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 investigate the impact of the government policy implemented in March 2012, aimed at increasing credit supply through public banks, on competition in the banking sector and economic activity. I find that the policy successfully increased overall credit supply, as increased lending of public banks did not significantly offset 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 limited and even negligible. I conduct a series of robustness checks to further explore this puzzling result. I find evidence suggesting that increased lending led to significant increases in deposits, indicating that borrowers leveraged easily accessible credit to take loans and save funds for future use.

1 Introduction

In this paper, I aim 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 objective of expanding credit supply across the Brazilian economy via public banks.[1] This setup provides a clear context to understand effects such intervention can have on the economy and competition within the banking sector, as the policy did not coincide with an impending crisis, eliminating other external shocks that could influence the outcomes of interest.[2]

I address research questions through several steps of empirical analysis. In the initial set of results, employing the data set containing balance sheet information on individual branches of Brazilian banks, I document that public banks adhered to the intervention and increased their credit supply. Looking at trends in loan origination, I observe substantial increases in loan amounts across all broadly defined loan categories for public banks. Specifically, *Caixa Economica Federal* (CEF) drives the increase in personal credit and mortgages, while *Banco do Brasil* (BB) increases the supply of agricultural loans. Moreover, both banks contribute to the tripling of investment loans in the period after March 2012.

The next set of results examines 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 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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[1]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*.

[2]The policy was implemented over the fears of an economic slowdown though.

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

Building on the established result that government intervention substantially increased credit supply in the economy, the next set of results examines whether this influx 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.[3] To estimate effects, I run a series of panel data regressions, regressing logarithms of GDP and employment on the logarithm of total lending. However, a significant threat to identification is that total lending is endogenous as I observe only loans that are actually issued. Therefore, this variable encompasses both information on credit supply and credit demand. I address this issue in two ways. First, I include variables intended to control for changes in credit demand, such as government transfers to municipalities and average municipality payroll. Despite these inclusions, potential unobserved heterogeneity across municipalities may bias the estimates. To account for this, I adopt a second approach, constructing a control variable that captures the portion of increase in total lending attributable to credit demand. I then estimate the coefficient of interest, incorporating this synthetic control variable in the regression, and assuming that the presence of this control variable in the main regression orthogonalizes total lending from the error term.[4] Using both approaches, I obtain very similar results, indicating that the effect of 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 impact on economic activity. First, I narrow the analysis to a subset of municipalities that have access to only one type of bank, either public or private. Despite obtaining an effect twice as large compared to the analysis of the whole sample, it remains economically insignificant. Second, I delve into the effects 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 explore the possibility that the effect is not visible at the very local level, but manifests only at the level of economically integrated municipalities. For example, it could be that people who took personal loans might have spent them outside of the municipality where loans were taken, say, by visiting a shopping mall in a municipality nearby, leading to spillover effects. To account for this, I conduct the analysis at a higher level of geographical aggregation.[5] Even at these levels of geographical aggregation, there is no evidence that increased lending had a significant effect on economic activity in the formal sector, confirming the original result that the policy, while effective in increasing credit supply, had a negligible impact on economic outcomes.

Finally, I 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 a significant portion of loans ended up in deposit accounts. Specifically, R\$230 out of a R\$1,000 loan found its way into deposit accounts, suggesting that households and firms took loans at the time of their high availability and saved the funds for future use. This means that

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[3]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.

[4]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.

[5]I use definitions of micro- and meso-regions as provided by IBGE.

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

In my research, I leverage multiple publicly available data sets coming from various sources. The primary data set for my analysis comprises branch level balance sheets. In order to study the impact on economic activity, I merge this data with data sets containing information about GDP, employment, and payroll. Additionally, I complement these data with other publicly available information allowing me to track government transfers, agricultural activity, population and informal employment as outlined below.

The branch level balance sheet data is a publicly available data set coming from the Monthly

Bank Statistics by Municipality (ESTBAN). This data set provides detailed information on the assets and liabilities of individual branches across all Brazilian banks at a monthly frequency. On the asset side, the data set recognizes different loan categories: personal loans, investment loans, agricultural loans, mortgages, and other loans.[6,7] In the analysis, I leverage this laon categorization to explore potential complementarities between different loan types and understand how specific loan categories affect particular sectors of the economy. Additionally, I aggregate this data to obtain total lending, that I use in estimating the effects of changes in total lending on economic activity. Regarding liabilities, the data set distinguishes between different deposit types, such as checking accounts, savings accounts, term deposits, and interbank deposits. Due to the unavailability of a more granular data set that would allow me to track bank's clientele, I use deposit information as a proxy for the size of bank's customer base.[8] Additionally, the ESTBAN data identifies the municipality of each branch and, given its panel structure, enables me to track entry and exit patterns of each bank/branch in each municipality in Brazil.

To assess the real effects of the government policy, I match the bank lending data with two additional data sets. The first data set is coming from the Brazilian Institute of Geography and Statistics (IBGE), containing information on the gross domestic product (GDP) at the municipality level at an annual frequency. It encompasses details not only about the total GDP but also about the value added across different economic sectors (industry, services, agriculture, and public administration). The second data set comes from the Annual Review of Social Information (RAIS). This data set provides details about total employment and average wage in the formal sector, and breaks down this information across agriculture, construction, tradable, non-tradable, and all other sectors.[9] I merge this data to branch level balance sheets utilizing the unique municipality identifiers in these data set.[10]

Throughout the paper, I utilize additional publicly available data sets containing information about government transfers to municipalities, agricultural production, population, and surveys providing measures of (informal) employment. Constitutional Transfers to Municipalities is a data set from The Transparent Treasury, providing information about government transfers to municipalities at a monthly frequency.[11] For the analysis, I consider only total transfers to municipalities, although the data set distinguishes between several different types of transfers made by the government. Data on agricultural activity is coming from the Municipal Agricultural Production (PAM), which is a nationwide survey conducted by IBGE. It supplies various details on agricultural production, including the average quantity and monetary value of output at an annual frequency, which I utilize in the analysis. Population estimates are provided for each year at the municipality level by IBGE. In order to conduct the analysis at a level of geographic aggregation that is different from the municipality level, I employ the administrative division of municipalities into micro- and meso-regions, as provided by IBGE. Finally, the National Household Survey (PNAD) offers detailed information on various outcomes for Brazilian households, including their

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[6]The data set distinguishes between farming and livestock loans. However, I define agricultural loans as a single category, aggregating over these two types of loans.

[7]The data set provides information on loans as a stock variable. As part of the analysis that I conduct relates to loan origination, I take the first difference of the data to obtain amounts of new loans that were issued in each month. In spite of using the term "new loans", this number could be both positive (if the amount of newly issued loans exceeds the amount of returned loans) or negative (in the opposite case),

[8]For example, I consider that large decreases in the amounts of checking deposits suggest that customers are switching away from a bank to another bank where they will start receiving their wages.

[9]RAIS covers the entire universe of tax-registered firms in Brazil. 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. Given the severe penalties that the firms face for filing late and/or incomplete information, leading to a high degree of compliance with this requirement, this data set essentially provdes a complete coverage of employment and wages in the formal sector in Brazil.

[10]IBGE provides the unique municipality identifiers for all municipalities in Brazil and these are used across all data sets that I am utilizing in my analysis.

[11]The Transparent Treasury is a portal through which information generated and consolidated by the National Treasury of Brazil is made publicly available.
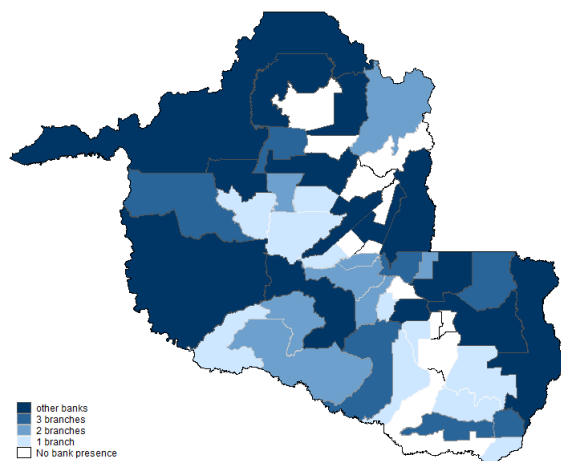
Figure 1: Bank presence - Rondonia

Notes: The map presents municipalities comprising the state of Rondonia, which lies to the northwest of Brazil, bordering Bolivia. There is a substantial number of municipalities within the state having access to only 1, 2 or 3 bank branches. Only the largest municipalities have access to more banks. Municipalities in white do not have access to banking services.

declared participation in the labor force and employment. I use this information to construct a measure of employment in the informal economy by contrasting it with the formal employment data available from RAIS.

3 Brazilian Banking Sector

Brazilian banking sector is quite large, with 151 distinct banks operating across 3,701 municipalities in the period 2008-2018. There are several important characteristics about Brazilian banking market that need to be pointed out. First, Brazilian banks can be separated into public (state-owned) banks and private banks. In addition to competing in providing financial services to households and firms, there are some fundamental differences between public and private banks. Public banks are legally mandated to provide services 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 Federal* (CEF), and these banks could be used by the Brazilian government as an instrument to promote and implement various policies.[12] This is the reason why these public banks can be located in small and isolated markets, sometimes being the only institution providing financial services to households and firms in such markets, especially when the government wants to promote banking services in underdeveloped municipalities where it could be difficult for a bank to operate profitably. On the other hand, private banks are profit maximizers.

Second, there is significant heterogeneity among municipalities in terms of the development of the banking sector. Some municipalities are quite large, with various banks operating with many branches in them. while others are substantially smaller, having access to only a few branches of a limited number of banks. Certain municipalities have access to just a single branch of only one bank. There is also a substantial portion of municipalities lacking access to banking services.[13] In the early 2000s, the Brazilian government implemented a policy aimed at expanding access to banking services in many more municipalities across the country.[14] Despite this policy promoting

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[12] For example, Coleman and Feler (2015) document how Brazilian government used public banks in a countercyclical manner during the 2008-2009 crisis.

[13] Note that in Brazil there are around 5,500 municipalities, and according to ESTBAN data set only about 3,700 of them had bank access by 2018.

