where the first bin represents municipalities with the lowest change in total lending, and the fifth bin contains those with the biggest increase in total lending. On top of that, I create a separate bin that includes all municipalities that had no

<sup>19</sup>Indeed, the F-statistic for instrument relevance is not above 10, the “rule-of-thumb” for testing the full rank condition of instruments in IV regressions. However, the p-values associated with these values of the F-statistic are below 10% level and 5% level for the full sample and after excluding municipalities that had no bank presence before January 2011, respectively.

<sup>20</sup>I also run regressions where I regress residuals from the main regression,  $\hat{u}_{m,t}$ , on the instrument. Even though this is not an actual test of the exclusion restriction, the fact that there is no significant relationship as coefficients on the instrument are both jointly and individually non-significant, suggests that the exclusion restriction should actually hold.

<sup>21</sup>p-value for the F-statistics is very high in GDP regressions, while it is above the 10% level for the employment regressions where I constrain the subset.

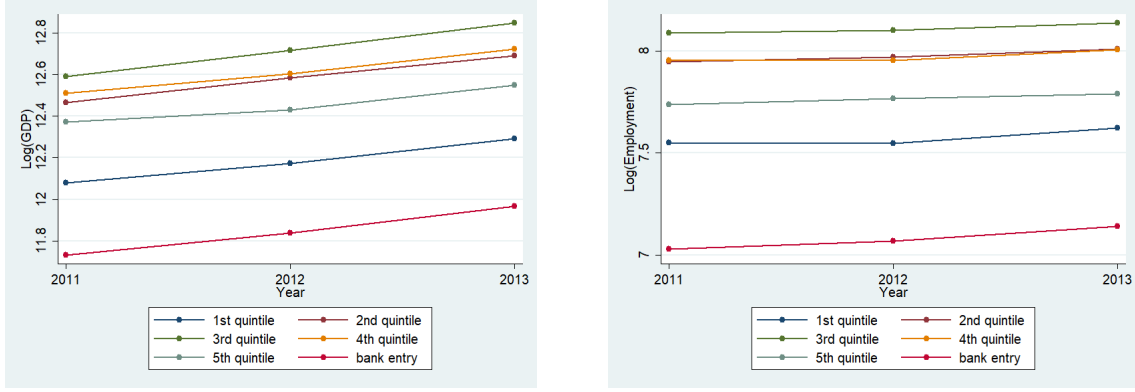


Figure 4: Evolution of GDP and employment across municipalities experiencing different level of increase in total lending.

bank presence before January 2011, but experienced bank entry only after this date. The evolution of GDP/employment is then presented in Figure 4.

These graphs confirm the regression results that the effect of increase in total lending on economic activity was virtually zero. In particular, in the case of GDP, we can see from the left panel of Figure 4 that the change in GDP was the same irrespective of differences between municipalities in changes in total lending (except only in the case of the group that experienced the greatest increase in total lending, where a small kink is observed). In the case of employment, employment remained almost entirely flat in the case of 4 quintiles that experienced the greatest increase in total lending. On the other hand, there is a small kink in the group of municipalities that experienced the lowest level of increase in total lending, while in the case of municipalities with no bank access prior to January 2011 there is a positive slope in employment which reflects that municipalities in this group increased employment over the period 2011-2013.

An alternative way of looking at this result would be to plot GDP against total lending after controlling both variables for all the controls and fixed effects. The same method can be used for employment. I conduct this analysis only on the set of municipalities in which there was bank presence before January 2011.<sup>22</sup> These plots are presented on Figure 5. As could be seen, there is no relationship between GDP and total lending. As for employment, even though there seems to be some positive slope for the fitted line, this slope is so small that I can conclude that the relationship is virtually non-existent. This confirms observations made from the plots presenting the evolution of GDP and employment across binned municipalities.

## 6 Possible explanatory mechanisms for the results

In this section, I explore several possible explanations for the puzzling result that increased lending had very negligible effect on economic activity, looking at different channels through which the effect could have materialized.

<sup>22</sup>I conduct this analysis for municipalities that experienced bank entry only after January 2011 separately. Results are presented in Appendix Figure 11. There seems to be no positive relationship between GDP and the increase in total lending, but a slightly positive relationship in the case of employment. However, since the number of those municipalities is small, their further examination is necessary before making any conclusions.

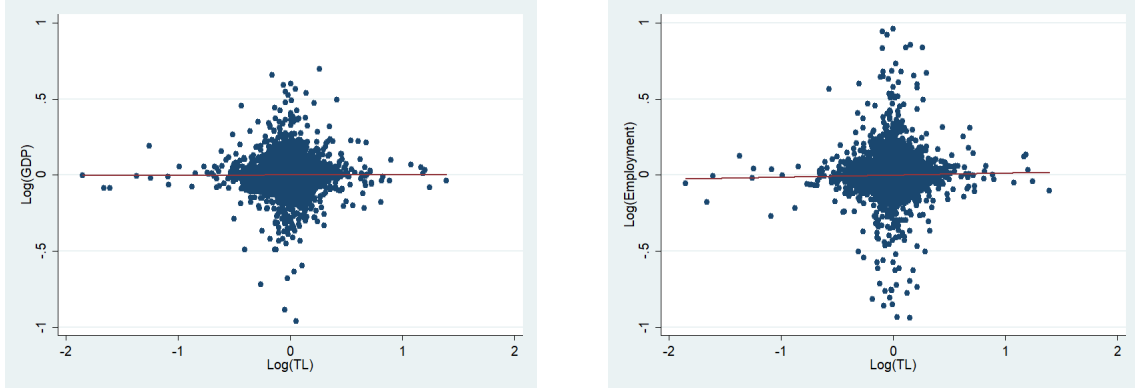


Figure 5: GDP and employment plotted against total lending.

