Lending and regional growth in Brazil: the development bank BNDES versus private and public banks

Philipp Ehrl[1]
Greisson Almeida Pereira[2]
Vinícius Vizzotto Zanchi[3]

Abstract

The present paper distinguishes how the type of bank that provides loans is related to GDP *per capita* in Brazilian municipalities between 2007 and 2016. A unique data set allows us to discriminate between the effects of credits operated by either private or public commercial banks, and loans provided by the national development bank BNDES either directly or indirectly through accredited financial institutions. Using the system GMM estimator, we find that credit from public commercial banks has the highest effect on economic growth but it is concentrated in the most populated municipalities. Moreover, indirect BNDES loans show a robust and significantly positive relation to local GDP given that this lending facility especially targets firms in small, credit constrained regions, and it was provided non-cyclically.

Keywords

Development banks, State-owned banks, Regional growth, BNDES.

Resumo

O presente artigo distingue como o tipo de banco que concede empréstimos está relacionado ao PIB per capita nos municípios brasileiros entre 2007 e 2016. Um conjunto de dados único nos permite discriminar entre os efeitos de créditos operados por bancos comerciais privados ou públicos ou empréstimos pelo banco nacional de desenvolvimento BNDES fornecidos direta ou indiretamente por meio de instituições financeiras credenciadas. Usando o estimador do sistema GMM, encontramos que o crédito dos bancos comerciais públicos tem o maior efeito sobre o crescimento econômico, mas está concentrado nos municípios mais populosos.

[1] Professor Doutor – Universidade Católica de Brasília - Pró Reitoria de Pós-Graduação em Economia, End.: QS 07 - Lote 1 - EPCT – Bairro: Taguatinga – CEP: 71966-700 – Brasília-DF – Brazil.
   E-mail: philipp.ehrl@gmail.com – ORCID: https://orcid.org/0000-0002-6661-8976.

[2] Assessor – Banco do Brasil – End.: SAUN Quadra 5 Lote B - Torre, Central Edifício Banco do Brasil Bairro: Asa Norte – CEP: 70040-912 – Brasília-DF – Brazil – E-mail: greisson.gap@gmail.com
   ORCID: https://orcid.org/0000-0002-0928-1772.

[3] Assessor – Banco do Brasil – End.: SAUN Quadra 5 Lote B - Torre, Central Edifício Banco do Brasil Bairro: Asa Norte – CEP: 70040-912 – Brasília-DF – Brazil – E-mail: viniciuszanchi@gmail.com
   ORCID: https://orcid.org/0000-0003-4148-8340.

Além disso, os empréstimos indiretos do BNDES apresentam uma relação positiva robusta e significante com o PIB local, uma vez que essa linha de crédito visa especialmente empresas em regiões pequenas e com restrições de crédito e foi concedida de forma não-cíclica.

Palavras-chave

Bancos de desenvolvimento, Bancos estatais, Crescimento regional, BNDES.

Classificação JEL

E51, G21, O43.

1. Introduction

Public intervention in the financial sector and government ownership of banks continue to be remarkably widespread, especially in low- and middle-income countries. Based on seminal cross-country studies by La Porta et al. (2002) and Beck and Levine (2002), the World Bank concludes at the turn of the century that state participation should be reduced due to the "clear evidence that the goals of such ownership are rarely achieved, and that it weakens the financial system rather than the contrary" (World Bank, 2001: 2). A decade and a severe global financial crisis later, favorable evidence by Banerjee and Duflo (2014), Bertray et al. (2013) or McKenzie and Woodruff (2008) lead the World Bank (2013: 101) to the less rigorous proposition that "policy makers need to avoid the inefficiencies associated with government bank ownership by paying special attention to the governance of these institutions and ensuring, among other things, that adequate risk management processes are in place". A major criticism, as observed by Carvalho (2014), Omran (2007), Dinç (2005), Faccio (2006), among others, is that government owned banks' actions are inefficient, abused by politicians, turning banks less profitable than under private ownership. Yet again, Sztutman and Aldrighi (2019) do not confirm the political influence hypothesis using an RDD estimation with close election outcomes.