[14] For the details and the outcomes associated with this policy, see Fonseca and Matray (2022).

| | Public Banks | | Private Banks | |
Loan category	Amount	% total	Amount	% total
Personal Credit	178,309.8	40.88%	29,638.1	78.80%
	(523,410.7)		(403,654.9)	
Investment Loans	63,326.4	12.09%	5,530.1	3.98%
	(254,192.0)		(228,385.1)	
Agricultural Loans	216,359.1	26.78%	11,081.5	15.03%
	(946,357.6)		(533,934.6)	
Mortgages	139,868.7	23.73%	0.0	-
	(432,065.5)		(0.0)	
Other Credits	26,757.6	-2.86%	569.4	2.19%
	(1,834,143.0)		(86,994.2)	
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.
Notes: Average amounts of new loans across public and private banks. Structure of new loans calculated based on banks that increased total lending in the period. Public banks were experiencing a decrease in other credits since the amounts of paid loans exceeded amounts of new loans, hence the negative proportion of other credits in the structure of public bank loans. Author's calculations.

entry of banks into new markets, a substantial amount of bank entry continued in later years.[15] This high heterogeneity in the presence of banks within a municipality is evident across every state in Brazil. Figure 1 illustrates bank presence across municipalities in the state of Rondonia, situated next to the Bolivian border in the northwest. Municipalities exhibit significant heterogeneity in terms of the development of the banking sector, with most having access to 1, 2, or 3 bank branches. Some municipalities within the state that have access to numerous branches of multiple banks, while others have no access to banking services at all.

Third, despite the presence of numerous banks competing in the Brazilian banking sector, the market is dominated by only a few of them. Specifically, according to the number of operating branches in March 2012, more than 85% of the market is controlled by the five largest banks. These major players 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%). I constrain the analysis to the subset of municipalities where only these five largest banks operate. This means that my sample includes municipalities in which all of these five banks operate, as well as those where only some of them have operating branches, or even those monopolized by a single bank among these five.

Fourth, certain banks specialize in issuing particular types of loans. For example, BB issues a substantial number/amount of agricultural loans (in addition to personal and investment loans), while CEF specializes in real estate loans (alongside significant personal loans). On the other hand, private banks primarily specialize in issuing personal loans. However, they still provide other types of credit. For instance, *Bradesco* is a large issuer of agricultural loans, while both *Itau* and *Santander* offer investment loans. It is important to note that private banks do not issue real estate loans in Brazil. [16]

Summary statistics of new loans, calculated over the period from January 2011 to March 2014 and presented in Table 1, illustrate some of these differences between public and private banks. We

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[15]For example, looking at the period January 2011 - March 2014, around 200 municipalities experienced bank entry. This bank entry into new municipalities was mainly driven by public banks opening their branches.

[16]The structure of the asset side of bank balance sheets of these five largest banks and its evolution over the period 2011-2013 is presented in Figure 12 in the Appendix.

can see that public banks issue all types of credit, while private banks specialize in issuing personal loans (constituting almost 80% of their newly issued loans) with some agricultural and investment loans (and no mortgages). Additionally, public banks issue substantially greater amounts of new loans on a monthly level compared to private banks, on average. While this could indicate that public banks issue larger-sized loans, it likely also reflects the fact that they issue more loans, i.e., have more clients who borrow from them than private banks. Finally, there is high heterogeneity in loan origination across municipalities.

3.1 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,[17] 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.

4 Empirical strategy

My empirical strategy comprises three main steps. In the first step, I aim to demonstrate that the government intervention effectively increased total lending. This involves showing that public banks complied with government intentions and increased credit supply, without significantly offsetting private lending. In the next step, I investigate whether competition over customers intensified between public and private banks due to the policy. Finally, in the third step, I assess the extent to which this government intervention affected economic activity, considering the change in bank credit supply as a mediator of this policy.

In the initial step, I analyze trends in loan origination by public banks to establish compliance with the government policy aimed at increasing credit supply in the economy. Subsequently, I examine how changes in public bank lending activity affected credit issuance of private banks. This analysis involves both descriptive methods, providing informal evidence, and regression analysis for a more formal approach. I estimate the regression model of the following form:

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

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[17]Joaquim et al. (2023) document that the economic recovery that Brazil experienced after the financial crisis in 2008-2009 was fast.

where i denotes a bank, m denotes a municipality, and t denotes time. The subscript $priv$ refers to a private bank, while pub refers to a public bank. The term $newloans_{i,m,t}^{priv}$ refers to changes in lending of a private bank i in municipality m at time t in one of its loan categories. Meanwhile, $newloans_{i,m,t-1}^{pub}$ represents a set of explanatory variables indicating 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. Time fixed-effects μ_t and municipality-bank fixed-effects μ_{im} (also following Sanches et al. 2018) are included. Finally, $\xi_{i,m,t}$ represents the error term. Inclusion of the municipality-bank fixed effect accounts for specific characteristics of a bank in each municipality. For instance, branches of CEF may specialize solely in issuing new mortgages when other banks have operational branches within the same municipality.

A potential concern for the validity of my results is that, after the policy introduction, public banks might issue loans that would have otherwise been issued by their private competitors. I address this concern by running different regressions given in equation 1, establishing relationships between different types of public and private credit and estimating the magnitude of the crowding-out effect.

In the second step, I examine the effects of the policy on competition in the banking sector, specifically focusing on the competition between public and private banks for clients.[18] For this purpose, I use changes in deposit amounts as a proxy for changes in the size of a bank's clientele. Therefore, I empirically assess competition effects by running regressions of the following form:

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

This regression closely resembles the regressions conducted in the first step of the analysis, given by equation 1. The key difference lies in the dependent variable, which now represents a change in private bank deposits. Due to the absence of information about the number of clients a bank has, I utilize changes in deposits as a proxy for changes in the customer base. For instance, one can imagine that a client obtaining a mortgage from *Caixa Economica Federal* might also transfer her checking account to CEF. In such a scenario, an increase in new loans issued by public banks, attracting more customers, would likely result in a significant decrease in checking deposits held by private banks.

In the third step, my goal is to examine the extent to which this policy, mediated through changes in credit supply, translates into economic activity and real economic outcomes. In order to achieve this, I estimate a series of regression specifications of the following form:

$$\log y_{m,t} = \beta_0 + \beta_1 \log TL_{m,t-1} + \beta_2 X_{m,t-1} \mu_m + \mu_t + \xi_{m,t} \qquad (3)$$

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 $t-1$, $X_{m,t-1}$ represents variables controlling for changes in credit demand, μ_m and μ_t are municipality and time fixed effects, and $\xi_{m,t}$ is the error term.[19]

However, the concern about the endogeneity of total lending, $TL_{m,t}$, remains. This variable contains changes in total lending that result not only from the increase in bank credit supply but also from changes in credit demand. For example, if economic activity in municipality m intensified due to rapid development of the municipality, resulting in an increase in GDP, employment,

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[18]One may want to explore other competition aspects in the banking sector, for instance, looking at interest rates offered by different banks. However, due to data limitations, I am not able to discuss competition effects across dimensions other than competition for clients.

[19]I also deal with the issue that dependent variables in equation 3 are available at an annual frequency, while total lending is available at a monthly frequency. To deal with this, I define the average total lending in municipality m over a year $t-1$ to be the explanatory variable.

and wages, which, in turn, would elevate credit demand. This unobserved heterogeneity enters the error term, contributing to the endogeneity issue as it is related to changes in total lending. To some extent, I can address this issue by controlling for observable demand heterogeneity between municipalities, using control variables such as government transfers, wages, and the value agricultural production, which should serve as proxies for changes in credit demand. Nevertheless, the concern persists because of unobserved heterogeneity that I cannot control for.

To mitigate this problem, I will adopt the approach outlined by Imbens and Newey (2009). Specifically, I will attempt to retrieve the effects of the policy on economic outcomes with a 2-stage procedure. In the first stage, I regress total lending using an instrument affecting credit supply while keeping credit demand at a fixed level. Specifically, I interact the fixed pre-policy values of variables controlling for changes in demand (government transfers, wages, and value of agricultural production) with an indicator variable that takes the value 1 for the periods after March 2012. Then, residuals from this first stage regression represent changes in total lending that is attributable to credit demand, and I use these residuals as an additional control variable in the second stage regression where I regress outcomes of interest on total lending. The identifying assumption is that, once I control for these residuals - which contain information about changes in total lending attributable to credit demand - total lending becomes independent of the error term, resolving the endogeneity issue.

Econometrically, 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 X_m's represent the pre-policy values of variables controlling for observable demand 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 stage 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 stage regression:

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

My instrument consists of interactions between variables controlling for observable demand heterogeneity between municipalities with the indicator variable $Post_t$ that takes the value 1 for all periods after March 2012.[20] 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 $\hat{\varepsilon}_{m,t}$, $TL_{m,t} \perp u_{m,t}|\hat{\varepsilon}_{m,t}$.

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

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

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.

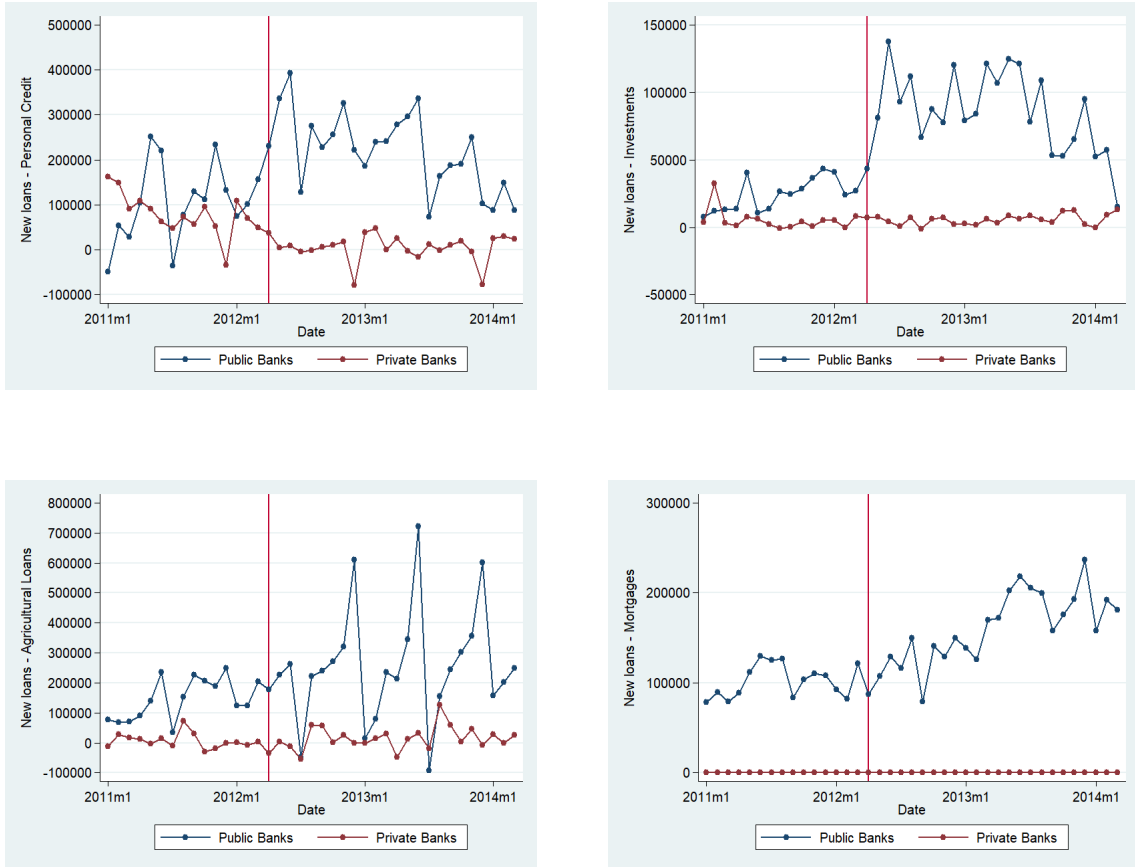[20]The validity of this instrument requires a discussion.