## 6.1 Monopolized municipalities

First, I look at a particular subset of municipalities - those that are “monopolized” only by one type of banks, either public or private. There are 1,183 such municipalities in my sample. Out of those, 748 municipalities are “monopolized” by having access to a public bank only. This really means that in those municipalities only branches of *Banco do Brasil* and *Caixa Economica Federal* operate (it could be that both banks operate their branches within a single municipality). On the other hand, there are 435 municipalities in which only branch(es) of private banks operate.

To break this down further, most of these municipalities are actual monopolies, in a sense that branch(es) of only a single bank operates in them - 1,112 out of 1,183 that are “monopolized”. When it comes to individual banks, BB is “the biggest” monopolist with 689 municipalities in which it is the only bank that operates. It is followed by three private banks - Bradesco is a monopolist in 169 municipalities, Itau in 160, and Santander in 81. CEF is a monopolist in only 13 municipalities, which reflects the fact that it almost exclusively operates in municipalities that have access to other banks (this is also important in light of extensive CEF entry after the policy was introduced, as this reveals that CEF entered into markets that already had access to bank(s)).

This particular subset of municipalities could be different because in those municipalities there are not many options for individuals and/or companies to get credit as they usually have to cooperate with a single bank. Therefore, it could be that some form of a relationship forms between the bank and the borrower, and with this relationship banks could, for example, learn more about their borrowers and lend money for to more productive purposes. For this reason, it could be the case that there is a different response in economic activity to increase in total lending for these municipalities.

Figure 6 shows the growth rate of total lending in municipalities where only public banks operate, then in municipalities that are “monopolized” by private banks, and contrasts the growth rate to other municipalities that have both public and private presence. As the figure shows, growth rate of total lending was very similar in municipalities that were “monopolized” by public banks to those where both public and private banks operated. This is suggestive evidence that the results are not driven by differences in changes in total lending as changes are very similar across these two types of municipalities. On the other hand, change in total lending in the case of municipalities that were “monopolized” by private banks entails high variability.

Results of regression analysis are presented over Tables 10 and 11.

In the first set of results, I consider a municipality “monopolized” if only one type of bank has branch(es) open in the municipality. I conduct the analysis without making a difference whether the municipality is “monopolized” by public or private banks (sub-column referred to

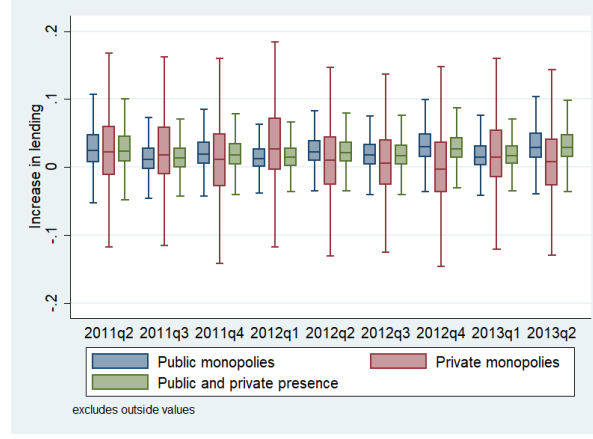


Figure 6: Growth of total lending

Notes: Blue boxes represent municipalities in which only branches of public banks were operating, while red boxes represent municipalities that were “monopolized” by private banks. Green boxes show growth of total lending in municipalities where both public and private banks were operating.

	GDP						Employment					
	both		public		private		both		public		private	
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
log(TL)	0.0099** (0.0048)	0.0095* (0.0050)	0.0251* (0.0129)	0.0274** (0.0132)	0.0078 (0.0050)	0.0067 (0.0052)	0.0363* (0.0219)	0.0364* (0.0217)	-0.0054 (0.0211)	-0.0067 (0.0216)	0.0424* (0.0249)	0.0413* (0.0240)
log(TT)	-	Y	-	Y	-	Y	-	Y	-	Y	-	Y
log(wage)	-	Y	-	Y	-	Y	-	Y	-	Y	-	Y
log(agrpr)	-	Y	-	Y	-	Y	-	Y	-	Y	-	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mun FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	3,100	3,039	1,934	1,886	1,166	1,153	3,091	3,040	1,925	1,887	1,166	1,153

Table 10: Effect of increase in total lending on GDP and employment looking at monopolized markets

Notes: *both* refers to specifications where I used all “monopolized” municipalities in the analysis, irrespective of whether a municipality had presence of only public or private banks. Standard errors are clustered at the municipality level. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

as ‘both’ in Table 10), but also splitting the sample into municipalities that have access to only one type of banks. The effect of increase in total lending on economic activity, as measured by municipality-level GDP and employment, is still negligible in all specifications.

However, even though the effect is negligible, there are some interesting facts that can be observed in these results. Namely, in my full sample, a 1% increase in total lending led to a 0.0047% increase in GDP. This effect is doubled when the analysis is constrained to “monopolized” municipalities. More strikingly, this effect is five times larger when only municipalities that have access to public bank(s) are considered. To a certain extent this may suggest the importance of public bank presence for economic activity.

I also redo the analysis by constraining the sample to only pure monopolies, that is, municipalities where only branch(es) of a single bank are present. Results of the regression analysis are presented in Table 11. Sub-column ‘all’ refers to estimation where I pooled all municipalities that are pure monopolies. I have also pointed out regression that I ran for BB and Itau as estimates are different for these relative to municipalities where other banks are monopolists.