The present paper investigates how much lending by the national development bank BNDES contributes to economic growth in Brazilian municipalities, as compared to credit from public and private banks. We analyze the period from 2007 to 2016 using dynamic panel data models as in Valverde et al. (2007). Regarding public banks, we distinguish non-earmarked loans from the earmarked loans provided by the BNDES. Moreover, we sepa-

rate the BNDES loans according to whether they are granted directly by the BNDES or indirectly through an accredited financial intermediary. Our aim is to account for the broader mission of development and public banks, i.e., increasing social welfare, which is why we do not reduce banks' lending efficiency to profits, but rather we focus on GDP *per capita* in municipalities. We also address the question of which target group of firms and municipalities are associated with the largest (relative) returns in terms of growth rates. The latter issue is particularly relevant in the presence of market failures (asymmetric information, uncertainty, agency problems, high transaction costs and imperfect competition) and when local capital markets are not sufficiently developed (Valverde et al., 2007). These circumstances describe the credit market in Brazil quite well and, therefore, the activities of financial intermediaries give rise to the expected monetary non-neutrality and the nonuniform growth effects, see Klagge and Martin (2005).

Surprisingly, there are very few papers that compare the effectiveness of credit from different sources within a single comparable institutional and cultural context. Our results thus complement the cross-country studies of Bezemer et al. (2016) and Beck et al. (2014) that distinguish between the growth effects of private and public credit. An advantage of subnational studies is the avoidance of the omitted variable problems pervading the cross-country literature (Kendall, 2009). Other studies that distinguish between private or public capital control by Berger et al. (2008), Cole (2009) and Omran (2007) analyze bank performance in China, India and Egypt, respectively. Yet, to the best of our knowledge, the present paper is the first to separate the effects of private banks, public banks and different credit lines from the national development bank (NDB). When NDBs are analyzed, as in Ru (2018) or Carvalho (2014), results are typically not compared to other type of banks and the focus is on political economy issues.

The BNDES, as one of the largest NDBs in the world, is a particularly interesting object of study and previous evidence regarding its usefulness is ambiguous. The size of its balance sheet relative to the Brazilian GDP tripled since the beginning of the new millennium and reached a peak height of 11% in 2015. In 2014, the BNDES disbursed a total of US\$ 107 billion[1], equal to three times the disbursements of the World Bank's lending arms, the IBRD and the IDA. The BNDES' expansion gained pace as of 2008 when it was used as an instrument to counteract the credit

---

[1] Throughout the paper, we use the OECD's PPP exchange rate from 2017, equal to 2.024, to convert Brazilian Reais (R\$) into US Dollars.

shortage of private banks during the looming financial crisis. The BNDES does not have physical branches and thus operates with direct and indirect loans. The main difference is that the latter have a maximum value and are provided through accredited financial institutions, which assume the default risk. As far as we know, this paper is the first attempt to provide a regional analysis of the BNDES' impact on economic growth in the aftermath of the financial crisis.

The following two papers are particularly close to ours, but contributions differ. Usai and Vannini (2005) distinguish between the effects of lending from several categories of banks on regional growth in Italy. They find that cooperative banks and special credit institutions play a positive role, whereas public and large private banks do not. A commonality with our results is that the favorable results of the two former types of institutions can be explained by their support to SMEs. Similarly, Meslier-Crouzille et al. (2012) observe that the share of rural banks is positively related to regional development in the Philippines and that the less developed the region, the stronger the effect is. In contrast to the present setting, the authors do not account for the potential endogeneity of lending and both papers also do not check how the (local) business cycle affects the results. The temporal and geographical coverage obviously differ as well.

Previous evidence on the performance of the BNDES is mixed. On the positive side, Cavalcanti and Vaz (2017) find that BNDES loans raise investment and productivity among SMEs. Our results are in line with Ehrl (2021) who shows that it is not a favorable interest rate that matters most but rather the emergency supply of external finance when and where it is most scarce. The author's main finding is that the receipt of (direct as well as indirect) BNDES loans increase the survival probability of firms by about 25% whereas other details of the loan contract are of minor importance. On the negative side, our evidence corroborates the work of Lazzarini et al. (2015) and Bonomo et al. (2014) who find no evidence that BNDES' loans affect performance, output growth and investment of listed companies. The authors confirm that the targeted firms do not suffer from credit restrictions. Our paper suggests that BNDES' loans can be effective, however, once credit constrained regions and firms are the recipients. In fact, according to Musacchio et al. (2017), this focus on smaller firms would be consistent with the operations of other development banks, such as the NDBs in Canada or Chile.

