Fiscal Federalism and Financial Intermediation: an analysis of the impact of banking presence in small Brazilian municipalities using Propensity Score Matching (PSM)

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Abstract

The process of administrative and fiscal decentralization verified in Brazil after the Federal Constitution of 1988 was accompanied by a growth in the number of small municipalities which, in general, do not have the financial conditions to implement public policies that have concrete effects to improve the economy and the level of development socio-economic in the regions where they are located. Public and private commercial banks, given their national capillarity, can assist in the socio-economic development of these small municipalities through the capacity to transfer resources from surplus regions to deficit regions, stimulating production and demand through financial intermediation. Thus, with the GDP per capita weighted by the IFDM^{he} (healthy and education) and weighted by the IFGF, the municipal budget expenditure per capita and the self-financing capacity as variables of interest, this paper tests the impact of public and private banks on the small Brazilian municipalities. The methodology of Propensity Score Matching (PSM) was used to evaluate two groups: municipalities with banking presence (treated) and municipalities without banking presence (control). The results showed positive impacts of the banking presence for the two types of bank analysed in the GDP and self-financing capacity. Alsok, it was confirmed that municipalities with bank presence have less per capita budget expenditure.

key-words: private and public banks, municipal socio-economic development, Propensity Score Matching (PSM).

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1 Introduction

The model of political and fiscal decentralization in Brazil, intensified after the Federal Constitution of 1988 (CF/88), provided greater autonomy for municipalities in the conduct of regional public policies. In this system, local governments can decide, on their own, the best way to manage their resources and meet the needs of the local population, without the consent or interference of a central government.

In parallel with the decentralization process, there was a proliferation in the number of municipalities, jumping from 3,991 municipalities in 1980 to 5,570 in 2015. According to the Brazilian Institute of Geography and Statistics (IBGE) (IBGE, 2015), in 2015 there were 3,279 municipalities with less than 15 thousand inhabitants in Brazil. That is, more than half (58.9%) of Brazilian municipalities are in this population range. Together, these municipalities represent 6.7% of GDP and 11.2% of the country's population. The states with the highest number of municipalities with up to 15 thousand inhabitants are Minas Gerais (18.3%), Rio Grande do Sul (11.4%) and São Paulo (10.3%). Figure 1 shows the spatial distribution of these municipalities.

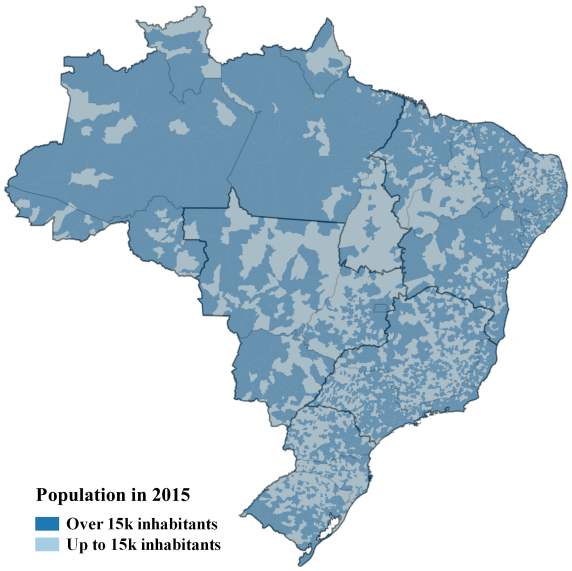

Figure 1 – Municipalities with up to 15 thousand inhabitants (2015)

It is evident that the union between decentralization and financial autonomy of these entities is experienced by a small group of municipalities, since the majority is small. As pointed out by Santos (2004), only medium and large cities can experience decentralization as a form of innovation. In this sense, only 5.1% of the municipalities would be able to sustain a local economy that would result in a collection burden with some expression.

For Paes e Siqueira (2008) developmental disparities between localities can be attributed to different levels of infrastructure. The poorest states and municipalities have the challenge of achieving a higher standard of development, but find barriers given their inability to finance themselves through their own tax revenues, and become heavily dependent on central government.

The Figures 2, 3 and 4 show the spatial distribution of GDP per capita (GDP_{pc}), GDP per capita weighted by the IFDM^{he} ($GDP_{pc}^{IFDM^{he}}$)[1] and GDP per capita weighted by the IFGF

[1] It was considered the mean of the IFDM index for health and the IFDM index for education.

(GDP_{pc}^{IFGF}) of municipalities with up to 15 thousand inhabitants. Although the weightings diminish the differences, they are still very visible, separating the country into two large blocks between the south and the north. The separation between the North and Northeast regions and the rest of the country is clear. In these regions, small municipalities lack more wealth and economic development compared to their southern counterparts.

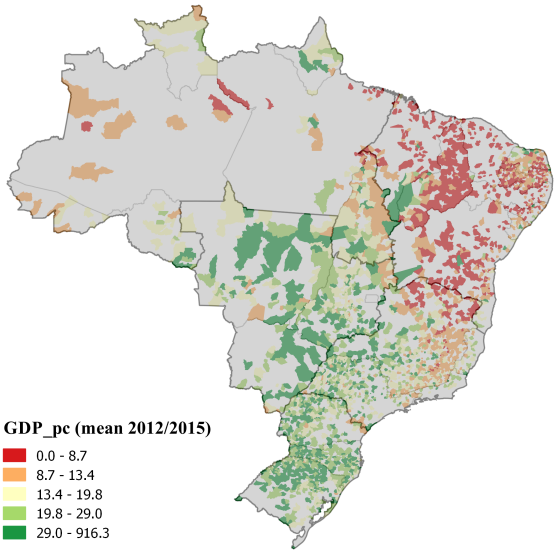

Figure 2 – *GDP* per capita (R$ k).

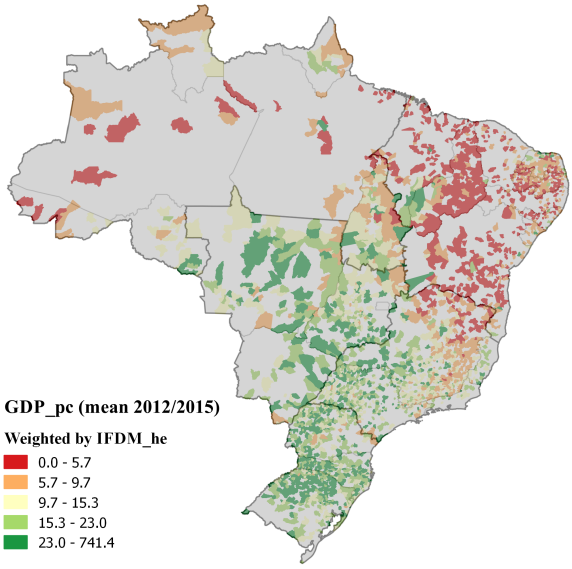

Figure 3 – *GDP* per capita (R$ k) weighted by the $IFDM^{he}$.

One of the causes pointed by the economic literature for the low development and inequality among regions is lack of human capital. In poor regions, the educational and qualification level as well as the access to basic health services are more precarious. The combination of physical capital and human capital often has different levels within the same region. For many authors, such as Levine e Renelt (1992), Schultz (1999) and Barro e Martin (1995), there is a close relationship between human capital and growth.

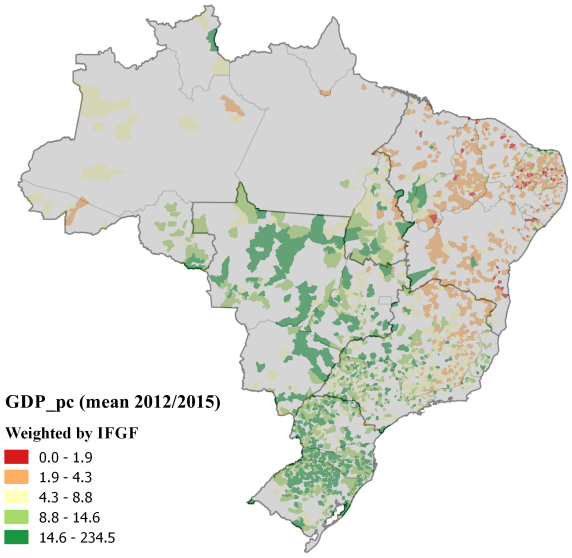

Figure 4 – *GDP* per capita (R$ k) weighted by the *IFGF*.

The financial imbalances currently experienced in the country in several states and municipalities have become more critical after the recession of 2015 and 2016. But, according to Cofecon (2016), one of its causes may be the structural imbalance between the functions assigned to entities federative and their respective sources of financing, attributed by the CF/88, which was aggravated by the federal government's strategy of raising revenues through contributions, since they, unlike taxes, are not distributed to other federative entities.

Paes e Siqueira (2008) advocate the transfer of resources from richer states or from central government to poorer municipalities in order to promote development and reduce income inequality. However, in a context of increasing fiscal deficits in the federal and central government units, this dependence is impaired. One exit would be the increase of the local wealth, with more production, increase of the employment and demand in the poorer regions, causing that the own collection can grow and more resources are directed to the improvement of the own locality.