	GDP						Employment					
	all		BB		Itau		all		BB		Itau	
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
log(TL)	0.0082*	0.0075	0.0185*	0.0204*	0.0688	0.0665	0.0363*	0.0364*	-0.0035	-0.0048	0.0209	0.0410
	(0.0046)	(0.0048)	(0.0110)	(0.0113)	(0.0526)	(0.0523)	(0.0221)	(0.0218)	(0.0213)	(0.0218)	(0.0311)	(0.0291)
log(TT)	-	Y	-	Y	-	Y	-	Y	-	Y	-	Y
log(wage)	-	Y	-	Y	-	Y	-	Y	-	Y	-	Y
log(agrpr)	-	Y	-	Y	-	Y	-	Y	-	Y	-	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mun FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	2,907	2,854	1,787	1,744	465	460	2,897	2,854	1,777	1,744	465	460

Table 11: Effect of increase in total lending on GDP and employment looking at purely monopolized markets  
Notes: Standard errors are clustered at the municipality level. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The results are the same, with effect still being negligible. Interesting to note is that, when either all monopolized municipalities are considered or those that are monopolized by a public bank, the estimates are attenuated relative to the previous set of regressions where I only distinguish whether a municipality is “monopolized” by public or private bank. This may suggest that there are some potential synergies that are realized between BB and CEF. However, due to a very low number of “monopolized” municipalities where both BB and CEF are present, I am unable to explore this further.

## 6.2 Effects on tradable sector

Not all sectors of a municipality’s economy are reliant solely on local demand. For example, industry products can be tradable and the level of production is not just driven by local demand, in contrast to services. It is very unlikely that someone will buy a kitchen appliance produced within the very same municipality she lives in, while on the other hand it is not very likely that the same person would travel to a different municipality to have a haircut. Therefore, in this part I examine if the effect of increase in total lending was different in tradables sector.

For this purpose, I estimate a regression equation that is similar to equation (3). As a dependent variable I use different proxies of activity in the tradables sector - industry value added at the municipality level, as industry products can be sold at other municipalities and hence can proxy for production of tradable goods, as well as employment and average wage in tradables sector. In some specifications I use total lending as an explanatory variable, while in others I use total investment lending (as this form of lending should be used for investments).

Results are presented in Table 12. What stands out as an immediate conclusion is that the effect of increase in total lending has no effect on economic activity in tradables sector. Hence, there is no support for the story that the effect of increase in lending could be different in sectors of the economy that are not reliant solely on local demand but could also sell outside of the local region.

For industry value added, I have also run the regressions constraining the sample to only municipalities where *Banco do Brasil*, *Bradesco* and *Santander* operate, as those banks specialize in providing investment loans. However, the results are essentially the same as that in Table 12. I obtain the same result in the case of employment and wages in tradables sector when the analysis is constrained to municipalities where those three banks operates.

	Industry VA				Employment (tradables)				Wages (tradables)			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
log(TL)	-0.0127 (0.0212)	-0.0094 (0.0214)			-0.0311 (0.0420)	-0.0378 (0.0428)			0.0145 (0.0153)	0.0121 (0.0150)		
log(TLin <sub>v</sub> )			-0.0017 (0.0110)	0.0022 (0.0109)			-0.0150 (0.0212)	-0.0133 (0.0213)			-0.0004 (0.0050)	0.0011 (0.0050)
log(TT)	-	Y	-	Y	-	Y	-	Y	-	Y	-	Y
log(wage)	-	Y	-	Y	-	Y	-	Y	-	Y	-	Y
log(agrpr)	-	Y	-	Y	-	Y	-	Y	-	Y	-	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mun FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	6,098	5,974	6,098	5,974	5,774	5,669	5,774	5,669	5,693	5,622	5,693	5,622

Table 12: Effect of increase in total lending on tradable sector

Notes:  $\log(TL)$  represents the logarithm of total lending, while  $\log(TLin_v)$  is the logarithm of total amount of investment loans. Standard errors are clustered at the municipality level. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

I have also run regressions with services value added, employment in non-tradables sector and wages in non-tradables sector as dependent variables which led to the same results, reconfirming that the increase in total lending on economic activity at the municipality level.

### 6.3 Aggregating across neighboring municipalities

So far the analysis have shown that the effect of increase in total lending on economic activity was negligible at the municipality level. This is puzzling as it is not entirely clear what was the effect of the increase, and where the effect were reflected. As a potential explanation it is worth exploring the possibility that the effects are only visible at a higher level of aggregation due to potential spillovers across nearby municipalities.

For example, we can consider Porto Velho, Nova Mamore and Buritis, three municipalities lying to the west at the Bolivian border. Porto Velho is the capital of State of Rondonia, while Nova Mamore and Buritis are two adjacent municipalities.<sup>23</sup> It could be easy to imagine that a lot of economic activity is shared between these municipalities given how close they are to each other. For example, people who live in Buritis may regularly commute to Porto Velho. Moreover, the mining of cassiterite is the most important economic activity in the region, while Porto Velho is an important trading center for it - it would not be unlikely that economic activity related to mining is spread across all the municipalities over this micro-region. Therefore, it is important to note the potential for spillover effects of increased lending, and this is what I am going to examine here.

I am using two levels of aggregation of municipalities in Brazil as provided by Brazilian Institute for Geography and Statistics (IBGE) - aggregation to micro-regions as well as aggregation to meso-regions. I consider 495 micro regions that are located within 129 meso-regions.<sup>24</sup> I aggregated the data in the following way. First, I started from the original sample that I used for the analysis, containing only municipalities in which only 5 of the largest banks operate. I augmented those with municipalities that are located within their respective micro- and meso-regions. Then,

<sup>23</sup>As per Brazilian Institute for Geography and Statistics (IBGE), those three municipalities constitute a separate are, i.e., micro-region, which is called Porto Velho.

<sup>24</sup>Note that according to IBGE there are 558 micro-regions and 137 meso-regions in Brazil.