Figure 2: Trends in loan categories across public and private banks.

# 5 Bank Lending Activity and Competition in the Banking Sector

The government intervention introduced in March 2012 aimed to increase credit supply to households and firms. In this section, I assess the success of this policy in increasing bank lending, examining two stages: (i) compliance of public banks with the policy (direct effect), and (ii) resulting changes in loan origination by private banks, especially the extent of potential crowding out of loans (indirect effect). Moreover, I study how the policy affected competition for clients between public and private banks.

5.1 Trends in Loan Origination

I begin by evaluating the effects of government intervention on total credit supply, examining the evolution of new loans across loan categories for both public and private banks (Figure 2). The first observation is that public banks, on average, significantly increased credit supply across all loan categories after March 2012. New personal loans almost doubled, new investment loans more than tripled, and average amounts of new agricultural loans and mortgages increased by about 75% and 60%, respectively (Table 14 in the Appendix confirms these numbers). Secondly, private banks' activity appears to be relatively similar before and after government intervention, suggesting that, even if there was some crowding out of loans, it was only partial. This is evident for investment loans (issued at about the same rate before and after) and mortgages (not issued at all by private banks). In the case of agricultural loans, there is even a slight increase in private banks' agricultural loans after March 2012, amplifying the overall increase in agricultural lending

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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.
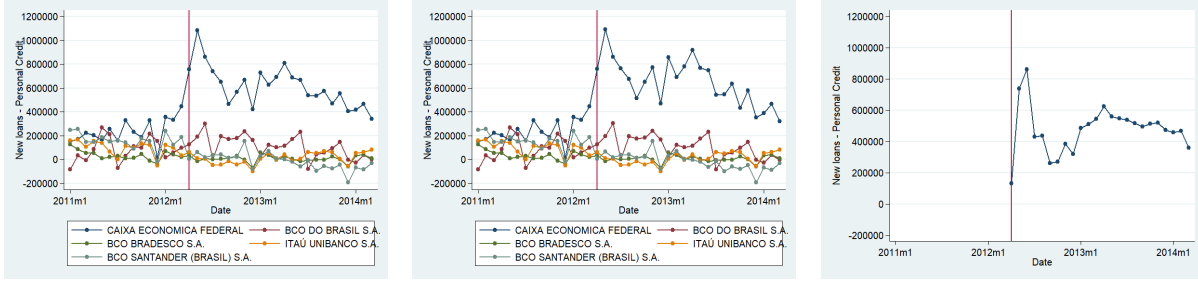
Panel B. Trends in new investment loans.

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.
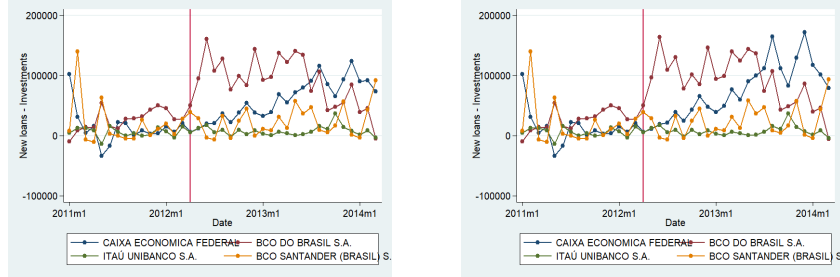
Panel C. Trends in new agricultural loans.

Notes: *Caixa Economica Federal* and *Itau* are excluded since agricultural loans represent a negligible part of their balance sheets.
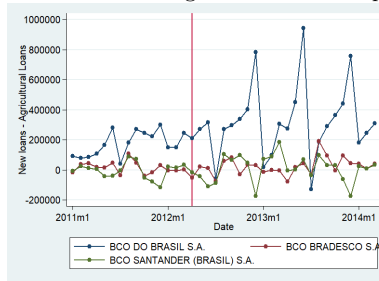
Panel D. Trends in new mortgages - *Caixa Economica Federal*.

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 3: Trends in new loans by bank.

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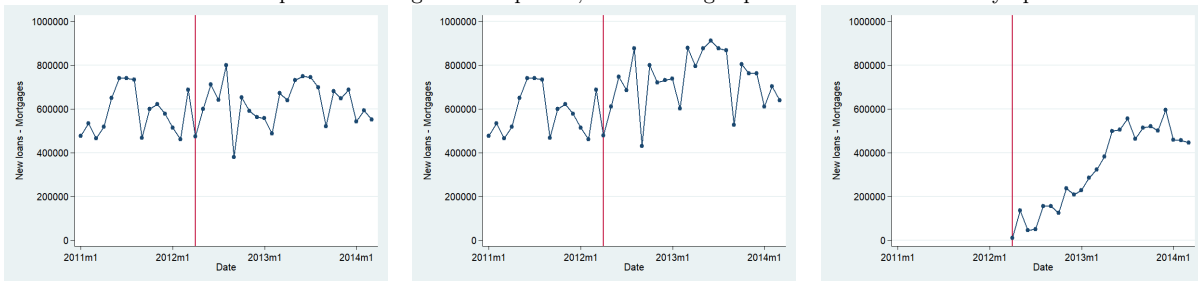| | Public Banks | | Priavte Banks | |
Loan category	Pre-policy	Post-policy	Pre-policy	Post-policy
Personal Credit	39.93%	41.34%	91.83%	70.42%
Investment Loans	5.38%	15.34%	1.79%	5.39%
Agricultural Loans	28.53%	25.93%	5.45%	21.19%
Mortgages	27.25%	24.51%	-	-
Other Credits	-1.08%	-7.11%	0.92%	3.00%
N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

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

by public banks. Finally, while there is a small concern about potential crowding out in the case of personal credit as private banks lowered the amounts of new personal loans after March 2012, public banks significantly increased it by an average of R$110,000. This suggests only a partial crowding out of private banks' personal loans by public banks. However, Figure 2 presents averages of new loans across a heterogeneous set of municipalities, and does not provide evidence for the presence and size of crowding out. I address this in the regression analysis below.

To understand the driving forces behind the increase in lending after March 2012, I analyze new loan origination for each individual bank across loan categories, as depicted in Figure 3.[21]

For personal loans (Panel A), the surge is primarily attributed to new personal loans issued by *Caixa Economica Federal* (CEF). CEF significantly increased the issuance of new personal loans across municipalities with existing branches (middle panel), and in areas where new branches were established after the policy. In contrast, other banks generally experienced about the same level of demand for personal loans both pre- and post-policy, with *Banco Santander* being an exception, showing a decreasing trend in personal loan demand over the period. This observation is crucial in mitigating concerns about potential crowding out, as the overall amount of new personal loans is on the rise.

In the case of investment loans (Panel B), the increase in the amount of investment loans was driven by newly issued investment loans of public banks. Namely, both BB and CEF increased investment lending after March 2012. Private banks, on the other hand, maintained a relatively constant level of newly issued investment loans before and after the policy, indicating no substantial crowding out of investment loans. *Banco Santander* even demonstrated a significant increase in new investment loans post-policy.

The pattern for agricultural loans (Panel C) mirrors the distinction between public and private banks, with *Banco do Brasil* driving new agricultural loans for public banks, and *Banco Bradesco* and *Banco Santander* playing significant roles for private banks. However, there is notable variability in new agricultural loans, likely linked to seasonality. Spikes occur towards the end of each year, corresponding to high costs that farmers incur for planting and growing their crops. Additionally, mid-year spikes coincide with farmers' final field preparations for winter and potential investments in machinery.

In Panel D, mortgages are shown for *Caixa Economica Federal* as it is the only bank issuing new mortgages.[22] While it may seem there was no increase in mortgages from the left panel, a distinction between CEF's branches operational before March 2012 and the newly opened branches

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[21]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.

[22]BB is also issuing some mortgages, but this is not at any meaningful level for the analysis, especially relative to mortgages issued by CEF. Hence, only the evolution of mortgages issued by CEF is presented in the figure.
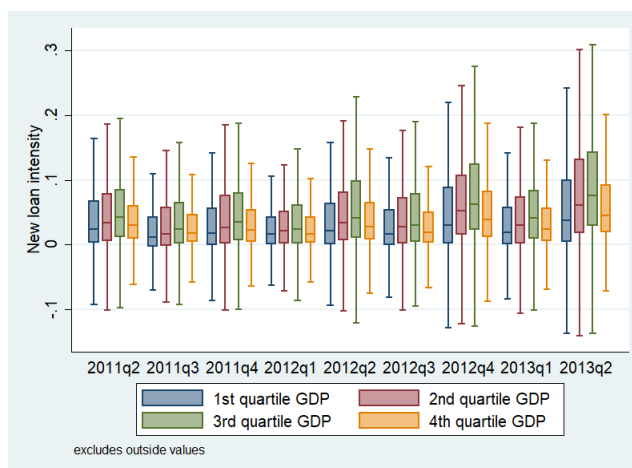
Figure 4: New loans relative to GDP

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.

reveals an increase in mortgage issuance relative to the pre-policy period.

Analyzing the structure of new loans created by both public and private banks, a striking observation is the tripling of the share of investment loans in the structure of newly originated loans. This trend is consistent across both public and private banks. Given the nature of these loans, it is essential to assess whether this increase led to positive outcomes for municipalities, as measured by GDP and employment, providing evidence on the efficiency of these loans. Additionally, a relatively stable structure is observed for other types of loans across public banks. In contrast, private banks exhibit a substantial increase in new agricultural loans and a decrease in personal loans, which were the primary focus of private banks before the policy intervention.[23]

To examine the intensity of the increase in lending, I contrast the amount of newly issued loans to municipality-level GDP, as illustrated in Figure 4. I split municipalities based on their GDP level. I chose to contrast amounts of new loans to a fixed GDP level from 2011.[24] Notably, new loans average 4.28% of the GDP level over the period in question.[25] This ratio remains relatively stable across the sample period, with an observable increase in loan intensity after the policy intervention. This confirms that banks issued larger amounts of new loans following the government intervention. Interestingly, the richest municipalities, constituting the fourth percentile of the sample by GDP level from 2011, exhibit a lower level of new loan intensity, comparable to the poorest municipalities. Moreover, Figure 4 reveals a certain level of seasonality in new loan origination, with higher loan amounts observed in the second and fourth quarters. This seasonality suggests variations in borrowing patterns throughout the year.