Self-financing capacity, measured by the percentage of budget expenditures that is paid by own resources, of the small municipalities is 1.7% as against 3.4% of other municipalities. On the other hand, the average per capita budget expenditure of the former is R$3.4 thousand against R$2.5 thousand. That is, there is an evidence of an exacerbated dependence on the small municipalities of government transfers.

Given this scenario of dependency faced by small municipalities, the non-neutrality of the currency in the regional economy and the great capillarity of commercial banks in the country, this paper presents an empirical study and analysis the return provided by the presence of banks in the socio-economic development of small municipalities and in the budget expenditure, through a causal relationship using Propensity Score Matching (PSM).

The results allow a new look at these regions and presents a possible way out to leverage the economic growth of small municipalities, given by financial intermediation. The ability of large commercial banks to direct resources from surplus to surplus regions is an important role in the economic development of these localities, making them less dependent on government transfers.

2 Theoretical Framework

According to Favato e Toledo (2017), the movement of municipal emancipation is supported both by who is favor, the "localists", and "nationalists", who support arguments based on analytical scale perspectives. The arguments of the "localists" support greater autonomy of the municipality, which would be the federal entity closest to the citizen, able to meet their demands directly. On the other hand, the "nationalists" advocate greater national sovereignty and that the emancipation of districts without adequate criteria creates municipalities without conditions of financial self-sufficiency and highly dependent on federal transfers, burdening the public budget.

2.1 Constitutional Transfers

Brazilian federalism encompasses two constitutional transfers from the federal level to the states and municipalities that are key components of the intergovernmental fiscal system and help in the availability of resources to less developed regions:

1. **the State Participation Fund (FPE)**: The federal government distributes 21.5% of its net revenues from the three major federal taxes: IRPJ, IRPF and IPI to the states, where 85% of the funds are specifically designated for the three poorest regions of the country: North, Northeast and Center-West. In each group of regions, 95% of the FPE resources are allocated on an equitable per capita basis and a per capita income measure and the remaining 5% based on the geographical area;

2. **the Municipal Participation Fund (FPM)**: consists of 22.5% of net revenues from the same three federal taxes listed above. The main criterion of allocation is the direct relation with the population and inversely with the income, with 10% of the resources distributed to the state capitals, 86.4% are distributed among the other municipalities according to a scale in which a fraction (population with less than 10,188 inhabitants) and a maximum for cities with a population of more than 156,216 inhabitants and the remaining 3.6% are an additional quota for the most populous municipalities.

2.2 Financial Intermediation and Economic Development

The role of public and private commercial banks in the economy is more than enabling financial intermediation. These players should consider their ability to generate social well-being through resources for families and businesses. According to Heddergott e Laitenberger (2017), the financial system can influence social welfare and the real side of the economy.

In markets with the presence of public and private banks, the role of each can be treated differently. For Martins, Bortoluzzo e Lazzarini (2014), public banks coexist with profit and social welfare goals and they can reduce the problems of credit supply and help with more complex long-term financing. They can also operate in markets where private banks have no interest in trading. As for example in agriculture or in long-term loans. On the other hand, according to Araújo e Cintra (1994), private banks tend to become short-term loans, disinterested in projects that, despite having a high social return, have little profit margin and high risk.

For Sharma (2010), customers are the engine for the development of the banking system. Specifically in this sector, they play a double purpose, that is, they deposit their money in banks that become the source of generations of new revenues and also receive credit that returns to the Bank.

3 Methodology

3.1 Causality Analysis

The impact of presence of the banks on the socio-economic development and the budget expenditure of small Brazilian municipalities will be evaluated based on GDP per capita (GDP_{pc}), GDP weighted by the IFDM^{he} of healthy and education ($GDP_{pc}^{IFDM^{he}}$) , GDP weighted by the IFGF (GDP_{pc}^{IFGF}), budget expenditure per capita (exp_{pc}) and the self-financing capacity of the municipalities[2] (sfc). The variables were treated per capita. The objective is to assess whether the banking presence has influence on the real side of the economy, considering the weight of the social development and the fiscal efficiency.

The Firjan Municipal Development Index ($IFDM$[3]) was created in 2008 and is prepared by the Federation of Industries of Rio de Janeiro (Firjan). The IFDM goes from 0 to 1 and according to Firjan (2015) a municipality's IFDM consolidates in a single number the level of local socio-economic development through the simple average of the results obtained with the weighting, in the same level, of the indicators: Employment and Income, Education and Health. The Annex A shows the component variables of each of these indicators. In this study, as the objective is to consider GDP per capita and social development, the GDP_{pc} was weighted by the arithmetic mean of health and education indicators, avoiding possible endogeneity caused by the variables that calculate the level of Employment and Income in GDP.

As the IFDM, the Firjan Fiscal Management Index (IFGF[4]) goes from 0 to 1. It was launched by Firjan in 2012. It is a social control tool that aims to stimulate the culture of administrative responsibility, enabling greater management improvement municipalities, as well as improving the decisions of public managers regarding the allocation of resources. The IFGF brings the debate on a subject of great importance for the country: the way in which the taxes paid by the society are administered by the city halls (FIRJAN, 2018).

As emphasized Duarte, Sampaio e Sampaio (2009), researches related to the impacts of public policies on variables of interest finds as a barrier the lack of information of individuals, in two situations: the beneficiaries and those not benefited by any policy. In the case of municipalities without a bank presence, it is possible to evaluate them before and after the banking presence. However, considering the economic and social dynamics and their impact in different periods, the ex-ante and ex-post analysis, without taking into account the changes between one period and another, could lead to biased results.

According to Dantas e Tannuri-Piant (2014), by the counter-factual theory, when evaluating a public policy, the ideal would be to observe the same individual in similar contexts, differing only by politics itself. The focus of this theory is to construct two statistically identical groups. One form of construction is done by randomizing the individuals between the groups who will receive the treatment and the group will not receive the treatment. This is the procedure adopted by *Rubin causal model* (RCM) (RUBIN, 1974), or *randomized controlled trial* (RCT), in which it gives high explanatory power.

The methods of counter-factual theory should be concerned with a significant source of bias in estimating the causal relationship. If the definition of the two groups does not occur randomly, then there must be other characteristics of the units that can determine the

[2] The self-financing capacity of the municipalities is calculated by: $(revenue\ from\ tax)/(budget\ expenditure)$. Represents the part of the expenditure that the municipal can afford with its own resources. That is, the part of the budget that doesn't depend on transferences from the federal and estate governments.

[3] In Portuguese: *Índice Firjan de Desenvolvimento Municipal*

[4] In Portuguese: *Índice Firjan de de Gestão Fiscal*

separation of the groups. Thus, the two groups would differ not only in relation to treatment but in relation to the distribution of characteristics. Methods that intend to mimic the RCT should seek to minimize the selection bias.

In this research there are two situations for the municipalities: with bank presence, $D = 1$ and without banking presence, $D = 0$. So, for any municipality i, there are only two possible outcomes: Y_{1i} if $D_i = 1$ e Y_{0i} se $D_i = 0$. The observed result for the variable of interest Y_i can be written as:

$$Y_i = DY_{1i} + (1 - D)Y_{0i} \tag{1}$$

The goal is to find the result of $E[Y_{1i} - Y_{0i}]$, which can be rewritten as:

$$E[Y_i|D_i = 1] - E[Y_i|D_i = 0] = E[Y_{1i}|D_i = 1] - E[Y_{0i}|D_i = 0] \tag{2}$$

When subtracting $E[Y_{0i}|D_i = 1]$, that is, the expected result for the municipality i that received the treatment if it did not have it, we have:

$$\underbrace{E[Y_i|D_i = 1] - E[Y_i|D_i = 0]}_{\text{Difference observed}} =$$

$$\underbrace{= E[Y_{1i}|D_i = 1] - E[Y_{0i}|D_i = 1]}_{\text{Average Effect of Treatment on Treaties (ATT)}} + \underbrace{E[Y_{0i}|D_i = 1] - E[Y_{0i}|D_i = 0]}_{\text{Selection bias}} \tag{3}$$

The equation 3 shows the bias or measure of the error that can be incurred in differentiating the municipalities just by the fact of having or not banking presence.

According to Heckman, Ichimura e Todd (1997), the treatment group being represented by a dummy variable D which assumes value 1 and the control group represented by the variable dummy which assumes a value of 0, the impact treatment is given by the mean treatment effect in the treated group (ATT):

$$\Delta_i = E(Y_{1i} - Y_{0i}|D_i = 1) \tag{4}$$

$$\Delta_i = E(Y_{1i}|D_i = 1) - E(Y_{0i}|D = 1) \tag{5}$$

3.2 Matching by Observable Characteristics

Models in which treatment choice is not randomized are called non-experimental. In order to analyse them, more hypotheses are necessary to guarantee the causal relation. According to Dantas e Tannuri-Piant (2014), models that use selection of known and observable variables for the construction of counter-factual groups are based on the hypothesis of conditional independence (HCI). This hypothesis assumes that the potential results are independent of the binary variable of treatment when conditioning to the observable variables X_i.