Our results are also related to other regional approaches that investigate growth effects of different financial topics such as local financial development (Kendall, 2009), banking competition (De Gueva and Maudos, 2009 and Burgstaller, 2013), financial innovation (Valverde et al., 2009) or credit demand (Crocco et al., 2014). Randomized field experiments or natural experiment settings typically do not compare different lending mechanisms, but they provide solid evidence on the effectiveness of a single program. An important insight from Karlan and Zinman (2009), McKenzie and Woodruff (2008), Banerjee and Duflo (2014) and Tarozzi et al. (2015) is that credit availability spurs real investment, profits and economic activity, principally among financial constrained firms.

The paper is divided into five more sections. The following section gives an overview of the BNDES' role in the Brazilian banking system. Section 3 describes the data sources and empirical strategy. Section 4 presents the results and interprets the coefficients in a simple cost-benefit analysis. Section 5 discusses the results in light of different theories regarding the question why differences between the credit from private and public banks exist. Section 6 concludes.

2.   The Brazilian Development Bank BNDES

The National Bank of Economic Development (BNDE) was created in 1952 and in 1982 its name was changed to National Bank of Economic and Social Development (BNDES). The idea was that the institution, besides financing the projects, would have a governmental role, being the long-term investment planner in the country, something that had not been carried out by any organization in Brazil. In the 1960s, the government created specific departments to address (public) infrastructure projects throughout the country. As a result, the BNDES began to reduce its share in this sector and was able to expand its activities in the private market which, hitherto, was a relatively neglected segment. At the end of the decade, financing of the private sector ended up surpassing that of the public sector with emphasis on base industries and inputs such as steel, petrochemicals, pulp/paper, and cement, among others (Paiva, 2012).

The BNDES' main funding source is the Worker's Support Fund (FAT), which transfers 40% of what it collects, among others, from social contri-

butions owed by legal entities to the Social Integration Program and the Public Servant Heritage Formation Program (PIS / PASEP). These funding flows are guaranteed by the Brazilian Constitution and thus remain quite stable over time. Another, volatile source of funding stems from the National Treasury, being subject to policy targets and public budget restrictions. Finally, the BNDES can use its own resources to supply loans.

Currently, the bank does not have physical branches and operates with direct and indirect loans. In direct loans, the applicant must apply for funding directly to the BNDES and the amount demanded, in general, cannot be less than US$ 4.9 million (R$ 10 million). The same value is the maximum amount for indirect loans which are provided through accredited financial institutions. The BNDES has a wide range of different types of credit, depending on the purpose of the funds. Within these credit lines the granting can be direct or indirect. The major distinction between the two modalities analyzed here is thus not the purpose of the loan but rather its volume, granting procedure and its implementation.

To receive an indirect loan, the borrower must apply for financing at one of the financial institutions accredited to the BNDES (financial agent). These financial institutions, which process and assume the risk of these financing operations, have their own policies and rules for granting credit. The net of accredited financial agents is wide and comprises public as well as private commercial banks, among others. Following their risk analysis standards, they can approve the operation as requested by the client or change it in value (percentage of financing) and terms, in compliance with the maximum limits determined by BNDES, other rules and regulations of the Central Bank, and the applicable law. It is these institutions that also define the guarantees of the operation.

In addition, to carry out the loan, commercial banks add a remuneration rate to the BNDES base interest rate, which reflects the credit risk assumed by accredited financial institutions in indirect operations, as well as the remuneration of their activities. Remuneration is determined by the financial institution's own criteria at the time of the transaction, and its value is negotiated between the institution and the client. In other words, in addition to benefiting from the capillarity of commercial banks, the BNDES transfers the risk of default.

The BNDES' disbursements evolved gradually from 2000 to the pre-crisis international financial period. At that time, the bank was used as a counter-cyclical instrument in order to fill the credit shortage of private banks. To this end, the National Treasury made steady financial contributions to the institution until it became the foremost source of funds in 2009 (World Bank, 2013). According to the BNDES, it received about $ 216 billion between 2008 and 2014. However, a severe economic recession began in 2014 and hit Brazil with negative growth rates of below 4% in 2015 and 2016. The consequent deterioration of the government budget forced the National Treasury to consolidate its resources, and the BNDES' borrowing capacity fell sharply.

Basically, the BNDES has been lending money at interest rates tied to the Long-Term Interest Rate (TJLP) plus an idiosyncratic risk premium, while the public bonds issued by the Treasury which were used to transfer the US$ 216 billion to the bank are paid at the considerably higher Selic rate generating an opportunity cost in the fiscal accounts called "implicit subsidy". In 2016, for example, while the TJLP was 7.50% per year the Selic was 14.25% p.a. According to the report of SEAE (2017), between 2008 and 2016 the implicit subsidies related to government transfers to the BNDES reached R$ 185 billion.