The presented evidence indicates an increase in credit supply of public banks following the government intervention in March 2012. Moreover, there seems to be only a mild, if any, crowding out effect on private banks' loans, resulting in an overall increase in total credit supply. However, two concerns need to be addressed before I can draw a conclusion.

First, it is conceivable that even in the absence of intervention, credit supply could have increased, as private banks might have issued more loans had public banks not attracted their

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[23]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.

[24]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.

[25]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.

existing and potential customers. For instance, customers might have sought agricultural loans from Banco Bradesco if there had been no intervention, leading to improved conditions for obtaining a loan from Banco do Brasil. To address this concern, I will explore complementarities between various loan categories of public and private banks next.

Second, even without the policy, the demand for credit might have increased, possibly due to increased economic activity and higher wages. Consequently, the observed increase in loan amounts may not be entirely attributed to an increase in supply resulting from government intervention but could be influenced by increased credit demand. To tackle this issue, I will control for changes in demand when assessing the effects of increased lending on real economic outcomes in the next section.[26]

5.2 Assessing the Size of Crowding-out

I proceed to identify potential complementarities between different loan categories of public and private banks that are observed in loan origination patterns discussed above. This approach allows me to assess both the significance and the extent of crowding out of private bank credit by their public counterparts. In what follows, I will use the panel structure of the data to estimate regression equations of the following form:

$$newloans_{i,m,t}^{priv} = \beta_0 + \beta_1 newloans_{i,m,t-1}^{pub} + \mu_t + \mu_{im} + \xi_{i,m,t} \qquad (4)$$

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. Time fixed-effects μ_t and municipality-bank fixed-effects μ_{im} (also following Sanches et. al. 2018) are also included. Finally, $\xi_{i,m,t}$ represents the error term.

In the first set of regressions, I examine the relationship between new loans of private banks for different loan categories and new loans across branches of their public competitors within the municipality. For instance, in a municipality with one branch of *Banco Bradesco*, two branches of *Banco do Brasil*, and one branch of *Caixa Economica Federal*, the explanatory variables include average new loans across the three branches of BB and CEF, with one variable for each loan category. The results of these regressions are presented in Table 3.

Most of the coefficients in the regressions are non-significant, aligning with patterns I observed examining trends in loan origination. However, there are a couple of points worth making. First, there is a positive and significant relationship between the issuance of personal loans by public and private banks, as evident in specification (1). This may seem counterintuitive when compared to conclusions drawn from trends in new personal loan issuance. However, when looking at trends in personal credit origination, I looked at averages across highly heterogeneous municipalities. It is possible that in municipalities where public banks increased personal loans, private banks did so by a smaller margin, and in municipalities where public banks decreased personal loans, their private competitors made substantial reductions. Consequently, the overall average may still show a decrease in newly issued personal loans by private banks, while the relationship to personal credit supply from public banks remains positive. Second, worth noting is a significant negative

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[26]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*	-0.0029	-0.0128
	(0.0079)	(0.0038)	(0.0138)
Public: Investment Loans	-0.0026	0.017	-0.0269*
	(0.0068)	(0.0088)	(0.0161)
Public: Agricultural Loans	-0.0001	0.0010	-0.0169*
	(0.0021)	(0.0017)	(0.0089)
Public: Mortgages	-0.0099	0.0029	0.0339
	(0.0107)	(0.0073)	(0.0255)
Public: Other Credits	-0.0018	0.0006	-0.0125**
	(0.0013)	(0.0009)	(0.0057)
Time FE	Y	Y	Y
Municipality × 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.

relationship between newly issued agricultural loans of public and private banks, as evident in specification (3). This suggests a low but significant crowding-out effect for agricultural loans. To put it differently, if a public bank issues new agricultural loans in one period, it leads to a subsequent decrease in agricultural loans issued by its private competitor(s) in the following period.

However, the high heterogeneity across municipalities in the sample calls for a more detailed analysis of the data. In what follows, I will estimate a set of regressions similar to regression equation 4, aiming to establish relationships between specific loan categories in certain municipalities, considering the characteristics of various banks' balance sheets.

First, I focus on examining the relationship between *Banco do Brasil* and *Banco Bradesco* in municipalities where only those two banks operate. Moreover, I will restrict the analysis to certain loan categories based on these banks' balance sheets - *Banco do Brasil* issues personal, investment and agricultural loans, while *Banco Bradesco* specializes in personal and agricultural loans. The results of these regressions are presented in Table 4.

Reviewing Table 4, I do not observe a significant effect. However, regarding the sign on agricultural loans in column (2), I can say that it suggests a partial but non-significant crowding-out effect.

Second, I aim to explore the effects of *Caixa Economica Federal*, the only bank issuing mortgages, on its private competitors. To achieve this, I restrict the regression analysis to the subset of municipalities where CEF is the sole 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.

Examining the results, 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 CEF are followed by an increase in new personal loans issued by its private competitors. On the other hand, the increase in mortgage issuance is related to decreased amounts of investment loans issued by private banks. Still, neither of the effects is significant, suggesting no crowding-out.

	Bradesco: Personal (1)	Bradesco Agricultural (2)
BB: Personal Credit	0.0134	0.0213
	(0.0100)	(0.0183)
BB: Investment Loans	0.0009	-0.0194
	(0.0049)	(0.0159)
BB: Agricultural Loans	-0.0015	-0.0043
	(0.0033)	(0.0102)
Time FE	Y	Y
Municipality × 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	0.0003
	(0.0037)	(0.0004)
CEF: Mortgages	0.0109	-0.0030
	(0.0106)	(0.0050)
Time FE	Y	Y
Municipality × Bank FE	N	N
N	866	418

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

Combined with the evidence from trends in new loans, the regression analysis supports previous conclusions that government policy had an effect in increasing total credit supply. It seems safe to conclude that the increased credit supply by public banks was not offset by the decreased credit supply of their private competitors. Moreover, as observed in the case of CEF, it might have even slightly increased the demand for credit from private banks. These established relationships also address the problem that public banks were issuing loans that might have otherwise been issued by private banks in the absence of the policy.

5.3 Client Retention

If public banks are lowering interest rates and attracting more clients, one consequence could be that these new clients, who previously held checking and savings accounts with private banks, switched to public banks as they obtained loans with them. If this was indeed the case, it implies that the policy intensified competition between public and private banks for customers. To investigate this, I will conduct regressions of changes in checking and savings deposits of private banks on new loan issuance by public banks. The regression equations are as follows:

$$\Delta deposits_{i,m,t}^{priv} = \beta_0 + \beta_1 newloans_{i,m,t}^{pub} + \mu_t + \mu_{im} + \xi_{i,m,t} \tag{5}$$

	Private: Checking (1)	Private: Savings (2)
Public: Personal Credit	-0.0058	-0.0196***
	(0.0075)	(0.0072)
Public: Investment Loans	0.0054	0.0044
	(0.0099)	(0.0056)
Public: Agricultural Loans	-0.0041	-0.0039***
	(0.0046)	(0.0019)
Public: Mortgages	-0.0080	0.0096
	(0.0122)	(0.0080)
Public: Other Credits	0.0001	0.0016
	(0.0024)	(0.0017)
Time FE	Y	Y
Municipality × 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 the dependent variable is the change in deposits, which proxies for the client retention. Note that I am not using lagged loan variables. The results are presented in Table 6. While 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 wages, 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, these results suggest that the competition for customers did not intensify following government intervention.

6   Effects on Economic Activity

In this section, I turn to studying the effects of the increase in total lending on real outcomes. I focus on the effects of increased lending activity on both GDP and (formal) employment at the municipality level.

6.1   Real Outcomes at the Municipality Level

The Brazilian government introduced the policy with the intention of extending credit to households and firms across the economy due to concerns about an economic slowdown. As demonstrated in the previous section, the policy successfully increased credit. However, the question remains whether this increased lending activity had positive effects on real outcomes. To address this question, I run regressions of the form:

$$\log y_{m,t} = \beta \times \log TL_{m,t} + \gamma X_{m,t-1} + \mu_m + \mu_t + u_{m,t} \tag{6}$$

where $y_{m,t}$ is the outcome variable (GDP or employment) 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 that the increase in total lending might be driven by 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, which include the average municipality payroll, government transfers to municipalities, and the annual value of agricultural production at the municipality level. These variables serve a "measure" of the market size. In other words, as wages increase or the government invests more money into a municipality, this can impact households and firms demand, including credit demand. Given that many municipalities in my sample are smaller, with a significant portion of their income coming from agricultural activity, I also include the annual value of agricultural production as a proxy for demand. Additionally, I include a series of fixed effects (region, state, meso-region, municipality, urbanity) controlling for specific, fixed characteristics of a geographic area, like the size of the municipality or the quality of land in a particular state or meso-region. Furthermore, I include time fixed effects to account for time-specific events.

I conducted the regressions on a sample comprising all municipalities where only the five largest banks operate, totaling around 2400 municipalities. Initially, I run the regression on the entire sample, irrespective of whether a municipality had access to a bank before January 2011 or experienced bank entry from one of those five banks only after January 2011, having had no bank access before this date. The results are presented in specifications (1) and (2) in Table 7. However, there is a concern about potential correlation between bank entry and economic activity at the municipality level. To address this, I repeat the analysis while excluding approximately 200 municipalities that experienced bank entry within the time horizon of my analysis.[27] The results of these regressions are presented in specifications (3) and (4) in Table 7.

The results indicate a negligible impact of increased lending on both GDP and employment across various model specifications. Specifically, the estimated effect is minimal, suggesting that a 1% increase in total lending corresponds to an average GDP increase of only 0.004%. Similarly, the impact on employment is modest, with an average increase of 0.035%. These findings imply that the observed increase in total lending has virtually no discernible effect on economic activity. Notably, when excluding municipalities that experienced bank entry during the period 2011-2013, the estimated effects for both GDP and employment become essentially zero.

To better understand the puzzling results and unravel the effects of the increased lending, I will conduct a series of robustness checks aimed at exploring this question and offering possible explanations. One hypothesis worth investigating is whether the increase in lending had spillover effects across neighboring municipalities rather than having an effect on the local level. This scenario could occur if, for instance, consumers used personal loans to augment their spending, not just within their local area but also in surrounding municipalities, i.e., at the regional level, contributing to regional economic activity. To investigate this possibility, I will utilize IBGE's administrative divisions, categorizing municipalities into larger regions such as micro- and meso-regions, which share economic activity.