Thus, in order to solve the bias problem, it is not necessary to consider the observable characteristics X_i which affect the variable of interest Y_i. According to **??**), conditioning for the vector X_i can be the selection bias disappears. Given that municipalities with identical

characteristics have the same probability of having a banking presence, the value of the variable of interest Y_i becomes independent of each one of the situations. Formally it is:

$$(Y_{1i}, Y_{0i} \perp D), \tag{6}$$

where $\perp$ indicates independence. In this way, the equation 5 can be rewritten as:

$$E(Y_{0i}|X_i, D = 1) = E(Y_{0i}|X_i, D = 0) = 0 \tag{7}$$

Thus, the effect of the banking presence on the municipalities given by the equation 3 can be rewritten as:

$$\Delta_i = E(Y_{1i}|X_i, D_i = 1) - E(Y_{0i}|X_i D = 0), \tag{8}$$

where the average impact of bank presence is obtained from the weighted average of the results for the different groups. For this, we take the expected value of the equation **??**, in the case where $D = 1$, and we get:

$$\Delta = E[\{E(Y_{1i}|X_i, D_i = 1) - E(Y_{0i}|X_i D = 0)]|D = 1\} = E\{\Delta|D = 1\} \tag{9}$$

The impact of bank presence on the variable of interest Y_i is calculated by means of the weighted sum of the differences between the average value of this variable for the two groups of municipalities. The comparison is only possible for municipalities with similar characteristics.

According to Duarte, Sampaio e Sampaio (2009), the difficulty of applying this method is given by the fact that, the more characteristics are used as base, the greater the number of observations required in the treatment group so that the pairing can be done with the group of control. To solve this problem, the probabilities associated with the variables X_i, $P(X_i)$ were considered. This change was made by Rosenbaum e Rubin (1983) and became known as propensity score matching (PSM).

3.3 Propensity Socre Matching (PSM)

The simple comparison between municipalities by the fact of having or not bank presence could lead to skewed results, given that there are municipalities of different sizes and located in distinct regions, with distinct populations. In this type of situation, Rosenbaum e Rubin (1983) proposed a method of matching the observable characteristics of the sample group, known as PSM.

The PSM is often used in studies that assess the impact of policies on variables of interest. Its purpose is to find a comparison group to the treatment group from a sample of individuals who do not participate in the treatment, reducing the bias of selectivity of non-random designs. The propensity score is the conditional probability of receiving a treatment, given a vector of measured covariates X_i, that is, observed independent variables. The method requires that the HCI is satisfied.

One of the obvious factors to include in PSM estimation is the criteria used to determine participation in some program. In this case, considering bank presence, we selected variables that could influence banks in the decision to implant an agency in a given municipality, such as per capita budget revenues, demographic density and the presence of agencies in the nearest municipalities. The objective of the PSM is the pairing, not the coefficient estimation, and allows a control group similar to the treatment group to be constructed, based on the distribution of observed variables.

The PSM solves the problem of pairing multidimensionality. The method can be deployed from a variable that controls the group, the propensity score (PS) $P(X)$, which is the conditional probability of a municipality having a banking presence, given its observable characteristics:

$$P(X) = Pr(D = 1|X) \tag{10}$$

The probability is linked to only one scalar. Thus, in equation 6, the vector of characteristics X_i can be changed by the scalar $P(X)$ in the equations 4 and 5:

$$E(Y_1 - Y_0|D = 1, P(X)) = E(Y_1|D = 1, P(X)) - E(Y_0|D = 0, P(X)), \text{ so} \tag{11}$$

$$(Y_0, Y_1 \perp D|P(X)) \tag{12}$$

According to Rosenbaum e Rubin (1983), for PSM application it is necessary to assume the hypothesis of balancing the observable characteristics and the existence of a common support, that is, not to compare the incomparable, which would generate bias in the evaluation. Thus, for each control group there is a corresponding treatment group. As PS is not known, it is necessary to estimate it by means of a probit/logit regression to obtain the probability of the municipalities having a banking presence, given the observable characteristics of each one, X_i. In this estimation, the independent variables are those that can influence or not the banking presence in a municipality. The dependent variable is a dummy that assumes value 1, if the municipality has a bank presence and 0 if it is from the control group, without a bank presence.

3.4 Calculation of the Effects of Bank Presence

Following, subgroups are then obtained within the control group with probabilities similar to those of the individuals in the treatment group. For PS block, it is tested whether the mean of each predictor variable used in the model does not differ between treatment and control. If a distinction is identified between groups, a less parsimonious model should be specified for PS estimation. Otherwise, if all the tests for each variable within each interval show that the mean does not differ significantly, one goes to the calculation of the mean effects.

The mean stratified pairing effect (ATT) shows how the treatment group was affected. Consider the distribution of the treaties and not treated in N blocks or strata, so that the mean of the PS estimates for the two groups does not present a significant difference in each stratum.Se Y the variable of interest, the first step is to calculate the differences in performance between groups within the strata:

$$\Delta_e^s = \frac{\sum_{i\epsilon(e)} Y_i^p}{N_e^p} - \frac{\sum_{i\epsilon(e)} Y_i^{np}}{N_e^{np}} \tag{13}$$

where p indicates the municipalities with bank presence and np are the municipalities without bank presence. The final result is given by:

$$\Delta^S = \sum_{e=1}^{m} \Delta_e^S \frac{N_e^p}{N^p} \tag{14}$$

In summary, there are three types to measure the treatment effects:

1. **average treatment effect for the treated (ATT)**, which considers treatment effect for the treated subjects only;

2. **average treatment effect (ATE)**, which represents the average impact of treatment on the population as a whole. It is the effect for the overall target population in the study (treated and untreated subjects together);

3. **average treatment effect for the untreated (ATU)**, which represents how much the group that is not being treated would be affected if treated.

3.5 Database and Sample

In order to identify the presence of public and private banks in the Brazilian municipalities, the list of branches and advanced service stations (PAA[5]) available by Bacen (2007-2018) was used. This is a monthly publication that contains data from Sep/2007 to Feb/2018 [6]. Considering that this data is in stock type, the information referring to the months of December of each year was used.As physical presence the existence of branches or PAA was considered, since the latter has the same functions as branch. The banking service stations (PAB[7]) were not considered, since they are installed in an institutions or entity of the public administration or private enterprise, with the exclusive objective of meeting the of the respective company and its employees, not providing services to the entire population. From the database obtained, the banking presence was grouped in four groups of municipalities:

- [a] municipalities with only the presence of private banks;
- [b] municipalities with only the presence of public banks;
- [c] municipalities with the presence of public and private banks simultaneously, and;
- [d] mmunicipalities without bank presence.

The municipalities [d] will be the control group, that is, municipalities that are not served by branches or PAA. As treatment group, the other groups of municipalities were selected. The analysis was performed for each group [a], [b] and [c], with the objective of evaluating the impact of each type of banks and the both types simultaneously.

To calculate the PS, it were used the variables: municipal revenue from transfers per capita (rtf_{pc}), municipal tax revenue per capita (rtx_{pc}), percentage of formal workers with high school educations (edu), demographic density (den), sum of the dummies of the private banks presence of the neighbours (wpr^{pr}), sum of the dummies of the public banks presence of the neighbours (wpr^{pu}) and the sum of the dummies for bank presence of the neighbours (wpr^{to}). W represents the spatial weight, measured by the matrix of type queen of order 1. Only the municipalities with less than 15 thousand inhabitants, focus of this work, were selected to the data.

Table 1 shows the relation bank presence by type of bank in the period from 2007 to 2015 for, separated by the municipalities up to 15 thousand inhabitants and the others. It is observed that the number of municipalities with only one type of bank is greater when the number of inhabitants is lower. From 2008, there have been a considerable increase in the number of municipalities with bank presence.

[5] In Portuguese: *Posto de Atendimento Avançado*
[6] Last data available until the close of this article.
[7] In Portuguese: *Posto de Atendimento Bancário*

Table 2 shows the descriptive statistics of the variables of interest, as well as observable variables used in this work. With exception of the edu, den and sfc, the rest of the variable are in R$ thousand and it were calculated by average of constants prices from 2012 to 2015.

According to Caliendo e Kopeinig (2008) the choice of the algorithm for pairing estimation brings a trade-off between bias and variance. One of the most used in the literature are the nearest neighbours (NN), where the individual in the control group is chosen from a partner in the treatment group who is closer in terms of PS. Other are Kernel, that is is a nonparametric pairing estimator that uses mean weights of all individuals in the control group to construct the counter-factual and the Caliper and Radius Matching, which avoids the risk of bad pairings when if the NN is long, imposing a maximum PS tolerance level. In this work, the results will be interpreted based on the kernel pairing, which, according to Caliendo e Kopeinig (2008) has one of the advantages of decreasing the variance, since more information is used.