	GDP		Employment	
	(1)	(2)	(1)	(2)
log(TL)	-0.0166 (0.0224)	-0.0189 (0.0225)	-0.0329 (0.0599)	-0.0219 (0.0567)
log(TT)	-	Y	-	Y
log(wage)	-	Y	-	Y
log(agrpr)	-	Y	-	Y
Time FE	Y	Y	Y	Y
Micro-region FE	Y	Y	Y	Y
N	1,476	1,446	1,469	1,446

Table 13: Effect of increase in total lending on GDP and employment (aggregation at micro-region)

Notes:  $R^2$  represents the contribution of variation in total lending to explaining the variation in the dependent variable. Standard errors are clustered at the micro-region level. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	GDP		Employment	
	(1)	(2)	(1)	(2)
log(TL)	-0.0295 (0.0528)	-0.0341 (0.0530)	0.0037 (0.0820)	0.0081 (0.0823)
log(TT)	-	Y	-	Y
log(wage)	-	Y	-	Y
log(agrpr)	-	Y	-	Y
Time FE	Y	Y	Y	Y
Meso-region FE	Y	Y	Y	Y
N	387	381	385	381

Table 14: Effect of increase in total lending on GDP and employment (aggregation at meso-region)

Notes:  $R^2$  represents the contribution of variation in total lending to explaining the variation in the dependent variable. Standard errors are clustered at the meso-region level. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

I calculated the increase in total lending that the entire region experienced, accounting for all branches of all banks that operated in each region, and not only branches of 5 largest banks. Finally, I aggregated outcome and control variables accordingly, for example, I calculated regional GDP and employment level as a sum of individual GDP and employment across all municipalities within the respective micro- and meso-region, or I calculated the average wage for the respective region as a simple mean of wages in all municipalities constituting that region.<sup>25</sup>

First, I present the results of the analysis aggregated at the micro-region in Table 13. In spite of taking care of potential spillover effects between closely neighboring municipalities, the results remain negligible.<sup>26</sup>

Aggregating the analysis to the meso-region level does not really alter the results as the estimated effect is still negligible. The results of this analysis are presented in Table 14.

<sup>25</sup>Another possibility is to calculate a weighted average, where I can weight individual wages with municipality population or employment level. However, I do not believe this will change the results substantially.

<sup>26</sup>The coefficient of interest even has a negative sign, which should reflect that the effect of increased lending was negative on real outcomes. However, given the high statistical insignificance of the coefficient and its very low value in all specifications, I consider that the effect is essentially zero.

	$\frac{dep_t}{GDP_{2011}}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\frac{Lending_{t-1}}{GDP_{2011}}$	0.227*** (0.006)	0.227*** (0.006)	0.235*** (0.006)	0.227*** (0.006)	0.236*** (0.006)	0.325*** (0.011)
$\frac{Lending_{t-1}}{GDP_{2011}} \times Inc2$						-0.087*** (0.014)
$\frac{Lending_{t-1}}{GDP_{2011}} \times Inc3$						-0.136*** (0.016)
$\frac{Lending_{t-1}}{GDP_{2011}} \times Inc4$						-0.040** (0.021)
$\frac{Lending_{t-1}}{GDP_{2011}} \times Inc5$						-0.160*** (0.005)
TT	-	Y	-	-	Y	Y
wage	-	-	Y	-	Y	Y
GDP	-	-	-	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y
N	62,748	62,727	61,644	62,748	61,623	61,623

Table 15: Effect of increase in total lending on deposit creation

Notes: Standard errors are clustered at the municipality level. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

## 6.4 Effects on deposits

One possibility is that the additional funds that were made available due to the increase in total lending ended up as deposits in banks. This could be the case if, for example, people took out loans when those were easily available and saved the money for a more uncertain future. In this section, I examine this possibility.

Here, I present the results of the regression analysis, where I estimated regressions of the following form:

$$\frac{dep_{m,t}}{GDP_{m,2011}} = \beta \times \frac{TL_{m,t-1}}{GDP_{m,2011}} + \gamma_1 X_{1,m,t-1} + \gamma_2 X_{2,m,y-1} \mu_m + \mu_t + u_{m,t} \quad (4)$$

where the dependent variable is deposits in municipality  $m$  at month  $t$  normalized by municipality's GDP from 2011.<sup>27</sup> The explanatory variable is lending in month  $t - 1$  within the same municipality  $m$  also normalized by GDP from 2011. I also use control variables that are supposed to control for increased spending ability (i.e., increased demand) that could be simply saved into deposit accounts. I use total government transfer in municipality  $m$  at month  $t - 1$ . I also use lagged wage and GDP index as measures of wealth of a municipality.

Results are presented in Table 15. Estimates from specifications (1) - (5) support the possibility that a substantial amount of increased lending ended up in deposit accounts. In particular, the estimates suggest that out of R\$1,000 in new lending, R\$230 ended up in deposit accounts, on average.<sup>28</sup>

<sup>27</sup>I choose to "homogenize" the variables dividing through by the fixed municipality level GDP from the period before the policy was introduced.

<sup>28</sup>Evaluating results of regressions in logarithms at the mean values for lending and deposits, I obtain that newly originated lending

Moreover, I explore how the response varies across different groups of municipalities according to their income level. To do this, I first split all municipalities into 5 quintiles based on their GDP level in 2011. Then, I interact the income level of municipality with increase in lending and estimate the regression using these interactions as explanatory variables. Results are presented in specification (6). I omit the lowest income group, so that I can use it as a reference group. Results suggest that, in municipalities constituting the lowest income group, the effect of increased lending on deposits was the strongest and significantly different from all other, wealthier municipalities. This makes sense as it suggests that in most financially constrained municipalities I observe the strongest evidence that borrowers were taking funds at the time of high availability and saving them for future use.

Even though the interest rates fell considerably in response to the policy, as documented in Joaquim et al. (2023), this result is still striking as this form of obtaining funds is quite expensive in Brazil. However, reinforcing the conclusion is that the effect is the strongest in poorest municipalities. Moreover, without further examination of interest rates in individual contracts it is very hard to say how expensive this form of financing actually was. Unfortunately, due to data limitations, I am unable to further examine this possibility.

## 7 Conclusion

In this paper, I explore how Brazilian government policy from March 2012, intended to increase credit supply, affected competition in the banking sector and economic activity. Employing the data set containing information on individual branches of Brazilian banks, I first document that public banks complied with the intervention and increased their credit supply. This led to an increase in total lending as public banks' lending did not significantly offset that of private banks. Moreover, using deposit data as a proxy for bank's clientele, I do not observe that competition for customers intensifies after the introduction of the policy.