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[27]If a municipality starts developing, it will become richer, concurrently elevating the demand for banking products such as bank credit. Recognizing this as an opportunity, banks may decide to enter this emerging market, expanding their services, growing their business, and increasing their customer base. Hence, a bank's entry decision becomes endogenous in a sense that it essentially enters its profit-maximization problem, weighing the potential benefits of acquiring new customers and the drawbacks of potentially higher default rates in new markets. However, as argued in section 3, public banks in Brazil are sometimes directed by the government to provide banking services to market segments that may not be inherently highly profitable. This makes the entry decision of public banks somewhat exogenous. This presents a potential avenue for future research, offering insights into the performance of public banks based on whether the entry into a new market was a strategic choice or a directive from the government.

	GDP				Employment			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
log(TL)	0.0047	0.0033	0.0036	0.0027	0.0354**	0.0357**	-0.0010	0.0009
	(0.0038)	(0.0041)	(0.0113)	(0.0115)	(0.0167)	(0.0166)	(0.0177)	(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
Municipality FE	Y	Y	Y	Y	Y	Y	Y	Y
N	6,682	6,553	6,524	6,403	6,667	6,554	6,509	6,404

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.

Before delving into these robustness checks, I will address the potential endogeneity issue associated with total lending.

6.2   Addressing the Endogeneity of Total Lending

Despite incorporating control variables in the previous regressions, there remains a concern about the endogeneity of total lending. As discussed earlier, from the data I only observe the credit market equilibrium in each municipality, making the variable *total lending* reflective of both credit supply and demand. To address this concern, I employ the procedure outlined by Imbens and Newey (2009) to disentangle the portion of increased lending attributable to changes in credit supply. The goal is to estimate the following regression:

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

where $\hat{\varepsilon}_{m,t}$ serves to control for the endogenous portion of $TL_{m,t-1}$, representing the share of the increase in total lending associated with changes in credit demand. This term, $\hat{\varepsilon}_{m,t}$, represents the residuals coming from the first-stage regression formulated as follows:

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

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

In the first-stage regression, $Post_t$ interacted with X_{1m} serves as an instrument for shifts in credit supply, and thus, the residual $\hat{\varepsilon}_{m,t}$ is supposed to capture changes in total credit attributable to the changes in credit demand. X_{1m} includes pre-policy log-levels of income measures - the average municipality wage (recorded at the end of 2011), total government transfers to the municipality (available at a monthly frequency), and the total value of agricultural production within the municipality in 2011 (available at a yearly frequency). Defined in this way, the instrument is designed to capture changes in credit supply, because it holds the demand fixed at pre-policy levels. The inclusion of variables from 2011 in the instrument also provides a level of exogeneity to economic activity in 2012 and 2013. In what follows, I explore whether the instrument satisfies necessary conditions, with a particular focus on the relevance condition, which is easier to test for.

On the other hand, $X_{2,m,t-1}$ comprises additional control variables, such as lagged wage, lagged total value of agricultural yearly production, lagged government transfers to municipality aggregated to the yearly level, and more structural control variables. These structural control variables

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	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
1st stage								
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 8: 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.

include fixed effects for region, state, meso-region, municipality, urban/rural/intermediate categorization of the municipality, and whether the municipality is in the Amazon area. Additionally, I include the time fixed effects. The purpose of these controls and fixed effects is to account for heterogeneity between the municipalities.

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

I estimate several specifications of the regression, In specifications (1) and (2), I utilize the entire sample, which includes both municipalities that had bank access prior to January 2011 and those that experienced a bank entry only after this date. In specifications (3) and (4), the sample is constrained to a balanced panel containing only those municipalities that had at least one operational bank branch prior to January 2011. Additionally, 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)).

There are several things to note from results presented in Table 8. Firstly, irrespective of the sample used for the analysis, the instrument is relevant, although not very strong. This is illustrated in the bottom panel of Table 8, presenting the results of the F-test conducted following the first step regression.[28],[29]

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[28]Indeed, the F-statistic for instrument relevance does not exceed 10, which is considered a "rule-of-thumb" value for testing the full rank condition of instruments in IV regressions. However, it is worth noting that the p-values associated with these F-statistics are below the 10% level and 5% level for the full sample and after excluding municipalities that had no bank presence before January 2011, respectively.

[29]I also conduct regressions where I regress the residuals from the main regression, $\hat{u}_{m,t}$, on the instrument. Although this is not an actual test of the exclusion restriction, the lack of a significant relationship, as indicated by both jointly and individually non-significant
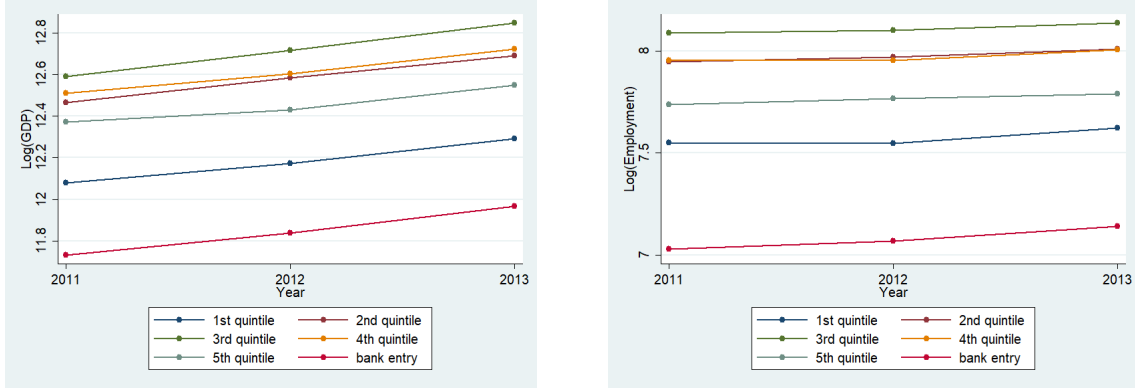
Figure 5: Evolution of GDP and employment across municipalities experiencing different level of increase in total lending.

Secondly, the results indicate that the effect of the increase in total lending on economic activity is virtually zero, confirming the results obtained before. Specifically, a 1% increase in total lending leads to a 0.002% increase in GDP and a 0.003% increase in employment, on average. The only significant effect is the impact of total lending on employment when considering the entire sample. However, once the 200 municipalities that experienced bank entry only after January 2011 are removed, 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.[30] This implies that there is no selection on unobservables, especially in the case of GDP. In other words, 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 increase in total lending.

To show this, I initially categorize municipalities into five different bins (quintiles) based on the size of the change in total lending they experienced after the government intervention. The first bin comprises municipalities with the smallest change in total lending, while the fifth bin includes those with the highest increase in total lending. Additionally, I create a separate bin for all municipalities that had no bank presence before January 2011 but experienced bank entry after this date. The evolution of GDP/employment is then depicted in Figure 5.

These graphs validate the regression findings that the effect of the increase in total lending on economic activity was practically negligible. Specifically, in the case of GDP, the left panel of Figure 5 illustrates that the change in GDP was the same regardless of variations in changes in total lending across municipalities (with a minor exception observed in the group that experienced the greatest increase in total lending). In the case of employment, there was almost no change in employment for the four quintiles with the most significant increase in total lending. However, a slight kink is evident in the group of municipalities with the lowest increase in total lending, and in the case of municipalities without bank access before January 2011. There is a positive slope in employment, indicating an increase in employment over the period 2011-2013.

An alternative approach to interpreting this result is to create plots of GDP and employment against total lending, after controlling all variables for controls and fixed effects. I perform this analysis exclusively on the set of municipalities with existing bank presence before January 2011.[31]

coefficients on the instrument, suggests that the exclusion restriction should indeed hold.

[30]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.

[31]I conduct this analysis for municipalities that experienced bank entry only after January 2011 separately. Those results are presented in Appendix Figure 14. There seems to be no positive relationship between GDP and the increase in total lending, but
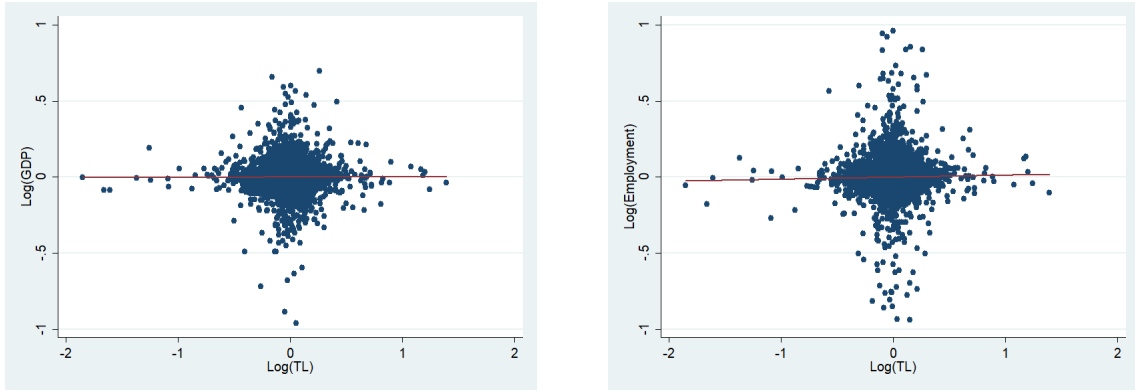
Figure 6: Changes in GDP and employment plotted against changes in total lending.

Figure 6 displays these plots, revealing no relationship between GDP and total lending. Regarding employment, although there appears to be a slight positive slope for the fitted line, it is so marginal that I can conclude that the relationship is virtually nonexistent. This further aligns with observations derived from the plots illustrating the evolution of GDP and employment across binned municipalities.

7 Robustness Checks

In this section, I investigate several potential explanations for the puzzling result that increased lending had a very negligible effect on economic activity. I examine different channels through which the effect could have materialized.

7.1 Monopolized Markets

First, I examine a specific subset of municipalities - those "monopolized" by either public or private banks. In my sample, there are 1,183 such municipalities. Among them, 748 municipalities are "monopolized" by public banks, meaning they have access only to branches of either *Banco do Brasil* or *Caixa Economica Federal* or both. On the other hand, there are 435 municipalities where only branch(es) of private banks operate.

To provide a more detailed breakdown, the majority of these municipalities are actual monopolies, with 1,112 out of 1,183 falling into this category. Breaking down individual banks, BB stands out as the most significant monopolist, with 689 municipalities in which it is the only bank that operates. Three private banks follow - Bradesco in 169 municipalities, Itau in 160, and Santander in 81. CEF operates as a monopolist in only 13 municipalities, speaking to its tendency to operate in markets with access to other banks. This is particulalry relevant considering CEF's extenisve entry into markets following the policy introduction, indicating that CEF entered markets already served by other bank(s).