Table 1 – Number of municipalities by type of bank presence separated by groups up to 15 k and over 15 k inhabitants

	Only private banks municipalites [a]		Only public banks municipalities [b]		Private and public banks municipalities [c]		No bank presence municipalities [d]	
	Up to 15 k	Over 15 k	Up to 15 k	Over 15 k	Up to 15 k	Over 15 k	Up to 15 k	Over 15 k
2007	494	126	1.029	635	279	1.313	1602	87
2008	1.206	191	1.001	634	284	1.335	898	16
2009	1.567	205	996	640	291	1.340	523	3
2010	1.858	197	1.002	641	290	1.350	224	3
2011	1.826	193	869	264	469	1.728	215	1
2012	1.767	134	531	70	868	1.993	202	0
2013	1.556	133	536	75	836	2.059	375	0
2014	1.531	129	535	71	828	2.083	393	0
2015	1.454	129	538	36	813	2.134	466	0
2016	1.354	129	535	27	808	2.153	564	0
2017	1.297	130	545	26	780	2.174	618	0

Prepared by the authors. Source: Bacen (2007-2018)

Table 2 – Descriptive statistics of interest (Y) and observable (X) variables[1]

		GDP_{pc}	GDP_{pc} x $IFDM^{se}$	GDP_{pc} x $IFGF$	exp_{pc}	sfc	rtf_{pc}	rtx_{pc}	eme	den	wpr^{k} [2]
Only	mean	17.4	13.1	8.5	8.8	0.0	3.8	0.2	0.6	29.8	4.8
banks	s.de	17.6	14.9	11.0	3.8	0.0	1.6	0.3	0.1	70.3	1.9
private	min	4.5	2.1	1.0	3.2	0.0	1.6	-0.1	0.1	0.1	0.0
municipalities	max	304.2	267.4	234.5	40.7	0.3	17.5	5.8	1.0	2364.4	16.0
[a]	obs[3]	1,454	1,454	1,118	1,188	1,186	1,197	1,197	1,454	1,454	1,454
Only	mean	27.0	21.3	15.1	10.0	0.0	4.2	0.2	0.6	25.5	4.2
banks	s.de	19.6	16.2	12.2	3.7	0.0	1.7	0.2	0.1	21.5	1.9
public	min	5.4	2.7	1.4	4.7	0.0	1.9	0.0	0.2	0.8	0.0
municipalities	max	185.4	151.8	107.4	27.9	0.2	13.4	1.7	1.0	132.2	17.0
[b]	obs[3]	538	537	470	463	463	463	463	538	538.0	538
Bancos	mean	27.9	21.9	14.1	8.1	0.0	3.3	0.3	0.6	32.9	5.4
private e	s.de	40.0	32.7	12.7	3.1	0.0	1.4	0.3	0.1	41.5	2.1
public	min	5.4	2.7	1.2	3.8	0.0	1.6	0.0	0.2	0.4	1.0
municipalities	max	916.3	741.4	140.6	38.7	0.3	24.2	3.4	1.0	869.0	16.0
[c]	obs[3]	813	813	702	689	690	693	693	813	813	813
No	mean	17.3	12.9	9.2	11.7	0.0	5.3	0.1	0.7	20.1	5.0
bank	s.de	13.7	11.5	8.6	4.4	0.0	2.1	0.1	0.1	23.4	1.9
presence	min	5.5	2.5	1.5	5.3	0.0	2.1	0.0	0.1	0.3	0.0
municipalities	max	168.8	151.8	100.1	36.9	0.1	17.3	1.3	1.0	166.7	12.0
[d]	obs[3]	466	466	375	376	375	376	376	466	466	466

Prepared by the authors using Stata/IC 14.2.

Notes: 1) Average 2012/2015. 2) k=private(pr), public(pu), private and public(to). 3) Not available for all year/municipalities.

4 Estimation and Results

The Table 3 shows the estimated PS result for each treatment group, that is, each municipality group according to the type of banking presence. The probit model was used in the estimation. All observable variables, including banking presence in neighbouring municipalities are significant.

Table 3 – Propensity score (PS) estimation - probit regression

Dependent variable: dummy of bank presence (wpr^k)[1]			
Observable variables[2]	Only private banks municipalities [a]	Only public banks municipalities [b]	Private and public banks municipalities [c]
Revenue from transfers per capita - rtf_{pc}	-0.3536***	-0.3456***	-0.5817***
Revenue from tax per capita - rtx_{pc}	2.6133***	3.7328***	4.5566***
% Formal workers with high school - edu	-1.4933***	-0.9682**	-2.1367***
Demographic density (inh/pop) - den	0.0047**	0.0049**	0.0093***
W presence private banks - wpr^{pr}	0.0637**		
W presence public banks - wpr^{pu}		0.1731***	
W bank presence - wpr^{to}			0.0917***
Observations	1,573	839	1,069
Prob >chi2	0.0000	0.0000	0.0000
Pseudo R2	0.1790	0.2090	0.4484

Prepared by the authors using Stata/IC 14.2.

Notes: 1) k=private(pr), public(pu), private and public(to). 2) Average 2012/2015.

The Figures 5 to 10 show the graphical analysis of the probability distribution of the treatment and control groups in each type of banking presence. It is represent the overlap checking before and after the matching and show that is a balance between the treatment and control group.

Given the assumption of conditional independence, one must check whether the pairing procedure balanced the distributions of the relevant variables between the control and treatment groups. Tables 4, 5 and 6, and Figures 11, 12 and 13, show the result of the significance test of the means in each control/treatment group. The bias was higher than 5%, the significance test showed no difference between the means of the group and the low R2 showed that the quality of the pairing is satisfactory. In addiction, available in Appendix C, The Figures 14, 15 and 16, show the spatial distribution of the municipalities after pairing. Each figure represents a kind of bank presence. It can be observed that the sample is well distributed in the space, not forming regional agglomerations that could influence the results.

In this work, the main purpose is to measure the ATT, that represents the effects caused by the bank presence into the municipalities. In addiction it is showed the measures of the ATE and ATU. The Table **??** shows the estimation[8] for kernel matching to these the effects. Following, we discussed the effects for each interest variable:

- **GDP per capita** (GDP_{pc}): the average of GDP per capita to the period of 2012/2015 in the municipalities that have only bank presence of private banks is R$1.8K higher

[8] To the estimation it was used the software Stata/IC 14.2, package psmatch2 (LEUVEN; SIANESE, 2003).

than in municipalities that don't have this type of banks. To the municipalities that have only bank presence of public banks the difference is higher and jump to R$4.8k. If one considers the presence of the both types of banks, the average is R$5.3k higher. This results show that is a perspective of economic production, the banks make the difference in the localities where they are present.

- **GDP per capita weighted by the social index** (GDP_{pc} **x** $IFDM^{he}$): when it was considered the GDP weighted, the difference between the municipalities that have bank presence is also higher thant the others. Here, the effects of public banks is also higher than the private banks.

- **GDP per capita weighted by the fiscal management indicator** (GDP_{pc} **x** $IFGF$): considering the weights of the fiscal management indicator, the results also shows a better performance of the municipalities that have bank presence.

- **Municipal budget expenditure per capita** (exp_{pc}): for this variable the results go in another direction of what was observed for GDP. Municipalities that have bank presence show less budget expenditure per capita than the others and indicates how can be important the financial intermediation to this localities. Making the local economy move through the currency can reduce the public sector spending.

- **Self-financing capacity of the municipalities** (sfc): In general, small municipalities are highly dependent on government transfers. The results for municipalities that have a banking presence, although marginal, are better than the others, that is, they are less dependent on the state and federal governments.

Table 8 shows the difference in percentage between the mean of the treatment and control group. The impact of the banks on the GDP per capita of the municipalities is higher when the variable is weighted by both the social development indicators IFD^{he} and the fiscal management indicator $IFGF$. It can be noted that municipal budget per capita expenditure is 18.2% lower in the municipalities with the presence of both types of bank. These results show that financial intermediation, seen as a lubricant for the gearing of the real economy, can increases the circulation of money and credit and, consequently, the production, the demand and employment. With this, the dependence of the municipal public spending can reduce in small municipalities.