After establishing that the policy led to increased credit supply, I move on to examine what were effects on economic activity of this increased availability of funds. I run a series of panel data regressions with various economic outcomes as dependent variables, controlling for credit demand to deal with endogeneity of total lending, finding a negligible effect of the policy on economic activity, at least in the short term that I am focusing the analysis on. After estimating a negligible effect on GDP and employment at the municipality level, I run a series of robustness checks, exploring different channels through which the effect could have materialized, confirming the original result that economic outcomes were not affected in the short term. However, I find that borrowers saved a substantial amount of money, taking loans when funds were easily obtainable and saving them for future use, suggesting that the effects of the policy would be spread across a longer period of time.

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in the amount of R\$1,000 leads to approximately R\$290 in new deposits. Therefore, this shows similar effects as analysis in levels. With logarithmic regressions I obtained that a 1% increase in total lending leads to 0.35% increase in total deposits, on average.

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## A Facts from the Data

### A.1 New branches and bank entry

In the period January 2011 - March 2014, three banks were active in opening new branches. Although the majority of new branches were opened in municipalities that already had some bank access, there were also some municipalities that experienced bank entry only after January 2011. Most notably, 59 municipalities experienced entry in December 2011, and also quickly after the government introduced the low interest rate policy, 47 municipalities in March 2012 and 30 municipalities in May 2012. Bank entry into new municipalities was driven by the entry of the public banks.

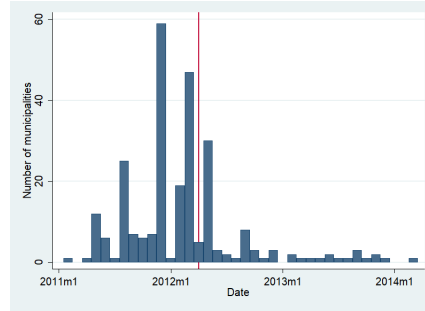


Figure 7: Municipalities with bank entry only after January 2011.

In addition to some entry into new markets, a lot of branches were opened in municipalities that already had bank access. All branch openings of banks that were actively opening branches in the period are presented in Figure 8.

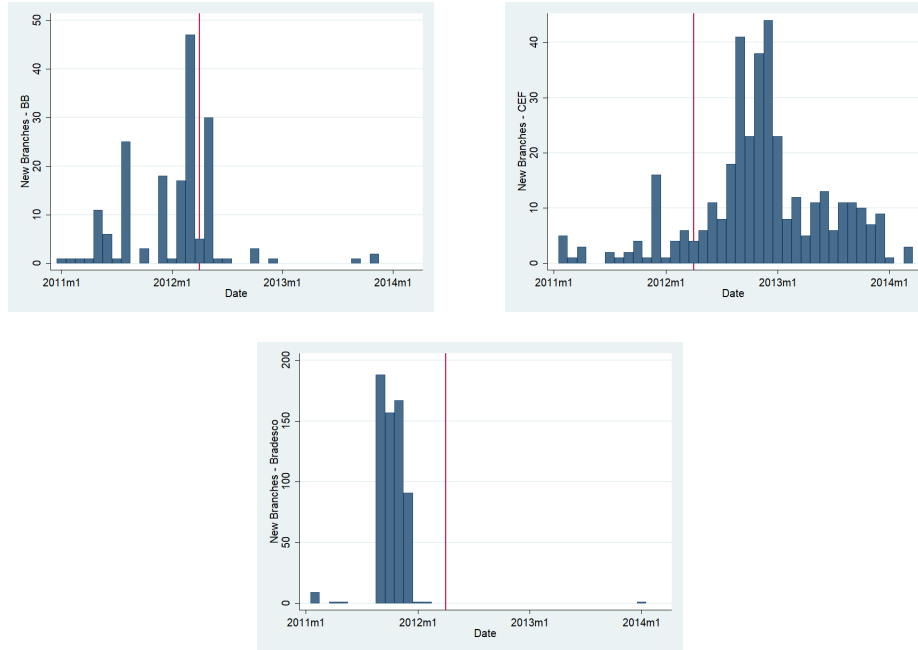


Figure 8: Newly opened branches by bank in the period 2011-2013.

From the top-left panel, it can be observed that *Banco do Brasil* opened almost 50 new branches in March 2012, the month when the government introduced low interest rate policy, and an additional 30 branches in May 2012. However, it mostly concentrated on markets in which it already operated (1,891 of them), and entered only 44 new markets. Given that it opened around 180 branches in the period 2011 - 2013, this means that 25% of new branches represented entering new markets for *Banco do Brasil*.

On the other hand, *Caixa Econômica Federal* systematically entered many new markets following the introduction of the policy and opened more than 300 new branches, which may not be surprising as its main focus is

making mortgages available (and this was one of the goals of the government policy). To be more precise, once the policy was introduced, *Caixa* opened 329 new branches. Out of those, 315 branches were opened in municipalities where *Caixa* was not present before the policy was introduced. This amounts to almost doubling its presence in small markets since it operated in 397 municipalities before March 2012.

Finally, *Banco Bradesco* had a short period of actively opening many new branches (more than 600) in the Fall of 2011. However, all of its new branches were open in municipalities where it already operated (1,070 municipalities), and it did not enter new markets in the period 2011 - 2013.

While *Itau* and *Banco Santander* did not create a large number of new branches in this period, there are a couple of things worth mentioning. *Itau* operated in 587 municipalities before March 2012, and out of its 15 new branch openings in the period 2011 - 2013 only 4 represented entering into new markets. On the other hand, *Banco Santander* opened 11 new branches in the period in question, and out of those 3 openings meant entering the new market. This gave a total of 330 municipalities in which *Banco Santander* operated in the period 2011 - 2013.

## A.2 Structure of the asset side of balance sheets of five largest banks

*Banco do Brasil* specializes in issuing personal credit and agricultural loans. The asset side of the CEF's balance sheet is heavily occupied by personal credit and mortgages.