This subset of municipalities could be of interest because, in these markets, individuals and/or firms have limited options for obtaining credit, usually having to rely on a single bank. Consequently, a relationship may develop between the bank and the borrower. This relationship-building process could involve the bank gaining a better understanding of the client and implementing improved screening procedures. Simultaneously, the borrower may establish credibility, facilitating easier access to additional loans. Consequently, these relationships could result in the issuance of

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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.
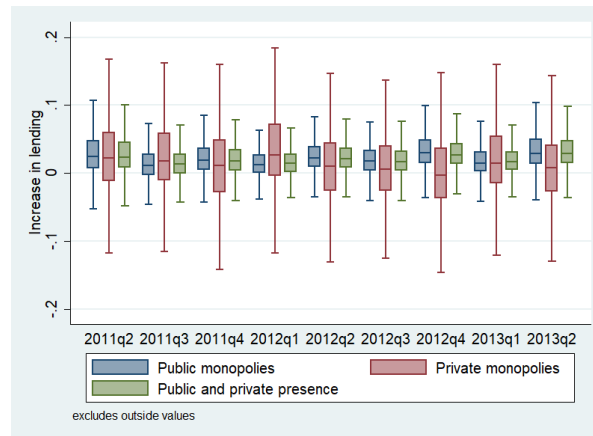
Figure 7: Growth of total lending

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.

loans to higher-quality clients, who, in turn, employ the funds more productively.[32] Furthermore, this context of monopolized municipalities helps address concerns related to competition between public and private banks driving the results I obtained in the previous section..[33] Therefore, it is plausible that there could be a different response in economic activity to an increase in total lending in these municipalities.

Figure 7 shows the growth rate of total lending in municipalities where only public banks operate, those that are "monopolized" by private banks, and compares it to municipalities with a presence of both public and private banks. The figure reveals that the growth rate of total lending was comparable in municipalities "monopolized" by public banks and those with a mix of public and private banks. This suggests that the observed results are not driven by disparities in changes in total lending, as these changes exhibit similar patterns in both types of municipalities. In contrast, municipalities "monopolized" by private banks display higher variability in the change in total lending.

The results of the regression analysis are presented in Tables 9 and 10. In the first set of findings, I consider a municipality "monopolized" if only one type of bank operates in it. I conduct the analysis without distinguishing whether the monopoly is held by public or private banks (sub-column referred to as 'both' in Table 9), but also splitting the sample into municipalities exclusively served by one type of bank. Despite the negligible effect on economic activity across specifications, some interesting facts are worth noting.

In the full sample, a 1% increase in total lending corresponds to a 0.0047% increase in GDP. This effect is magnified when the analysis focuses on "monopolized" municipalities. Particularly noteworthy is the finding that this effect becomes five times larger when I exclusively consider municipalities with access to public banks. This suggests a potential significance of public bank presence for local economic activity.

I redo the analysis by restricting the sample to pure monopolies, that is, municipalities where only branch(es) of a single bank are present. The results of this regression analysis are presented in Table 10. Sub-column 'all' refers to estimation where I pooled all municipalities that are pure monopolies. Additionally, I emphasize regression that I conducted for BB and Itau, as estimates

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[32]This could be an interesting question on its own. However, to answer such question, there is a heavy data requirement on individual credit contracts that would allow for observing creation of relationships between a bank and a borrower.

[33]I previously discussed that I do not observe that competition for customers between public and private banks intensifies following the government intervention. However, my analysis is silent on different aspects in which those banks can compete, for example, interest rates on their loans. Given that I do not have data on interest rates, I cannot pursue explaining this aspect of bank competition.

	GDP					
	both		public		private	
	(1)	(2)	(3)	(4)	(5)	(6)
log(TL)	0.0099**	0.0095*	0.0251*	0.0274**	0.0078	0.0067
	(0.0048)	(0.0050)	(0.0129)	(0.0132)	(0.0050)	(0.0052)
log(TT)	-	Y	-	Y	-	Y
log(wage)	-	Y	-	Y	-	Y
log(agrpr)	-	Y	-	Y	-	Y
Time FE	Y	Y	Y	Y	Y	Y
Mun FE	Y	Y	Y	Y	Y	Y
N	3,100	3,039	1,934	1,886	1,166	1,153

	Employment					
	both		public		private	
	(1)	(2)	(3)	(4)	(5)	(6)
log(TL)	0.0363*	0.0364*	-0.0054	-0.0067	0.0424*	0.0413*
	(0.0219)	(0.0217)	(0.0211)	(0.0216)	(0.0249)	(0.0240)
log(TT)	-	Y	-	Y	-	Y
log(wage)	-	Y	-	Y	-	Y
log(agrpr)	-	Y	-	Y	-	Y
Time FE	Y	Y	Y	Y	Y	Y
Mun FE	Y	Y	Y	Y	Y	Y
N	3,091	3,040	1,925	1,887	1,166	1,153

Table 9: 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.

are different for these municipalities relative to those where other banks are monopolists.

The results are the same, with the effect continuing to be negligible. Interesting to note is that, when considering all monopolized municipalities or those monopolized by a public bank, the estimates are attenuated compared to the previous set of results where I only distinguish whether a municipality is "monopolized" by a public or private bank. However, due to the limited number of "monopolized" municipalities where both BB and CEF are present, I am unable to further explore this difference in results.

Finally, the results for monopolized markets provide suggestive evidence that supports my earlier findings that the competition between public and private banks over customers does not intensify following the government intervention. If there were indeed competition over customers between public and private banks, it might be the case that in those markets, banks might issue loans that are less productive or extend credit to riskier clients to attract customers. Consequently, a portion of increased lending would be allocated to these unproductive loans, which would not contribute positively to economic activity. However, in the case of monopolized markets, where there is certainly no competition, such concerns are eliminated. Nevertheless, the effect of the increase in total lending on economic activity remains negligible and comparable to the effect I estimate using the entire sample of municipalities. This suggests that the lack of effects on

	GDP					
	all		BB		Itau	
	(1)	(2)	(3)	(4)	(5)	(6)
log(TL)	0.0082*	0.0075	0.0185*	0.0204*	0.0688	0.0665
	(0.0046)	(0.0048)	(0.0110)	(0.0113)	(0.0526)	(0.0523)
log(TT)	-	Y	-	Y	-	Y
log(wage)	-	Y	-	Y	-	Y
log(agrpr)	-	Y	-	Y	-	Y
Time FE	Y	Y	Y	Y	Y	Y
Mun FE	Y	Y	Y	Y	Y	Y
N	2,907	2,854	1,787	1,744	465	460

	Employment					
	all		BB		Itau	
	(1)	(2)	(3)	(4)	(5)	(6)
log(TL)	0.0082*	0.0075	0.0185*	0.0204*	0.0688	0.0665
	(0.0046)	(0.0048)	(0.0110)	(0.0113)	(0.0526)	(0.0523)
log(TT)	-	Y	-	Y	-	Y
log(wage)	-	Y	-	Y	-	Y
log(agrpr)	-	Y	-	Y	-	Y
Time FE	Y	Y	Y	Y	Y	Y
Mun FE	Y	Y	Y	Y	Y	Y
N	2,897	2,854	1,777	1,744	465	460

Table 10: 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.

economic activity is not driven by bank competition for customers.

7.2 Aggregating Effects across Neighboring Municipalities

Continuing with the exploration of potential explanations for the puzzling negligible effect of increased lending on economic activity at the municipality level, I consider the possibility that the effects might be more pronounced at a higher level of geographical aggregation. This hypothesis arises from the idea that spillover effects across nearby municipalities could contribute to a more discernible impact on economic activity.

To illustrate, 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.[34] 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 for work or leisure. Moreover, the mining of cassiterite is the most important economic activity in the region, and Porto Velho is an important trading center for it - it is likely that economic activity related to

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[34]As per Brazilian Institute for Geography and Statistics (IBGE), several municipalities including these three constitute a separate area, i.e., micro-region, which is called Porto Velho.
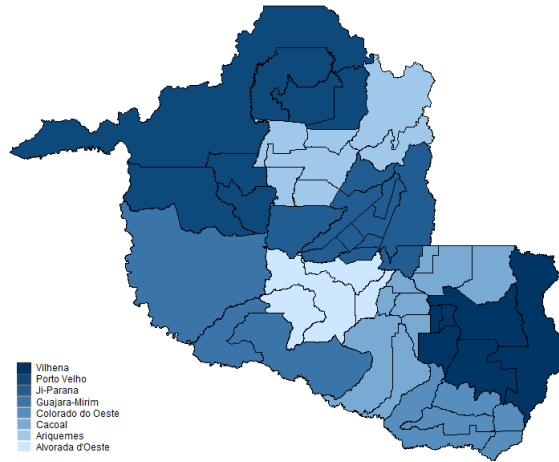
Figure 8: Micro-regions - Rondonia

Notes: The map presents administrative division of the state of Rondonia into micro-regions by IBGE. Each of these micro-regions consists of several municipalities sharing economic activity.

mining is spread across all the municipalities within this micro-region. Therefore, recognizing the potential for spillover effects of increased lending across neighboring municipalities constituting "local economies" is important.[35] For example, there are eight local economies (micro-regions) in the state of Rondonia, as presented in Figure 8. In what follows, I want to explore the potential spillover effects across these geographical clusters.

I am using two levels of geographical 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 - to investigate potential spillover effects of increased lending. I consider 495 micro regions that are located within 129 meso-regions.[36] I aggregated the data in the following way. First, I begin with the original sample that I used for the analysis, containing municipalities served by the five largest banks only. I augmented those with neighboring municipalities within their respective micro- and meso-regions. This expanded analysis involves calculating the overall increase in total lending at the regional level, taking into account all bank branches in each region, not just those of the five largest banks. Subsequently, I aggregate outcome and control variables at the regional level, such as regional GDP, employment levels, and average wages.[37]

First, I present the results of the analysis aggregated at the micro-region level in Table 11. Despite accounting for potential spillover effects between closely neighboring municipalities, the results remain negligible.[38]

Aggregating the analysis to the meso-region level does not significantly alter the results, as the estimated effects remain negligible. The results of this analysis are presented in Table 12.

8   Effects on Deposits

Another possibility is that the additional funds that were made available by the increase in total lending ended up as deposits in banks. This hypothesis suggests that households and firms, taking

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[35]The definition of these local economies, i.e., micro-regions, resembles the idea of commuting zones in the United States.

[36]Note that according to IBGE there are 558 micro-regions and 137 meso-regions in Brazil.

[37]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.

[38]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.