According to data from BNDES, in 2018 agriculture, commerce and services, and industry were granted 20% each while infrastructure received 40% of all disbursements. In addition, around 80% of the loans were directed towards medium and large companies. See Barboza et al. (2019) for more details about the development of the BNDES credit composition over time.

3.   Methodology and data

3.1. Motivation

The aim of the present paper is to test whether the type of bank that provides loans is related to GDP *per capita* in Brazilian municipalities. This section presents theoretical arguments and key empirical findings that define basic hypotheses and guide our estimation.

The key mechanism that links credit supply to economic growth is that financially constrained firms rely heavily on external finance (Beck & Levine, 2002). Providing additional credit in a constrained market allows firms to grow and entrepreneurs to enter the market. Given that in Brazil, as well as in any other developing country with notoriously high interest rates, firms are credit constrained (Levine, 2005 Crocco et al., 2014), higher credit supply should lead to non-negative growth effects. The first general hypothesis is thus:

H1: Higher lending has a non-negative effect on economic growth.

According to this bank-based view, the role of the financial intermediary regarding screening, evaluating and pricing of investment projects is crucial. Especially in the presence of market failures such as asymmetric information, uncertainty, high transaction costs and low competition in the localized financial market, the type of bank could make a crucial difference regarding the allocation of credit to the real economy (Valverde et al. 2007, Stiglitz, 1995). In general, banks may also differ regarding interest rates of loans and the extent they provide firms with technical assistance, funding of intangible resources, cash flow buffers, etc. (Sapienza, 2004) Public banks, including the BNDES, are likely to generate more positive growth effects because their target function is not bound to profit making but it includes social well-being. For example, NDBs can give preference to certain sectors that are more sustainable or subject to positive externalities, such as infrastructure, or utility companies (Griffith-Jones, 2016).

H2: Lending from public banks provides a more positive growth stimulus as compared to lending from private banks.

Yet public banks and the BNDES may not necessarily show the same behavior since the latter has the advantage of having access to government backed resources. Especially during a period of financial distress, private and public commercial banks may find themselves in the need to reduce credit supply as a consequence of lacking resources (Bertray et al., 2014, Griffith-Jones, 2016). Differences between the public commercial banks and the NDB may still arise due to the purpose of the loan, among others. Whereas the BNDES' loans are primarily targeted to fund productive investments, the non-earmarked loans obviously include many other purposes, as well. Even though the four type of banks are not directly comparable to each other, the comparison between them is still insightful in its

own regard and the growth effect of public commercial banks may serve as a baseline floor that public banks should surpass. These arguments can be resumed to the following two hypotheses:

H3: Lending from the BNDES provides a more positive growth stimulus when the economy is under distress.

3.2. Estimation strategy

Our empirical analysis of the impact of different sources of credit on municipalities' GDP *per capita* is based on the well-known dynamic panel model and the system GMM estimator from Blundell and Bond (1998) as in Valverde et al. (2007). According to the authors, this approach is superior in terms of consistency and efficiency compared with other cross-section and/or instrumental variable alternatives. The choice of variables is motivated by the Cobb-Douglas production function where all variables are already transformed in *per capita* stocks. That is, the dependent variable y_{it} is the GDP *per capita* of municipality i in year t and the vector of explanatory variables X_{it} includes the following six *per capita* terms: physical capital, a measure for human capital, the stock of non-earmarked credit in public banks as well as in private banks, direct and indirect earmarked credit stocks provided by the BNDES. a_i and b_t represent municipality and time fixed effects (FE) and v_{it} is the error term. The strong persistence of GDP as well as the regular fluctuations over the business cycle disqualifies the use of a static panel model from our point of view. Yet the inclusion of at least one lag of the dependent variable is more common in country-level studies than in the regional context. Due to the dynamic nature of eq. (1), the model is only capable of identfying immediate, short-term effects of credit supply.

$$y_{it} = \rho y_{it-1} + \beta X_{it} + a_i + b_t + v_{it} \tag{1}$$

While the motivation for human and physical capital in eq. (1) is straightforward, the credit composition component deserves some comment. The specification allows the composition of credit to affect GDP through the technological component in the production function. Since we are already considering the level of physical capital in each region, the amount of credit from either private banks, public banks or the BNDES represents possible advantages beyond the acquisition of physical means of production

that firms display as capital in their balance sheets, as explained in the previous section.