On the other hand, all three private banks specialize heavily in personal loans, with *Bradesco* also issuing substantial amounts of agricultural loans, *Itau* offering investment loans, and *Santander* adding both of these types of loans.

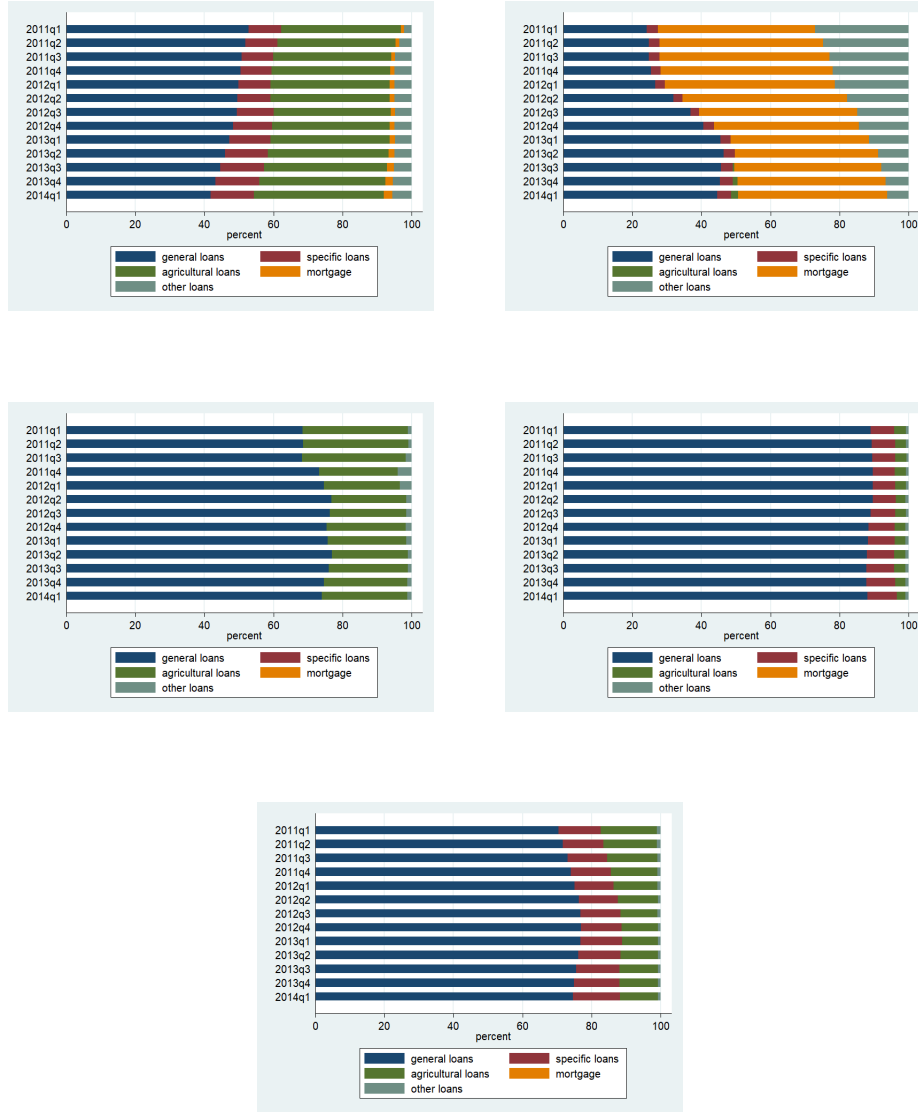


Figure 9: Trends in proportion of each loan category in bank's total issued credit.

Notes: Top-left panel is for *Banco do Brasil*; top-right panel shows *Caixa Economica Federal*; middle-left panel is for *Banco Bradesco*; middle-right panel shows *Itau*; bottom panel *Santander*.

### A.3 Loan origination by bank type

Loan category	Pre-policy			Post-policy		
	Mean	StDev	N	Mean	StDev	N
<i>Public Banks</i>						
Personal Credit	106,203.8	476,972.7	34,893	217,519.9	543,009.9	64,167
Investments	24,318.9	215,438.6	34,893	84,537.9	270,617.5	64,167
Agricultural Loans	146,818.7	742,594.3	34,893	254,174.1	1,038,598.0	64,167
Mortgages	102,190.5	360,801.5	34,893	160,357.5	464,991.0	64,167
Other Credits	43,507.6	1,251,306.0	34,893	14,580.4	2,083,693.0	64,167
<i>Private Banks</i>						
Personal Credit	75,756.6	436,300.0	29,176	5,547.2	383,308.5	55,853
Investments	5,111.4	192,769.5	29,176	5,748.8	244,940.4	55,853
Agricultural Loans	5,105.7	599,911.2	29,176	14,203.1	495,970.1	55,853
Mortgages	0.0	0.0	29,176	0.0	0.0	55,853
Other Credits	875.9	79,014.83	29,176	409.2	90,884.5	55,853

Table 16: Loan origination of public and private banks before and after the low interest rate policy was introduced.



## A.4 Trends in deposit creation

I start by briefly examining trends in deposits and deposit creation over the period January 2011 - March 2014. Table 17 shows new deposits across public and private banks. Over the period 2011-2013, we can see that private banks were increasing checking deposits faster, while public banks were increasing savings deposits by more than their private competitors. However, creation of new term deposits slowed down after the policy.

Deposit type	Public Banks			Private Banks		
	Mean	StDev	N	Mean	StDev	N
Checking	5,516.8	1,257,064.0	99,060	9,863.2	705,180.6	85,029
Savings	193,346.9	596,341.3	99,060	101,245.4	410,769.7	85,029
Term deposits	77,649.5	3,932,145.0	99,060	28,258.0	1,246,981	85,029

Table 17: New deposits over the period Jan 2011 - Mar 2014 for public and private banks.