	GDP		Employment	
	(1)	(2)	(1)	(2)
log(TL)	-0.0166	-0.0189	-0.0329	-0.0219
	(0.0224)	(0.0225)	(0.0599)	(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 11: Effect of increase in total lending on GDP and employment (aggregation at micro-region)
Notes: 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	-0.0341	0.0037	0.0081
	(0.0528)	(0.0530)	(0.0820)	(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 12: Effect of increase in total lending on GDP and employment (aggregation at meso-region)
Notes: Standard errors are clustered at the meso-region level. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

advantage of the increased accessibility of loans, chose to secure funds for an uncertain future by depositing the borrowed amounts. Alternatively, borrowers who could secure loans under more favorable conditions post the government intervention might have utilized this opportunity to repay their debts, placing the difference into deposit accounts.[39] In this section, I examine this possibility.

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

$$\frac{dep_{m,t}}{GDP_{m,2011}} = \beta \times \frac{TL_{m,t-1}}{GDP_{m,2011}} + \left(\sum_{q=2}^{5} \beta_q \times \frac{TL_{m,t-1}}{GDP_{m,2011}} \times I_{q,m} \right) + \gamma_1 X_{1,m,t-1} + \gamma_2 X_{2,m,y-1} + \mu_m + \mu_t + u_{m,t}$$

(7)

where the dependent variable is the deposits in municipality m at month t normalized by the municipality's GDP from 2011.[40] The explanatory variable is total lending in month $t-1$ within

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[39]In its issue from October 2012, FGV IBRE Macro Bulletins provide information about reductions in interest rates and bank spreads allowing for debt renegotiation, that will result in adjustments of household budgets.

[40]I choose to "homogenize" the variables dividing through by the fixed municipality level GDP from the period before the policy was introduced.

	$\frac{dep_t}{GDP_{2011}}$		
	(1)	(2)	(3)
$\frac{Lending_{t-1}}{GDP_{2011}}$	0.227***	0.236***	0.325***
	(0.006)	(0.006)	(0.011)
$\frac{Lending_{t-1}}{GDP_{2011}} \times I_2$			-0.087***
			(0.014)
$\frac{Lending_{t-1}}{GDP_{2011}} \times I_3$			-0.136***
			(0.016)
$\frac{Lending_{t-1}}{GDP_{2011}} \times I_4$			-0.040**
			(0.021)
$\frac{Lending_{t-1}}{GDP_{2011}} \times I_5$			-0.160***
			(0.005)
TT	-	Y	Y
wage	-	Y	Y
GDP	-	Y	Y
Time FE	Y	Y	Y
Municipality FE	Y	Y	Y
N	62,748	61,623	61,623

Table 13: 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.

the same municipality m, also normalized by GDP from 2011. Additionally, control variables are incorporated to account for increased spending ability (i.e., increased demand) that could potentially be saved into deposit accounts. These controls include the total government transfer in municipality m at month $t-1$. as well as lagged wage and the GDP index serving as measures of the wealth of a municipality.

Furthermore, in one specification, I incorporate the term within the brackets from equation 7. This term is intended to capture the differences between municipalities based on their income level.[41] This term involves the interaction of deposits with the indicator variable $I_{q,m}$, equal to 1 if municipality m is in the $q-th$ quintile of the income distribution. This allows me to examine whether there is a variation in the magnitude of the portion of loans saved between municipalities with different income levels. For example, I would anticipate that households and/or firms in the poorest municipalities demonstrate a more pronounced effect of lending on deposits, indicating that borrowers in these municipalities are more inclined to leverage easily accessible credit to take loans and save for the future.

Results from specifications (1) and (2) in Table 13 support the possibility that a significant portion of increased lending ended up in deposit accounts. The estimates indicate that, on average, out of R$1,000 in new lending, R$230 ended up in deposit accounts.[42]

Specification (3) highlights variations in responses across municipalities with different income levels. I omit the lowest income group, so that I can use it as a reference group. The results

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[41]As a measure of municipality's income, I use the pre-policy GDP at the municipality level. Based on this measure, I split municipalities in the sample into income quintiles.

[42]Evaluating results of regressions in logarithms at the mean values for lending and deposits, I obtain that newly originated lending amounting to R$1,000 leads to approximately R$290 in new deposits. This indicates similar effects as the analysis in levels.

Reserva de emergência
Tem reserva? Ela seria suficiente para pagar contas e manter padrão por quanto tempo? Em %

Menos de 3 meses
10

Entre 3 e 6 meses
10

Entre 6 meses e um ano
6

Por mais de um ano
6

Não tem reserva
67

Fonte: Pesquisa Datafolha realizada em 5.dez.2023. Foram feitas 2.004 entrevistas com pessoas de 16 anos ou mais em 135 municípios de todo o Brasil. A margem de erro é de 2 pontos percentuais, para mais ou para menos, dentro de um nível de confiança de 95%
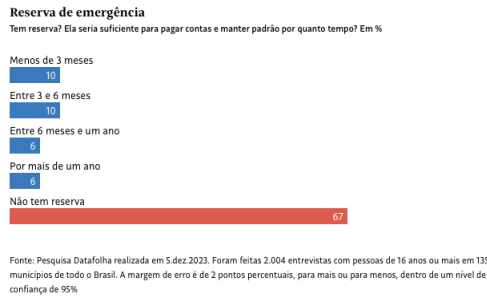
Figure 9: Household emergency reserves

Notes: Results of a survey carried out on December 5, 2023. 2,004 interviews were conducted with people aged 16 or over in 135 municipalities across Brazil. The error margin is +/-2 p.p. with a 95% confidence level.

Source: Datafolha

indicate 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 aligns with the notion that, in municipalities that were most financially constrained, the borrowers were saving greater portions of funds obtained through loans for future use.

Despite the considerable reduction in interest rates in response to the policy, as documented in Joaquim et al. (2023), this result remains striking, considering that obtaining funds through loans is relatively expensive in Brazil.[43] Two facts reinforce the conclusions of the analysis. Firstly, the results are not counterintuitive, showing that the largest portion of loans was saved in the poorest municipalities. Moreover, a survey conducted by the research institute Datafolha, presented in Figure 9, indicates that two-thirds of the population is struggling with paying bills and maintaining their standard of living, lacking savings for emergencies. This suggests that people might be taking out loans to cover living expenses and save some money, especially during periods when loans are easily accessible.

Results showing that a significant portion of loans were saved in deposit accounts might have different potential explanations, opening the door for several avenues for future research.

First, the question arises if there are any structural differences between the clientele of public and private banks. In Figure 4, I observe a smaller increase in lending in higher-income municipalities following the credit expansion. Additionally, the discussion of trends in loan origination from section 5 shows that increase in lending is mainly coming from public banks. Combining these two observations, I conjecture that customers of public banks are lower-income compared to clients of private banks. If this is indeed the case, it would further reinforce the conclusions of this section, as it would not be surprising that lower-income customers take the opportunity to get loans at the moment of their increased availability to save the funds for future use.

The second question, which is somewhat related to the first one, is whether households and/or firms obtaining loans from public banks after the government intervention, were able to access credit before the policy. This would tackle concepts of borrower quality and the bank screening process. However, addressing this question would entail significant data requirements, as it would require insights into the entire universe of individual loan applications.

Finally, worth mentioning is the possibility that borrowers may have used the loans that became available to them after the policy to repay older debts that did not go through the system. Investigating this question would, however, require data on household and firm debt from all possible sources, both official and unofficial.

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[43]Without further examination of the specifics of loan conditions, particularly with respect to interest rates, it is challenging to assess how expensive this form of financing future consumption/investment actually was. To answer this question, I would at least require data on interest rates charged by bank branches, which I do not have access to.

9   Conclusion

In this paper, I investigate how the Brazilian government policy implemented March 2012, aimed at increasing credit supply, impacted competition in the banking sector and economic activity. Using a data set containing information on individual branches of Brazilian banks, I first document that public banks adhered to the intervention and expanded their credit supply. This resulted in an overall increase in lending, as the expansion in public bank lending did not significantly offset that of private banks. Furthermore, by using deposit data as a proxy for a bank's clientele, I do not observe that competition for customers intensifies following the implementation of the policy.

However, it is important to note that there is ample room for further research regarding the implications of the policy for competition in the banking sector. First, employing detailed information about the customer base of each branch would allow for tracking movements of customers between banks, providing a deeper understanding of competition over customers. Second, competition for customers represents only one dimension across which banks can compete. Equally, if not more, important is competition on loan conditions, particularly interest rates. This form of competition can have significant implications for loan issuance, including the amounts and types of loans. As the government aimed to promote lending through this policy, understanding if the policy stimulates interest rate competition between public and private banks across various loan categories would be of great interest. However, as data on interest rates charged by individual branches is not available, I cannot explore this important avenue for research at this time.

After establishing that the policy led to increased credit supply, I move on to examine the implications of increased lending for economic activity. I perform a series of panel data regressions with various economic outcomes as dependent variables, controlling for credit demand to address the endogeneity of total lending. I find a negligible effect of the policy on economic activity, at least within the short-term focus of my analysis. Following the estimation of a negligible impact on GDP and employment at the municipality level, I conduct a series of robustness checks, exploring different channels through which the effect could have materialized. These robustness checks confirm the initial 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. This suggests that the effects of the policy may be spread across a longer period of time.

Several important questions arise from these puzzling results. Firstly, it would be interesting to understand the demographics of customers for public and private banks. The analysis I conduct suggests that public banks attract lower-income customers. With data about characteristics of borrowers and depositors at each branch, we could gain a deeper understanding. This, in turn, could provide insights to the client structures of public and private banks differ and what implications these differences have for the types of loans issued, their utilization, default rates, etc. This prompts another avenue for research, understanding if customers obtaining loans from (public) banks post-policy were unable to secure credit before the policy. Besides shedding light on the structure and productivity of issued loans, this setting allows for the study of default rates, borrower quality, the bank screening process, and adverse selection problems in general. Furthermore, future research should address potential effects this policy had on economic activity in informal sectors of the Brazilian economy. However, as I lack access to necessary data to study these questions, I leave them for future research.

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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.
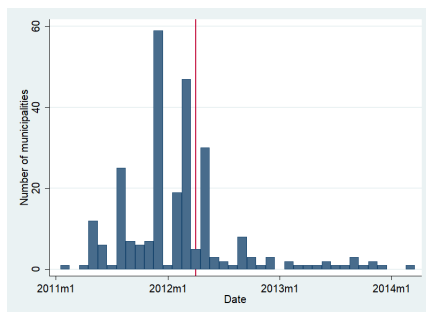

Figure 10: Municipalities with bank entry only after January 2011.