The empirical approach in eq. (1) overcomes many of the difficulties associated with the identification of growth effects from the receipt of loans. First, the study of a single integrated financial market, with a homogeneous institutional and cultural environment avoids the omitted variable bias present in cross-country analyses. Municipality fixed effects (FE) further eliminate all kinds of time-invariant factors that determine the economic growth of regions. In the present context of productive credits the municipality FE also account for the time-invariant composition of firms within regions which is particularly important because some firms have better relations to financial institutions, including the BNDES, than other firms. To account for further dynamic effects caused by firm entry and exit, we also control for firm turnover.

Second, time effects control for the national business development but the inter-state or even inter-municipality business cycle may diverge from the national trend. Since one lag of GDP may not be sufficient to capture the entire and possibly heterogeneous business cycle of municipalities, we also include up to three lags in a robustness check as in Acemoglu et al. (2019).

Third, the system GMM estimation according to Blundell and Bond (1998) avoids the bias from contemporary shocks and the reverse causality between GDP and credit stocks by using lags in differences and levels as instrumental variables for endogenous variables in the model. Their estimator is consistent for data with high temporal persistence (in contrast to the estimator proposed by Arellano and Bond (1991)) and for dynamic models with a finite number of observation periods and it overcomes the Nickel bias of order $1/T$ in the within estimation. In line with Beck et al. (2014) and Roodman (2009), we limit the number of instruments in order to prevent over-fitting, weakened over-identification test statistics and imprecise variance estimates. Assuming the absence of serial correlation in the error term, a condition which is clearly rejected in the present estimations, implies the following moment conditions

$$E[\Delta v_{it}, (y_{it-s}, X_{it-s})] = 0 \, \forall s \geq 2 \tag{2}$$

That is, we treat lagged GDP and all of the explanatory variables as potentially endogenous. The large number of Brazilian municipalities puts us in

a more comfortable position than country-level studies as the remaining bias of order 1/N in the system GMM estimation becomes negligible. Another important condition that needs to be verified is the near-unit root dynamic of the GDP process. The null hypothesis of ρ=1, however, can also be rejected comfortably in our data.

Forth, our data includes all BNDES loans, non-earmarked loans from nearly every financial institution in the country. As borrowing from the BNDES or commercial banks requires some sort of official document, informal firms naturally face more severe credit restrictions and difficult access to credit. The share of the informal market is quite high in Brazil, however (Ulyssea, 2018, Ehrl and Monasterio, 2019). Consistently, neither of the remainder variables (GDP, capital stock etc.) include the activity in the informal market. In the present context, this omission could bias our estimates if higher informality is both associated with higher formal economic activity and higher credit supply. Yet, the use of lagged variables as instruments mitigates this concern.

3.3. Data

The analysis of lending in Brazilian municipalities is limited to the period from 2007 to 2016 by the availability of the BNDES data series (since 2007) and the latest information available for the municipalities' GDP (in 2016). Table 1 describes the variables used, their sources and presents the basic summary statistics. All variables were relativized in *per capita* terms[2] and the monetary data were brought to 2017 prices by the Extended Consumer Price Index (IPCA).[3] The amount of human capital used in the production is proxied by the share of formal workers with at least secondary education. Due to the absence of official or administrative information at the municipality-level, we also need to construct a measure for physical capital. To calculate the physical capital, we use the average gross fixed capital formation in formal enterprises in each municipality. This variable is calculated by the mean of the GFCF by establishments in the country multiplied by the number of formal companies in each municipality, provided by the Ministry of Labor and Social Security (MTPS).

---

[2] Considering the population of municipalities in each year according to data from the Brazilian Institute for Geography and Statistics (IBGE).
[3] The IPCA is the reference index for inflation in Brazil.

The information about the stock of credit offered by state-owned banks and private banks is taken from the Monthly Banking Statistics by municipality (Estban), collected and published by the Brazilian Central Bank (BACEN). To avoid duplication of information with the indirect earmarked credit provided by the BNDES, we only use non-earmarked loans from commercial banks.