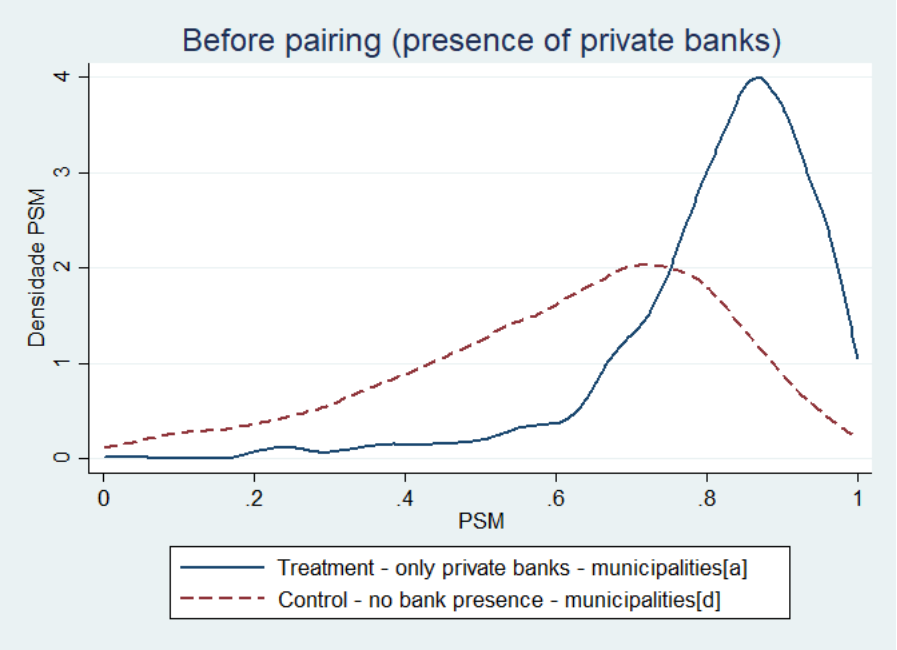

Figure 5 – PSM Density - private banks - before matching

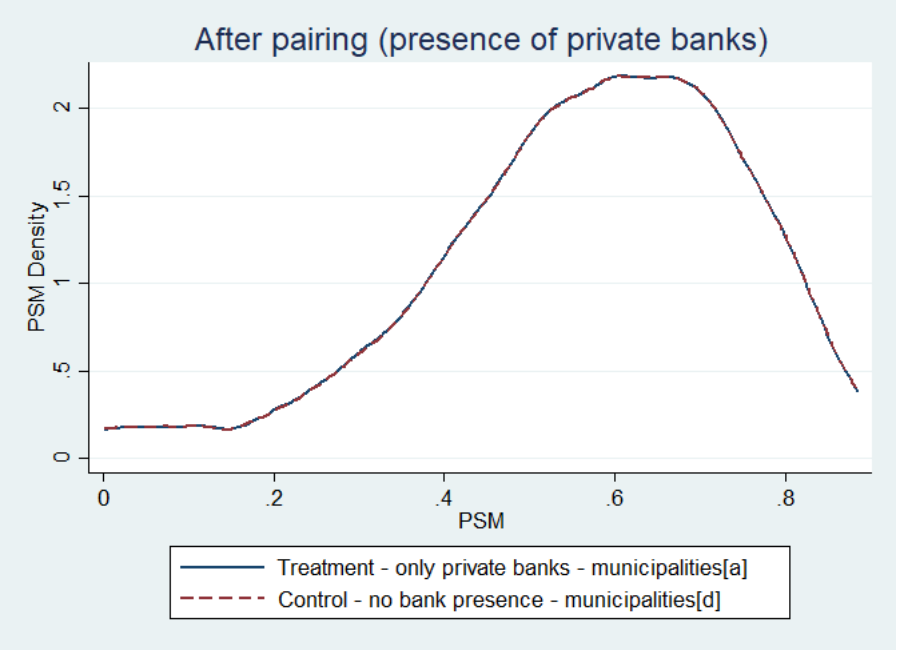

Figure 6 – PSM Density - private banks - after matching

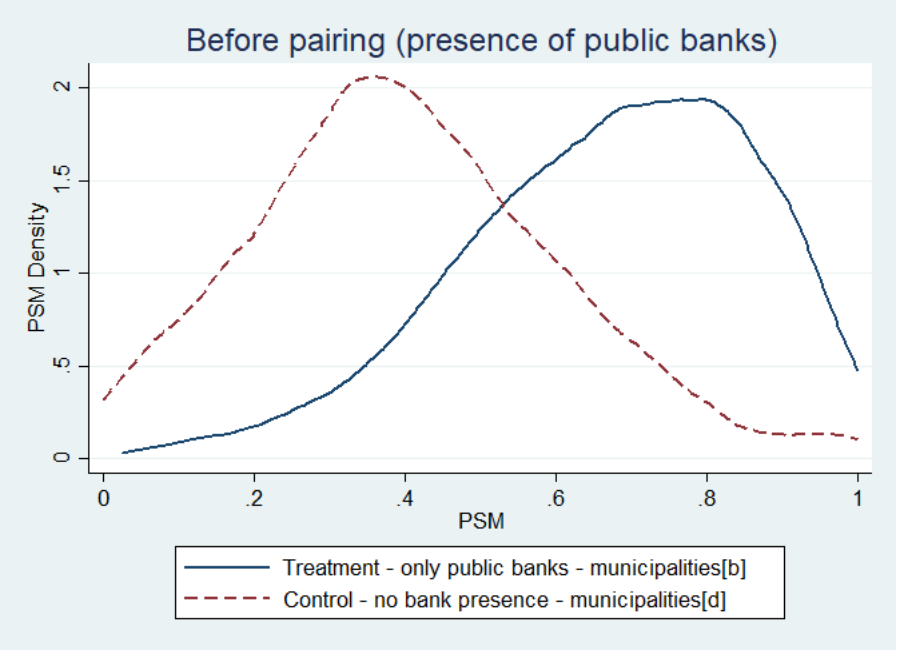

Figure 7 – PSM Density - public banks - before matching

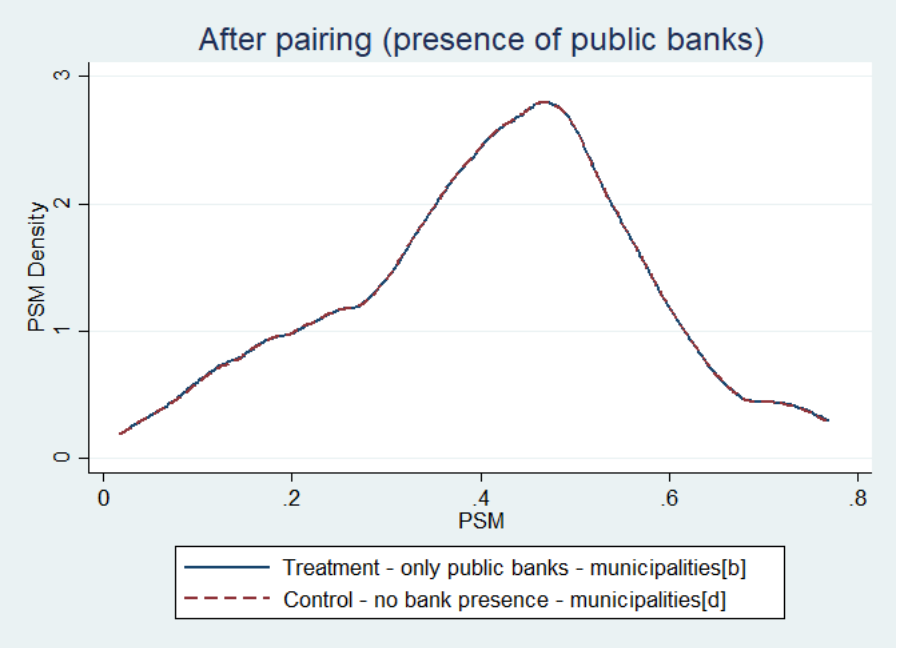

Figure 8 – PSM Density - public banks - after matching

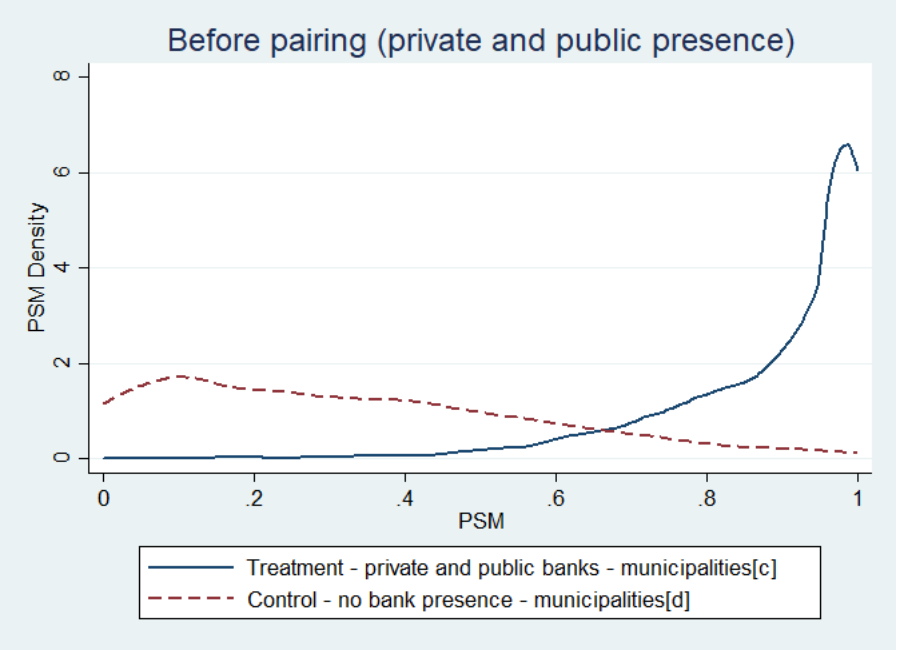

Figure 9 – PSM Density - private banks and public - before matching

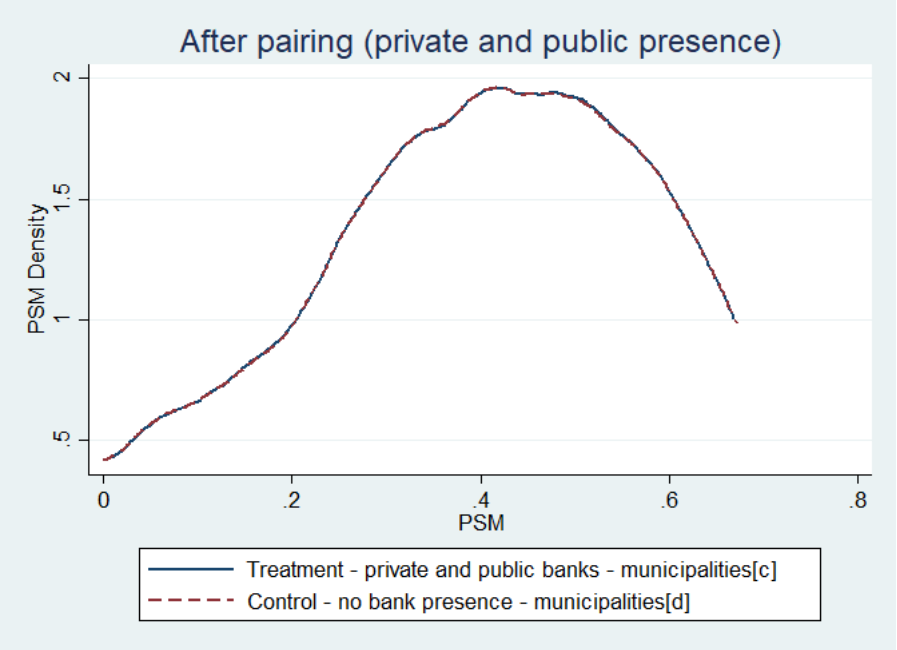

Figure 10 – PSM Density - private banks and public - after matching

Table 4 – PS test after matching - private banks

Only bancos private [a]								
U=unmatched		Mean			%reduct	t-test		V(T)/
M=matched		Treated	Control	%bias	|bias|	t	p>|t|	V(C)
rtf_{pc}	U	3.7657	5.2522	-79.0		-14.31	0.000	0.61*
	M	3.7657	3.9876	-11.8	85.1	-3.56	0.000	1.35*
rtb_{pc}	U	0.1767	0.1453	14.1		2.06	0.039	4.41*
	M	0.1767	0.1811	-1.9	86.3	-0.41	0.682	1.58*
eme	U	0.6225	0.6529	-21.8		-3.65	0.000	1.07
	M	0.6225	0.5972	18.2	16.5	4.37	0.000	0.99
den	U	30.552	19.987	18.8		2.65	0.008	11.67*
	M	30.552	24.954	10.0	47.0	2.35	0.019	5.93*
Wpr^{pr}	U	4.8338	4.4069	22.3		3.73	0.000	1.08
	M	4.8338	4.8248	0.5	97.9	0.11	0.912	0.96