In addition to some entry into new markets, a lot of branches were open in municipalities that already had bank access. All branch openings of banks that were actively opening branches in the period are presented in Figure 11.
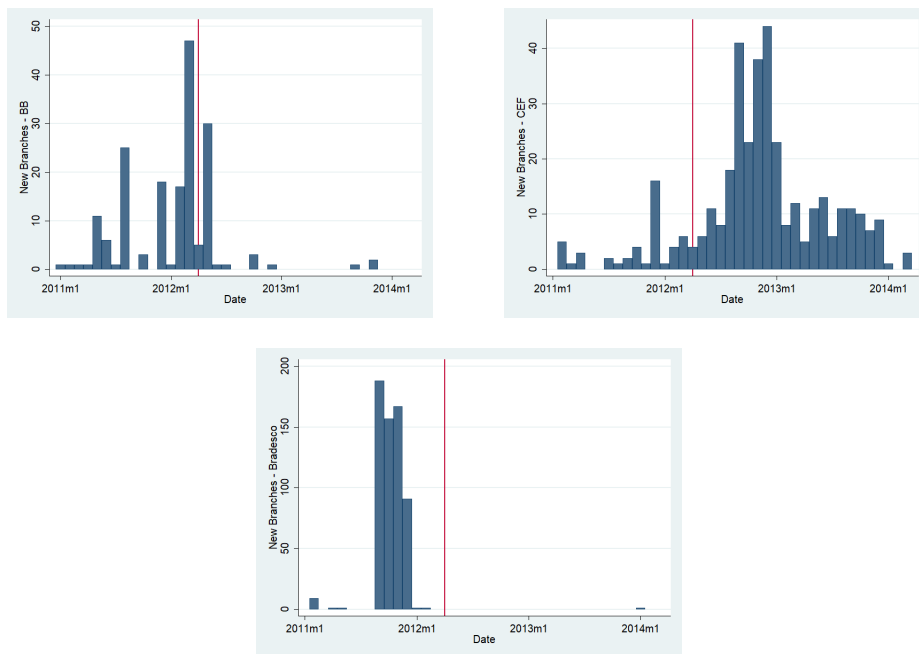

Figure 11: Newly opened branches by bank in the period 2011-2013.

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 Economica 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.
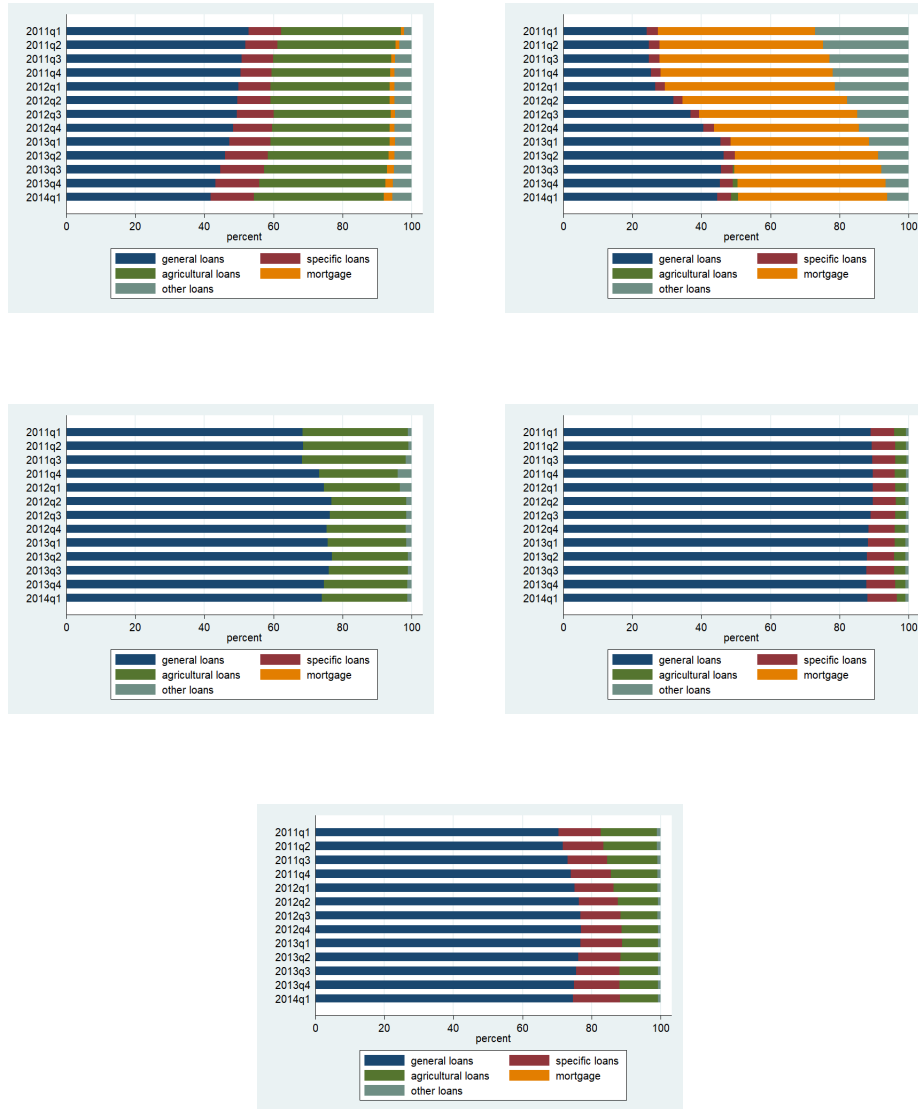

Figure 12: Trends in proportion of each loan category in bank's total issued credit.

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
Public Banks						
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
Private Banks						
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 14: 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 15 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 15: 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 16
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
Public Banks						
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
Private Banks						
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 16: 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 13 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
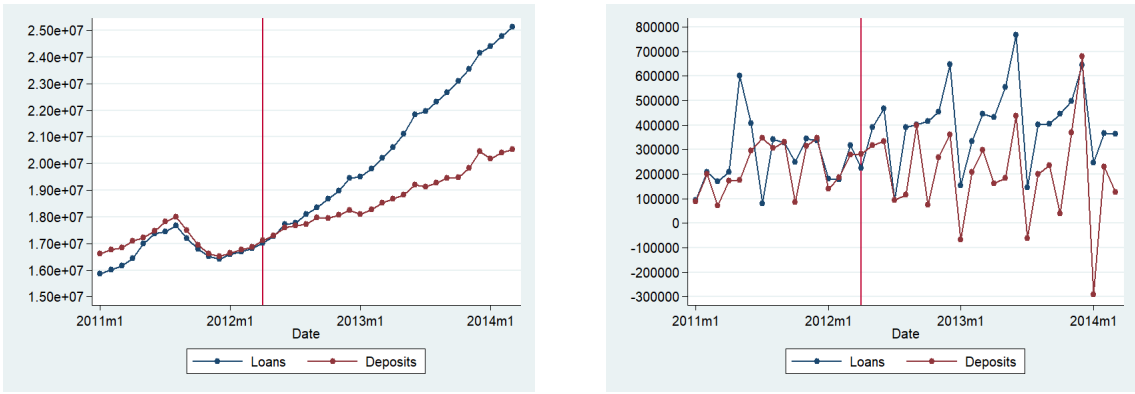in loans and deposits.

Figure 13: 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 Municipalities with no bank access prior to January 2011

In Figure 14, 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.
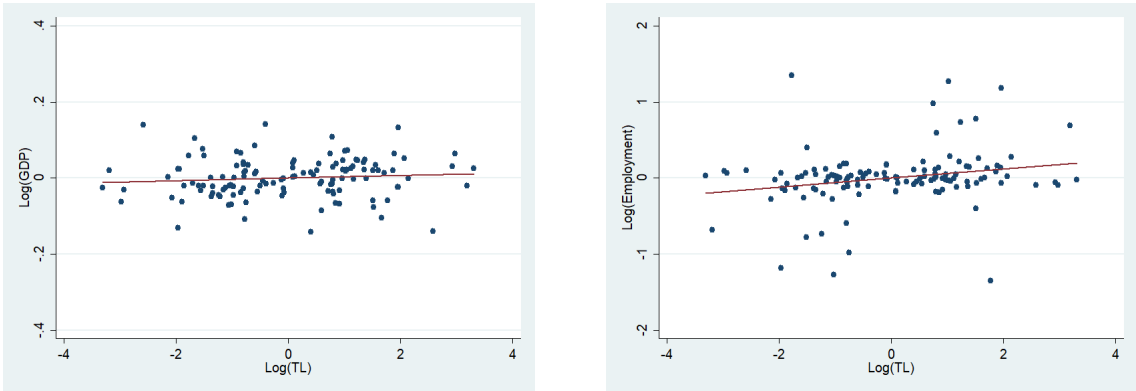

Figure 14: GDP and employment plotted against total lending.

B.2 Effects on tradable and non-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 (6). 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 preented in Table 17. 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.

	Industry VA				Employment (tradables)				Wages (tradables)			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
log(TL)	-0.013	-0.009			-0.031	-0.038			0.015	0.012		
	(0.021)	(0.021)			(0.042)	(0.043)			(0.015)	(0.015)		
log(TLinv)			-0.002	0.002			-0.015	-0.013			-0.001	0.001
			(0.011)	(0.011)			(0.021)	(0.021)			(0.005)	(0.005)
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 17: Effect of increase in total lending on tradable sector

Notes: $log(TL)$ represents the logarithm of total lending, while $log(TLinv)$ 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.

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 17. 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.

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.

	Services VA				Employment (non-tradables)				Wages (non-tradables)			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
log(TL)	-0.004	-0.004			-0.003	-0.004			-0.001	-0.001		
	(0.008)	(0.009)			(0.013)	(0.014)			(0.005)	(0.005)		
log(TLinv)			-0.001	0.001			-0.016**	-0.016**			-0.004	-0.004
			(0.004)	(0.004)			(0.008)	(0.008)			(0.003)	(0.003)
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	6,111	5,987	6,111	5,987	6,095	5,987	6,095	5,987	6,095	5,987	6,095	5,987

Table 18: Effect of increase in total lending on non-tradable sector

Notes: $log(TL)$ represents the logarithm of total lending, while $log(TLinv)$ 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.

B.3 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 6, 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**	0.0205**	0.0217**	0.0202**	0.0653**	0.0583**	0.0635**	0.0693**	0.0614**
	(0.0087)	(0.0086)	(0.0087)	(0.0086)	(0.0257)	(0.0249)	(0.0257)	(0.0257)	(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.4 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	0.0635	0.0488	0.0825	0.0401
	(0.1136)	(0.1114)	(0.1371)	(0.1034)	(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.

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:

$$\log y_{m,t} = \beta_1 \times Treated_m \times Post_t + \gamma X_{m,t-1} + \mu_m + \mu_t + u_{m,t} \tag{8}$$

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	0.0692	0.0250	0.0099
	(0.0147)	(0.0438)	(0.0282)	(0.0739)
$Treated_m \times Post_t \times Public_m$	-	-0.0678	-	0.0205
	-	(0.0452)	-	(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.