Earmarked credit refers to financing with a specific destination, aimed at medium- and long-term investment. The earmarked loans from the BNDES are grated at subsidized interest rates. On the other hand, non--earmarked credit operations have interest rates freely agreed between borrowers and financial institutions. As resources for non-earmarked credit are not subsidized, their interest rates are usually much higher than those for earmarked credit. In general, earmarked credit to companies covers, for the most part, BNDES operations, in addition to rural loans, real estate and other government programs offered by public commercial banks. That is, even though the sample comprises the credit operations of other state-owned commercial banks in Brazil, including regional development banks, we use as a comparison to BNDES only transactions with freely negotiated rates. In this way, even though public commercial banks may have a social mission alike the BNDES, we only consider operations in which these institutions seek greater profitability and are more affected by cyclical movements. For a comparison between the BNDES and another arge regional development bank (the BNB), see Ehrl and Portugal (2021).

Table 1 - Description, source and aggregate values of the variables

Variable	Description	Source	Mean	Std. Dev.
GDP	Log of GDP *per capita* (in R$ 1,000)	IBGE	2.956	0.690
physical capital	Log of physical capital *per capita*. Calculated based on the GFCF by establishments in the country multiplied by the number of establishments in each municipality.	MTPS	1.529	0.865
human capital	Log of human capital. Percentage of the number of formal workers with at least complete secondary education.	MTPS	-0.603	0.271
public credit	Volume of non-earmarked credit stock *per capita* offered by public banks in R$100,000.	BACEN	0.004	0.031
private credit	Volume of non-earmarked credit stock *per capita* offered by private banks in R$100,000.	BACEN	0.011	0.010
BNDES direct	Volume of direct credit stock *per capita* offered by the BNDES in R$100,000.	BNDES	0.008	0.078
BNDES indirect	Volume of indirect credit stock *per capita* offered by the BNDES in R$100,000.	BNDES	0.019	0.037

Figure 1 displays maps with the geographical distribution across munici-palities of the four types of credit used in this study. It becomes apparent that private lending is much more concentrated than public lending. On the one hand, this occurs because private institutions can be primarily found in larger and higher-income cities. On the other hand, state-owned institutions also serve a wider social purpose, installing bank branches even in locations where a lower profit margin is expected.
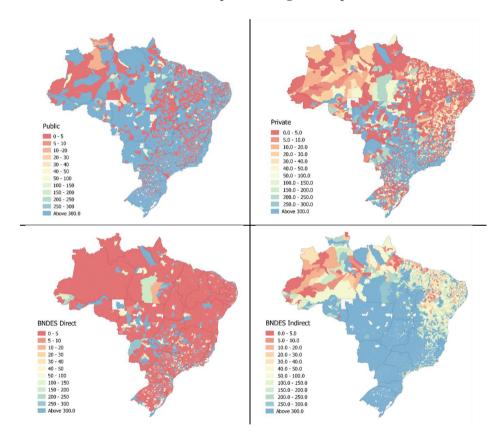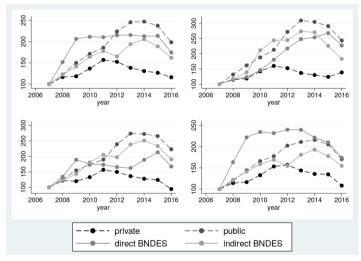

Figure 1 – Mean Credit stocks by municipality 2007-2016

Notes: The scale represents the size of the average credit stock per capita in R$ in each municipality and each of the four different credit types considered here, namely credit from public banks (excluding the BNDES), private banks and the BNDES' direct and indirect credit. That is, municipalities in the highest group, above 300, have an average credit value of over R$ 300 per individual.

Figure 1 also reveals that a considerable fraction of municipalities presents credit stocks equal to zero, most likely because these locations do not host public or private banks agencies.[4] These zero values impede us to apply the logarithmic transformation and we prefer to work with the four types of credit stocks in 100,000 Brazilian Reais *per capita*. To be precise, 52% of all municipalities show zero private credit stocks over the entire period 2007–2016, whereas regarding public credit, the share is equal to 41%. In sharp contrast, there are only 40 municipalities, i.e., less than 1% of municipalities without any type of credit. This comparison shows the virtually nationwide coverage of indirect BNDES loans. Despite their ample supply, indirect loans show a lower intensity in the North and Northeast regions. The lower credit values may be explained by the relatively lower income and productive capacity in these two regions. The same observation applies to the distribution of private credit. Finally, the direct BNDES loans are the ones with the highest spatial concentration, which is not surprising, given that this type of credit has a minimum volume of R$ 10 million and is thus mostly available to large companies, which tend to be located in agglomerations.