Breaking this down to pre- and post-policy to observe a pattern in deposit creation, we can see from Table 18 that both public and private banks went from losing checking deposits to creating them after March 2012, with a more pronounced change in the case of public banks. On the other hand, in both types of banks a higher creation of savings deposits was observed after the low interest rate policy was introduced, with an increase of roughly 50% in savings deposit creation for public and a 100% for private banks. As for term deposits, we can still observe a slowing down of their creation after the policy was introduced, and in the case of private banks we can even observe a decrease in term deposits.

Deposit type	Pre-policy			Post-policy		
	Mean	StDev	N	Mean	StDev	N
<i>Public Banks</i>						
Checking	-31,213.8	1,061,519.0	34,893	25,490.3	1,351,164.0	64,167
Savings	148,818.1	652,051.0	34,893	217,560.9	562,268.1	64,167
Term deposits	154,124.8	1,532,918.0	34,893	36,063.4	4,752,584.0	64,167
<i>Private Banks</i>						
Checking	-5,260.1	727,368.5	29,176	17,763.2	693,183.5	55,853
Savings	67,135.2	349,304.4	29,176	119,063.5	438,421.4	55,853
Term deposits	105,184.8	1,244,905.0	29,176	-11,926.41	1,246,189.0	55,853

Table 18: Deposit creation of public and private banks before and after the low interest rate policy was introduced.

However, this is not entirely informative as there is high volatility of deposit creation over the period, reflected in very high standard deviation.

In Figure 10 I contrast how loans and deposits evolved over the period I am analyzing. From the left panel, we can see that both loans and deposits were increasing on average after the government intervention in March 2012, however, the growth rate of deposits was visibly smaller. From the left panel we can see month-to-month changes in loans and deposits.

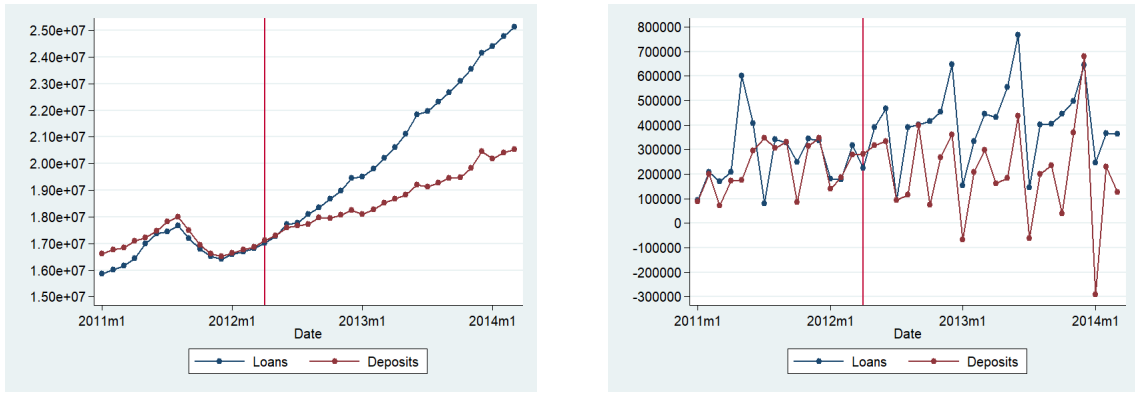


Figure 10: Trends in loans and deposits

Notes: Left panel shows total values, while the left panel presents month-to-month changes in loans and deposits.

## B Additional Analysis of Effects on Economic Activity

### B.1 Effects on agricultural activity

As presented above, the increase in agricultural loans seems to have the negative effect on the overall GDP. Given the availability of the data, I want to examine what is the particular effect of agricultural loans on activity in agricultural sector, namely, agricultural value added as well as the average corn yield. For this purpose I estimate the following regression:

$$\log y_{m,t} = \beta \times \log TAL_{m,t-1} + \gamma X_{m,t-1} + \mu_m + \mu_t + u_{m,t}$$

which is very similar to regression specification from equation 3, with the difference that I am using  $\log TAL_{m,t}$ , total agricultural lending, as the variable of interest. Results are presented in Table 19.

The effect is significant at the 5% level for both outcomes. A 1% increase in agricultural lending leads to a 0.02% increase in agricultural value added, on average. When it comes to corn yield, a 1% increase in total agricultural lending leads to a 0.065% increase in average corn yield. These results suggest that the productivity in agricultural sector and the product of agricultural sector indeed benefit from increase in availability of agricultural loans.

	Agriculture VA				Corn yield				
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(5)
log(TAL)	0.0220** (0.0087)	0.0205** (0.0086)	0.0217** (0.0087)	0.0202** (0.0086)	0.0653** (0.0257)	0.0583** (0.0249)	0.0635** (0.0257)	0.0693** (0.0257)	0.0614** (0.0250)
log(TT)	-	Y	-	Y	-	Y	-	-	Y
log(wage)	-	-	Y	Y	-	-	Y	-	Y
log(agrpr)	-	-	-	-	-	-	-	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	5,334	5,310	5,280	5,256	5,157	5,133	5,103	5,155	5,077

Table 19: Effect of increase in total agriculture lending on agriculture product and corn yield.

Notes: Standard errors are clustered at the municipality level. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

## B.2 Effects on informal economy

One possibility that remains is that the increase in credit supply was “spent” in informal economy. In this part, I will try to assess to what if and to what extent this might be the case. On one hand, for a firm that operates within the informal economy it might be very difficult to obtain access to credit. For this reason, I would expect that the effect of increase in lending is very limited in the informal sector. However, this is only the “extensive margin”. On the other hand, the “intensive margin” needs to be considered - the possibility of a formal firm employing workers “out of records”. Hence, it is possible that increase in lending leads to higher employment when informal economy is considered.

I use the National Household survey (PNAD), representative at the national level, to construct a measure of employment in the informal economy. PNAD contains information on the number of people who were employed during the survey week within a state (unfortunately, the lowest level of aggregation is the state level). I use this data as a proxy for the total number of employees within a state. On the other hand, using RAIS data on formal employment, I calculate the number of formal employees within a state. I use the difference as an estimate of informally employed workers.