* if variance ratio outside [0.89; 1.12] for U and [0.89; 1.12] for M								
Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched (U)	0.179	309.76	0.000	31.2	21.8	92.5**	1.63	60
Matched (M)	0.010	33.27	0.000	8.5	10.0	23.0	1.73	60
** if B>25%, R outside [0.5; 2]								

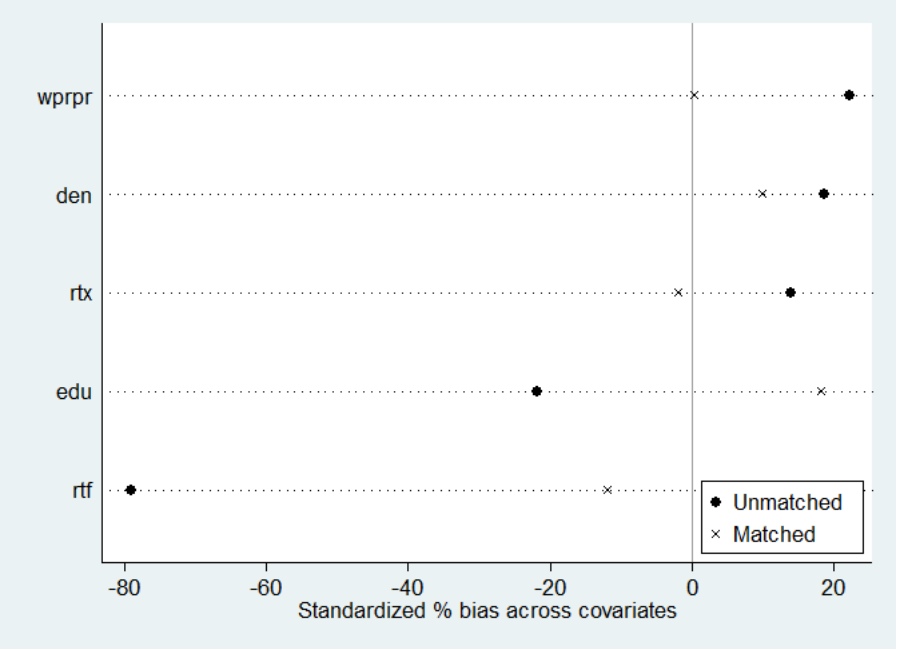

Figure 11 – Ps test - graph - private banks

Table 5 – PS test after matching - public banks

Only public banks [b]								
Unmatched (U)		Mean			% reduct	t-test		V(T)/
Matched (M)		Treated	Control	%bias	|bias|	t	p>|t|	V(C)
rtf_{pc}	U	4.1900	5.2500	-55.2		-8.03	0.000	0.66*
	M	4.1900	4.500	-16.3	70.5	-2.88	0.004	1.15
rtB_{pc}	U	0.2145	0.1453	47.5		6.79	0.000	1.30*
	M	0.2145	0.2218	-5.0	89.4	-0.59	0.558	0.50*
edu	U	0.6308	0.6529	-17.5		-2.55	0.011	0.71*
	M	0.6308	0.59754	26.3	-50.4	4	0.000	0.70*
den	U	25.6100	19.984	25.7		3.71	0.000	0.93
	M	25.6100	22.926	12.3	52.2	1.64	0.101	0.59*
Wpr^{pu}	U	4.1700	3.3245	45.4		6.57	0	0.88
	M	4.1700	4.5093	-17.9	60.7	-2.5	0.013	0.65*

* if variance ratio outside [0.83; 1.20] for U and [0.83; 1.20] for M

Sample	Ps R2	LRchi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched (U)	0.209	241.18	0.000	38.3	45.4	111.3**	1.07	60
Matched (M)	0.022	28.27	0.000	15.6	16.3	35.3**	0.86	80