Figure 2 – Evolution of credit stocks by municipality type and source 2007-2016

Notes: The vertical axis displays the level of credit stock in each of the four modalities relative to their level in 2007 which is normalized to 100. The upper graph on the laft hand side shows the aggregate values for Brazil. The upper graph on the right hand side refers to loans in the largest municipalities with a population above 100,000 inhabitants, as defined in table 3. The lower graph on the left and on the right refer to middle and small sized municipalities, respectively.

---

[4] Since the credit data of the Central Bank of Brazil is accurate, the values can be regarded as true zeros, not missing information. The absence of any kind of bank is plausible due to the large number of cities have low population, high poverty, and crime, doing the presence of the bank branch unprofitable.

Figure 2 shows the evolution of credit stocks over time in Brazil and in each of the three municipality types, being of large, medium-sized and small population size. It becomes clear that during the years when the Brazilian economy suffered the most distress, i.e. during the global financial crises from mid 2007 to early 2009 and during the economic downturn beginning in 2014, private credit stock either shrunk or grew less compared to the other three credit sources. These differences apply to municipalities, albeit the least differences are observed in large municipalities, at least during the global financial crisis. Overall, figure 2 confirms the anti-cyclical movement of loans from public banks, including the BNDES.

4.   Results

4.1. Baseline results

This section presents how credits from either public, private or the national development bank BNDES are related to the GDP in Brazilian municipalities over the period 2007–2016. At first, we estimate equation (1) using the system GMM technique. The results of the baseline specification are displayed in column (2), table 2. In this estimation, all explanatory variables are instrumented by their second, third and fourth lag to avoid an endogeneity bias. The AR(2) test statistic at the bottom of the table clearly supports the notion that instruments from the second lag on can be considered exogenous. Furthermore, we constrain the sample to municipalities that host at least one public or private bank. There are still 3360 of those municipalities with a positive amount of credit stock over the entire observation period. Having explained the baseline results, we provide a discussion about how different specifications affect the outcome, and we provide a justification for our choices.

The coefficients in column (2) show that the credit stock in both private and public banks are positively related to the level of GDP. Across all specifications in table 2, the influence of public banks is clearly higher than that of private banks. Column (2) also indicates that the indirectly operated BNDES loans are more effective than the direct ones. Whereas the magnitude of the indirect loans is in between those of public and private

banks, the coefficient of direct BNDES loans remains statistically insignificant. The point estimates indicate that an increase in indirect BNDES loans by R$ 10,000 *per capita* should increase local GDP *per capita* by 3.1%.

Table 2 – Credit stocks and GDP *per capita*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.GDP	0.903***	0.914***	0.900***	0.905***	0.931***	0.905***	0.892***	0.910***
	(0.018)	(0.016)	(0.013)	(0.020)	(0.015)	(0.014)	(0.021)	(0.018)
physical capital	0.042***	0.037***	0.044***	0.046***	0.025**	0.041***	0.041***	0.041***
	(0.010)	(0.009)	(0.006)	(0.011)	(0.010)	(0.008)	(0.011)	(0.008)
human capital	0.022	0.017	0.005	-0.008	0.010	0.019	0.018	0.019
	(0.015)	(0.016)	(0.012)	(0.019)	(0.017)	(0.016)	(0.016)	(0.017)
private credit	0.178***	0.159***	0.184***		0.088**	0.173***	0.193***	0.173***
	(0.066)	(0.057)	(0.061)		(0.040)	(0.056)	(0.064)	(0.060)
public credit	0.807***	0.530**	0.600***		0.498**	0.579**	0.688***	0.528**
	(0.247)	(0.225)	(0.201)		(0.222)	(0.229)	(0.256)	(0.215)
BNDES direct		0.062	-0.001	-0.010	-0.034	0.062	0.104***	0.060
		(0.045)	(0.045)	(0.056)	(0.059)	(0.039)	(0.039)	(0.044)
BNDES indirect		0.310***	0.240***	0.153	0.300*	0.306***	0.517***	0.310**
		(0.104)	(0.092)	(0.238)	(0.155)	(0.089)	(0.110)	(0.122)
AR(2) test p-val.	0.505	0.487	0.765	0.148	0.496	0.486	0.474	0.486
# of groups	3360	3360	5504	1823	3360	3360	3360	3360
Obs.	30240	30240	49536	16407	30240	30240	30240	30240
Instruments for credit stocks	lags 2-4	lags 2-4	lags 2-4	lags 2-4	lags 2	lags 2-6	none	lags 2-4