Results of regression analysis are presented in Table 20. Across all specifications, we can see that a 1% increase in total lending leads to a 0.04-0.08% increase in informal employment, on average. More importantly, the effect is negligible.

Of course, these results need to be taken with caution. Given that I am constraining the analysis to the period 2011-2013, to understand the short-term effects of the policy without allowing much time and space for other external shocks, and the fact that PNAD provides data at the state level, I am left with a very small sample based on which I estimate the effects increased lending had on informal employment. A potentially better estimate would be obtained if informal employment could be estimated at the lower level of aggregation, say at the micro-region level.

	Employment				
	(1)	(2)	(3)	(4)	(5)
log(TL)	0.0861 (0.1136)	0.0635 (0.1114)	0.0488 (0.1371)	0.0825 (0.1034)	0.0401 (0.1238)
log(TT)	-	Y	-	-	Y
log(wage)	-	-	Y	-	Y
log(agrpr)	-	-	-	Y	Y
N	75	75	72	75	72

Table 20: Effect of increase in total lending on informal employment (at state level)

Notes: Standard errors are clustered at the state level. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

### B.3 Municipalities with no bank access prior to January 2011

In Figure 11, I present the relationship between GDP/employment and increase in total lending for municipalities that had no bank presence before January 2011, but experienced bank entry only after this date. This is the analysis similar to the one I conducted in the main body of the paper, where I first take out all the effects of control variables and fixed effects from GDP, employment, and total lending, and then plot the former two against total lending to understand if different levels of increase in lending affected economic outcomes differently. While there is seemingly no relationship between GDP and total lending, a positive relationship is observed between employment and increase in total lending in municipalities that experienced bank entry after January 2011.

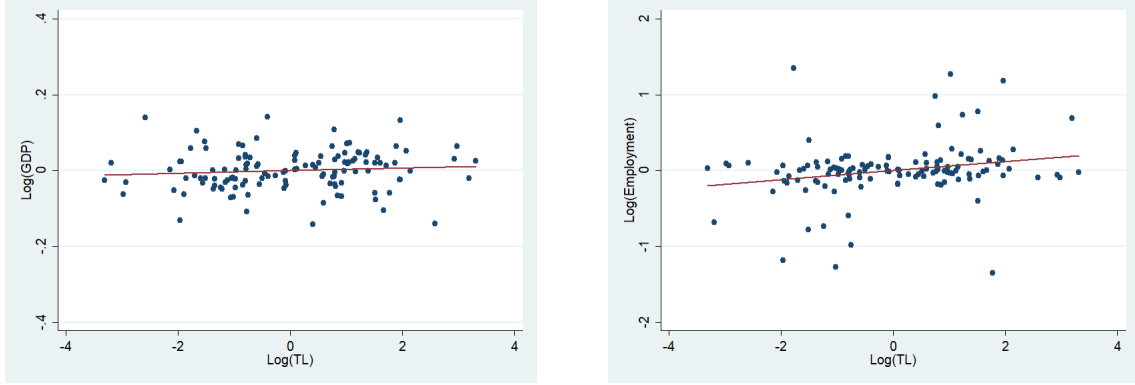


Figure 11: GDP and employment plotted against total lending.

## C Effects of bank entry

In the results I obtained it seems that, if there are real effects of an increase in lending, they are coming from municipalities that experienced bank entry only after January 2011 (and not having bank access prior to that date). This may suggest that the availability of financial institution is more important for economic activity than the lending intensity.

To explore this possibility, I split the sample into the treatment group (municipalities that had no access prior to January 2011) and the control group (municipalities with bank presence before January 2011). To assess the difference that bank presence in a municipality makes I use the following regression specification:

$$\log y_{m,t} = \beta_1 \times Treated_m \times Post_t + \gamma X_{m,t-1} + \mu_m + \mu_t + u_{m,t} \quad (5)$$

where  $Treated_m$  is an indicator equal to 1 if municipality  $m$  experienced bank entry after January 2011 without having bank presence before the date, and  $Post_t$  is an indicator variable equal to 1 for all periods after March 2012.

	GDP		Employment	
	(1)	(2)	(3)	(4)
$Treated_m \times Post_t$	0.0192 (0.0147)	0.0692 (0.0438)	0.0250 (0.0282)	0.0099 (0.0739)
$Treated_m \times Post_t \times Public_m$	- -	-0.0678 (0.0452)	- -	0.0205 (0.0787)
N	9,619	9,619	9,620	9,620

Table 21: Effect of bank entry on GDP and employment

Notes: Standard errors are clustered at the municipality level. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The results are statistically insignificant. However, looking at numbers we can see that obtaining bank access leads to a 1.92% higher GDP growth. The effect is substantially more pronounced for municipalities that experienced entry of a private bank. These results suggest that bank access might be important for the development of a municipality, which is in line with results from Fonseca and Matray (2022). On the other hand, results for employment are very noisy, but the estimates suggest that the entry of a public bank is important for growth of employment.

These results, however, should be taken with caution, especially for two reasons. First, the number of municipalities that experienced bank entry in the period 2011-2013 is very small (190 municipalities out of 2,400 that are in my analysis). Second, it is very unclear whether banks' entry decisions are independent from municipality's growth trajectory, i.e., the decision to enter a new market is likely related to economic conditions in that market. It is possible that, as a public bank, one of the objectives of *Banco do Brasil* is client reach, so it may enter markets and offer credit in municipalities that are not quickly developing. This concern is slightly mitigated by the fact that BB is publicly traded and therefore subject to constraints of the stock market. On the other hand, private banks' ultimate goal is profitability so it is expected that they would enter only those markets in which their profitability would be the highest, and these could be municipalities experiencing speedy development, which would drive the results and bias them upwards as these municipalities would already be on the high growth trajectory.