** if B>25%, R outside [0.5; 2]

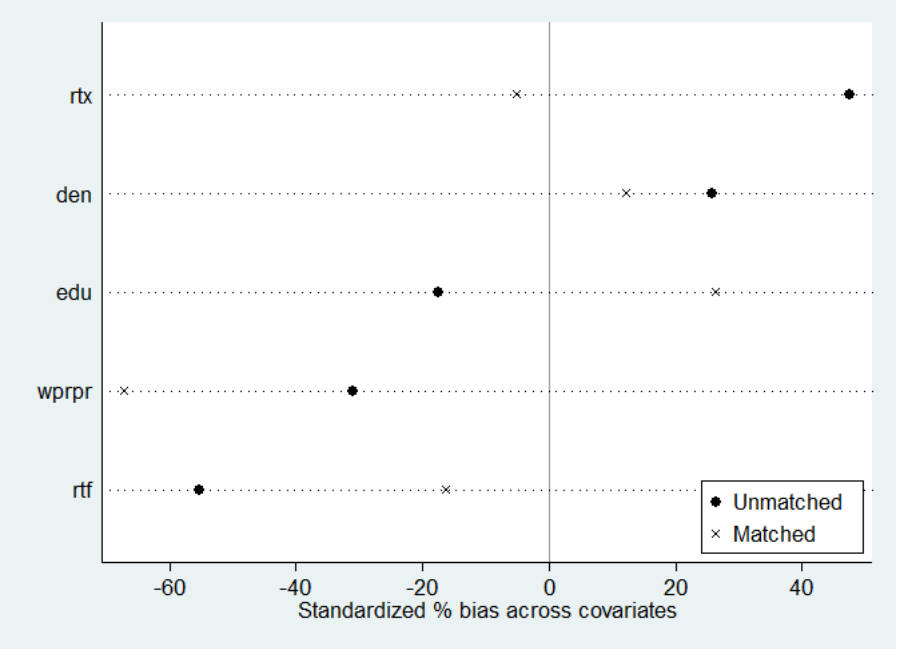

Figure 12 – Ps test - graph - public banks

Table 6 – PS test after matching - public banks

Private and public banks[c]								
Unmatched (U) / Matched (M)		Mean Treated	Mean Control	%bias	% redução |bias|	t-test t	t-test p>|t|	V(T)/ V(C)
rtf_{pc}	U	3.9189	5.2678	-77.0		-9.25	0.000	0.40**
	M	3.9189	4.1612	-13.8	82.0	-2.06	0.040	0.93
rtb_{pc}	U	0.2580	0.1451	53.3		7.677	0.000	3.85**
	M	0.2580	0.3425	-39.9	25.1	-5.12	0.000	0.61**
edu	U	0.5967	0.65282	-43.3		-6.88	0.000	0.79**
	M	0.5967	0.5568	30.9	28.6	5.63	0.000	0.74**
den	U	34.1444	19.986	40.6		5.85	0.000	3.85**
	M	34.1444	33.255	2.6	93.7	0.39	0.698	1.13
Wpr^{pr}	U	5.4920	5.0427	22.5		3.45	0.001	1.22**
	M	5.4920	5.4677	1.2	93.6	0.21	0.833	0.93
* if variance ratio outside [0.86; 1.16] for U and [0.86; 1.16] for M								
Sample	Ps R2	LRchi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched (U)	0.150	206.91	0.000	39.9	42.0	74.3**	4.24**	100
Matched (M)	0.032	61.22	0.000	18.7	16.7	43.0**	1.01	50
** if B>25%, R outside [0.5; 2]								

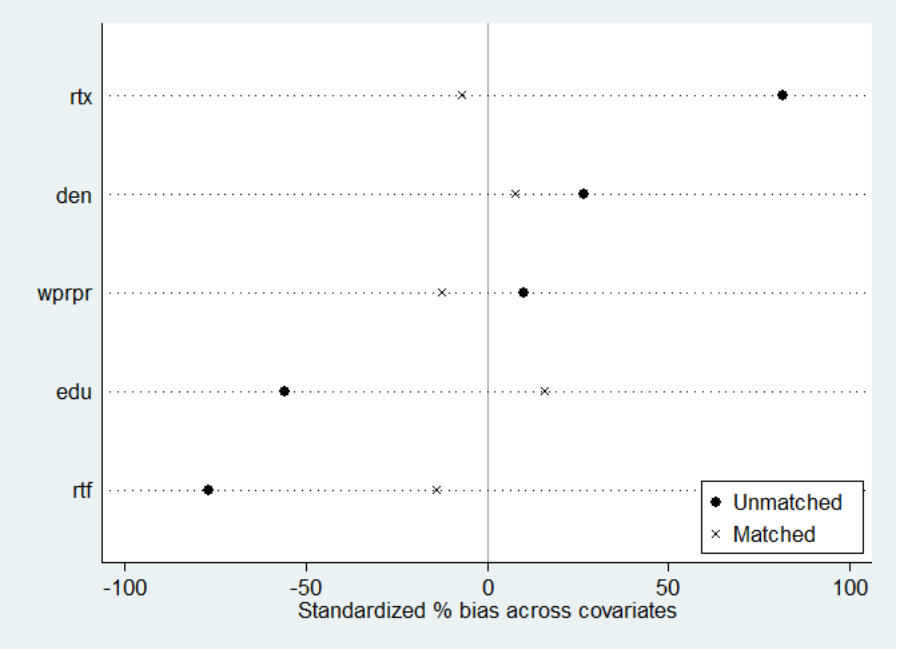

Figure 13 – Ps test - graph - private and public banks

Table 7 – ATT, ATU and ATE estimation with kernel matching

		T=Treatment C=Control D=Difference														
		GDP_{pc}			GDP_{pc} x $IFDM^{he}$			GDP_{pc} x $IFGF$			exp_{pc}			sfc		
		T	C	D	T	C	D	T	C	D	T	C	D	T	C	D
Only	Not matched	17.9	18.0	-0.1	13.6	13.6	0.1	8.5	9.0	-0.5	8.8	11.7	-2.9	2.2	1.4	0.7
private	ATT	17.9	16.1	1.8	13.6	11.6	2.0	8.5	7.5	1.0	8.8	9.3	-0.5	2.2	2.1	0.1
banks	ATU	18.0	20.8	2.8	13.6	16.4	2.8	9.0	9.8	0.8	11.7	12.0	0.3	1.4	1.6	0.2
municipalities[a]	ATE			2.0			2.2			0.9			-0.3			1.2
Only	Not matched	27.5	18.0	9.5	21.7	13.6	8.1	15.0	9.0	5.9	10.0	11.7	-1.8	2.6	1.4	1.2
public	ATT	27.5	22.6	4.8	21.7	17.3	4.3	15.0	11.7	3.3	10.0	10.4	-0.5	2.6	2.4	0.2
banks	ATU	18.0	32.1	14.1	13.6	25.9	12.3	9.0	17.7	8.7	11.7	13.1	1.4	1.4	1.8	0.4
municipalities[b]	ATE			9.0			7.9			5.7			0.3			0.3
Private	Not matched	28.0	18.0	10.0	22.1	13.6	8.5	14.1	9.0	5.1	8.1	11.7	-3.6	3.6	1.4	2.2
and	ATT	28.0	22.7	5.3	22.1	16.0	6.1	14.1	10.1	4.0	8.1	9.9	-1.8	3.6	3.6	0.1
public	ATU	18.0	78.5	60.5	13.6	63.4	49.8	9.0	16.1	7.1	11.7	14.2	2.5	1.4	2.2	0.7
municipalities[c]	ATE			24.7			21.5			5.1			-0.3			0.3

Table 8 – Difference between the mean of the treatment group and the control group (%)

	Only private banks municipalities[a]	Only public banks municipalities[b]	Private and public banks municipalities[c]
GDP_{pc}	11.2	21.7	23.3
GDP_{pc} x $IFDM^{he}$	17.2	25.4	38.1
GDP_{pc} x $IFGF$	13.3	28.2	39.6
exp_{pc}	-5.4	-3.8	-18.2
sfc	4.8	8.3	1.7

Prepared by the authors.

5 Final Considerations

Given the large number of small municipalities that can not benefit from the scale gains in the management of public resources, one way out of developing these localities can be by encouraging the presence of banks in those cities.

Banking presence in these localities can help as a lubricant for the engine of the real economy, making resources from deficit regions be able to be directed to surplus regions. Financial intermediation can provide greater savings training and help with investment decisions.

The way out of the financial crisis of municipalities and states may come from the real side of the economy, the private sector, and institutions that promote production, consumption, and employment.

This work showed that the municipalities that have banking presence presented better social and economic indicators and lower government expenditures.

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APPENDIX A – Table-Summary of the component variables of the $IFDM$ - by Development Area

Table 9 – Component variables of the $IFDM$

IFDM		
Employment&Income	Education	Healthy
Generation of formal employment	Enrollment in early childhood education	Number of prenatal consultations
Absorption of local labor	Dropping out of primary school	Deaths due to ill-defined causes
Formal income generation	Age-grade distortion in elementary school	Child deaths due to preventable causes
Average wages of formal employment	Teachers with higher education in primary education	Sensitive hospitalization of basic attention
Inequality	Average daily classroom hours in elementary school	
	Result of IDEB in elementary school	
Source: Ministry of Labor and Employment	Source: Ministry of Education	Source: Ministry of Health

APPENDIX B – Nearest neighbor (NN) and radius caliper (0.05) estimations

Table 10 – ATT, ATU and ATE nearest neighbor (NN) estimation (1 neighbor)

		T=Tratamento C=Controle D=Diferença														
		GDP			*GDP* x $IFDM^{se}$			*GDP* x *IFGF*			exp_{pc}			sfc		
		T	C	D	T	C	D	T	C	D	T	C	D	T	C	D
Only	Not matched	17.9	18.0	-0.1	13.6	13.6	0.1	8.5	9.0	-0.5	8.8	11.7	-2.9	2.2	1.4	0.7
bancos	ATT	17.9	16.5	1.4	13.6	11.9	1.7	8.5	7.6	0.9	8.8	9.6	-0.7	2.2	2.2	0.0
private	ATU	18.0	20.6	2.6	13.6	16.1	2.5	9.0	9.6	0.6	11.7	12.1	0.4	1.4	1.7	2.3
municipalities [a]	ATE			1.7			1.9			0.9			-0.5			0.1
Only	Not matched	27.5	18.0	9.5	21.7	13.6	8.1	15.0	9.0	5.9	10.0	11.7	-1.8	2.6	1.4	1.2
bancos	ATT	27.5	28.0	-0.6	21.7	22.2	-0.5	15.0	15.0	0.0	10.0	10.8	-0.8	2.6	2.6	0.1
públicos	ATU	18.0	32.3	14.3	13.6	25.5	11.9	9.0	18.0	8.9	11.7	13.8	2.0	1.4	1.8	0.4
municipalities [b]	ATE			6.0			5.1			4.0			0.5			0.2
Bancos	Not matched	28.0	18.0	10.0	22.1	13.6	8.5	14.1	9.0	5.1	8.1	11.7	-3.6	3.6	1.4	2.2
private e	ATT	28.0	25.1	2.9	22.1	17.8	4.3	14.1	10.4	3.7	8.1	10.1	-2.0	3.6	3.5	0.1
públicos	ATU	18.0	95.4	77.4	13.6	77.4	63.8	9.0	16.8	7.8	11.7	14.6	2.9	1.4	2.2	0.8
municipalities [c]	ATE			29.1			25.2			5.1			-0.3			0.3

Table 11 – ATT, ATU and ATE radius caliper (0.05) estimation

		T=Tratamento C=Controle D=Diferença														
		GDP			*GDP* x $IFDM^{se}$			*GDP* x *IFGF*			exp_{pc}			sfc		
		T	C	D	T	C	D	T	C	D	T	C	D	T	C	D
Only	Not matched	17.9	18.0	-0.1	13.6	13.6	0.1	8.5	9.0	-0.5	8.8	11.7	-2.9	2.2	1.4	0.7
private	ATT	17.9	16.1	1.8	13.6	11.5	2.1	8.5	7.5	1.0	8.8	9.3	-0.5	2.2	2.1	0.1
banks	ATU	17.9	20.6	2.7	13.5	16.2	2.7	8.9	9.6	0.7	11.7	12.0	0.3	1.4	1.6	0.2
municipalities[a]	ATE			2.0			2.2			0.9			-0.3			0.1
Only	Not matched	27.5	18.0	9.5	21.7	13.6	8.1	15.0	9.0	5.9	10.0	11.7	-1.8	2.6	1.4	1.2
public	ATT	27.5	22.5	5.0	21.7	17.2	4.5	15.0	11.6	3.4	10.0	10.4	-0.5	2.6	2.4	0.2
banks	ATU	18.0	32.3	14.3	13.6	26.0	12.5	9.0	17.8	8.8	11.7	13.1	1.4	1.4	1.8	0.4
municipalities[b]	ATE			9.2						5.8			0.3			0.3
Private	Not matched	28.0	18.0	10.0	22.1	13.6	8.5	14.1	9.0	5.1	8.1	11.7	-3.6	3.6	1.4	2.2
and public	ATT	28.0	22.9	5.1	22.1	16.1	6.0	14.1	10.2	4.0	8.1	9.9	-1.8	3.6	3.6	0.1
banks	ATU	18.0	79.9	61.9	13.6	64.6	51.0	9.0	16.2	7.1	11.7	14.2	2.5	1.4	2.2	0.7
municipalities[c]	ATE			25.1			21.8			5.1			-0.3			0.3

APPENDIX C – Spatial Distribution of the municipalities of the treatment and control group after pairing

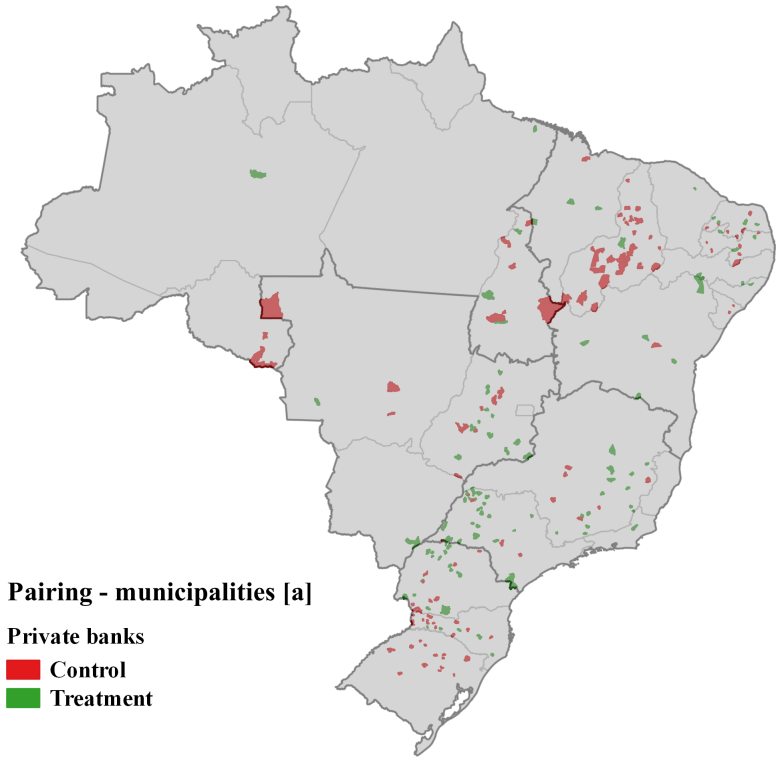

Figure 14 – Municipalities of treatment and control after pairing - private banks

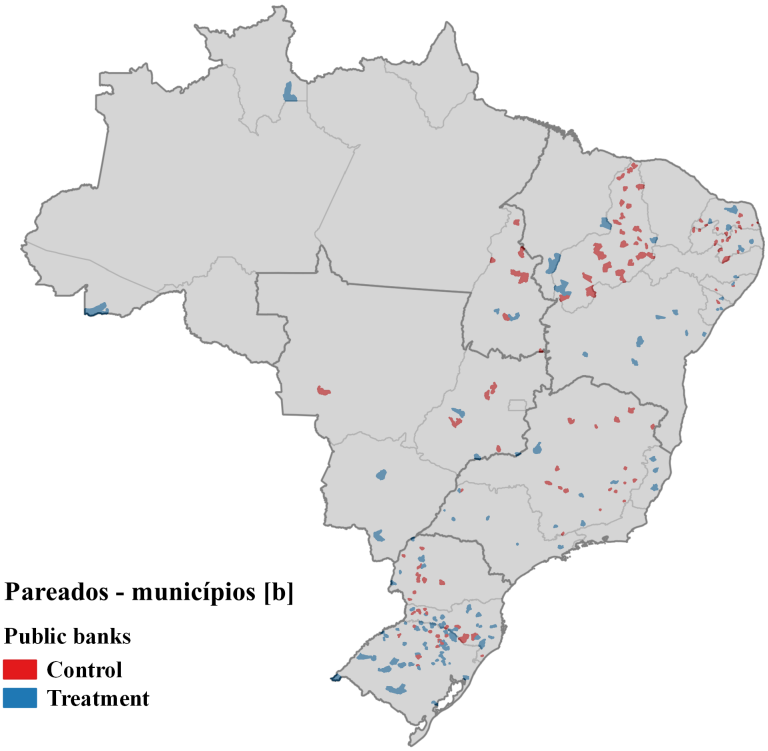

Figure 15 – Municipalities of treatment and control after pairing - bancos públicos

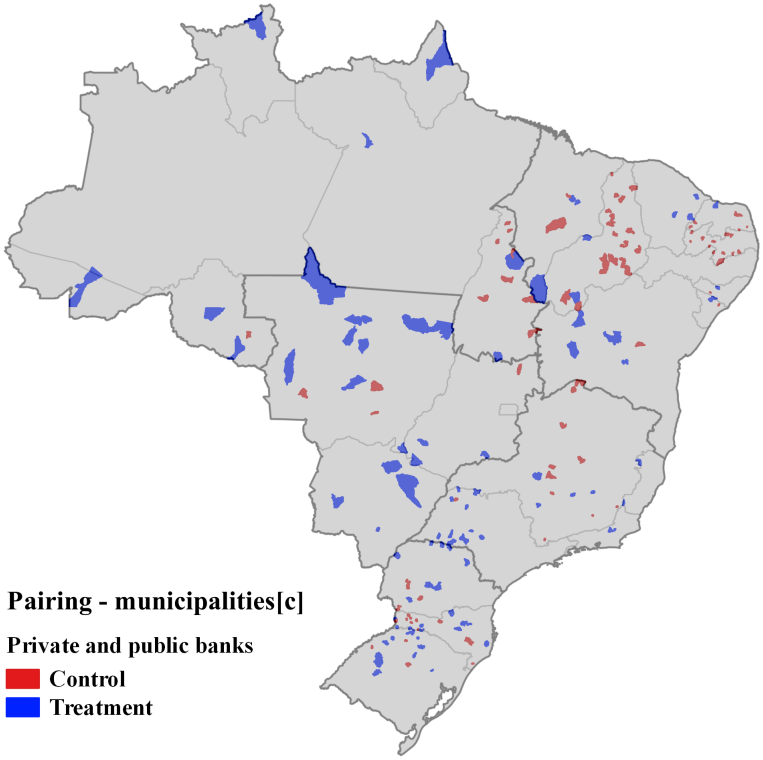

Figure 16 – Municipalities of treatment and control after pairing - private banks and public