The dependent variable is log GDP per capita. The coefficients are obtained using the system GMM estimator which uses levels and first differences in lags as instruments for all explanatory variables in the table. "L." refers to variables with a one year lag. All specifications also include municipality and year fixed effects. The default in columns 1, 2 and 5 to 8 is to include municipalities that show a positive number of public or private credit stock. The regression in column 3 includes all municipalities while columns 4 is based on municipalities that do not host both private and public banks. The last line indicates which lags are used as instruments for the credit stock variables Except for column (7), lagged GDP and the two capital variables also use the same type of lagged IVs. The estimation in column 8 adds the number of firms in each municipality and years to the baseline specification in column 2. Municipality clustered standard errors are in parentheses. * indicates $p < 0.10$, ** $p < 0.05$ and *** $p < 0.01$, respectively.

The remainder estimations in table 2 represent robustness checks for the baseline results. Column (1) shows that without considering the credit provided by the BNDES, the effect of the other variables is biased upward. The bias is strongest in case of public banks which suggests that municipalities that receive large amounts of indirect loans also have a good coverage by public banks but not by private banks. The potential overestimation by 50% for the impact of lending from public banks demonstrates how important it is to include the participation of the BNDES in evaluations of the Brazilian banking system.

The estimations in columns (3) and (4) vary the composition of municipalities. In comparison to our preferred specification without the zero-credit regions, it is reassuring to see that the results regarding the non-credit variables are highly similar. Once all Brazilian municipalities are included in column (3), the effect of the four types of credit stocks is different. Yet, by definition, nonexistent credit stocks in municipalities without a public nor private bank cannot cause growth effects. The excessive number of zero credit stocks seems to be related to lower GDP growth, leading to upward biased coefficients for public and private lending. Column (4) shows that even the BNDES loans do not significantly impact the GDP of regions without public and private credit stocks, suggesting that either the productive capacity is extraordinarily weak and/or the lack of a financial intermediary is a major obstacle for firms to access BNDES loans. These observations lead us to the conclusion that municipalities without bank branches cannot be representative in a study on the effects of credit composition and that these municipalities rather distort than complement our estimations.

Next, we alter the number of instruments for each endogenous variable in columns (5) and (6). Including more or less lags hardly changes the estimated coefficients and thus leads to the same conclusions. However, the estimations suggest that increasing the number of internal instruments decreases the standard errors relative to the size of the coefficients and thus may lead to overconfident conclusions. Considering the credit stocks as exogenous variables in column (7), i.e., not using lagged instruments at all, however, leads to significantly higher point estimates. This upward bias can be explained by the positive correlation with contemporaneous (demand) shocks and the expected (positive) reverse causality between GDP and credit stocks. It thus seems to be more appropriate to consider all variables as endogenous in the present case.

In the last column of table 2, we add the number of firms per municipality-year to the baseline model in column (2). The coefficients of this new variable are insignificant and those of the remaining variables change very little. This exercise shows that the relation between credit stocks and GDP growth is not driven by firm turnover and the associated de- or increase in loans of exiting or entering establishments.

The results in the eight different specification in table 2 sustain the high persistence but not explosive effect of the lagged dependent variable showing significance in all models with a coefficient above 0.89 but still considerably below 1. In addition, the data also confirm the expected positive relation between fixed capital and GDP while our proxy for human capital, although positive, shows no significance.[5] Note that the coefficients of both types of capital cannot be compared to the well-known elasticities from the Cobb-Douglas production function, because we transformed the equation in *per capita* terms. In fact, the coefficients of human and physical capital are in line with Lima and Silveira Neto (2016).

4.2. Results by municipality size

Our aim in this section is to further explore the regional aspect of the previous results and hence we investigate potential heterogeneous effects across the size distribution of municipalities. It is particularly interesting to find out why public banks and indirect BNDES loans stimulate economic growth more than lending from private banks.

If, on the one hand, the benefits for the recipients are related to either the quality of the banks' services, their average interest rates, or whether credits are earmarked or not, one should observe the same positive effects in all municipalities. While we cannot discriminate between these three potential explanations, they lead to the same outcome and, at least, can be tested altogether.[6]

---

[5] This lack of significance may be due to the fact that we do not control for differences between sectors (many of the sectors, especially services rely heavily on low-skilled labor), or due to the generally still low levels of high-skilled workers. Measurement error and the fact that this variable only refers to workers in the formal labor market are also likely to bias the coefficient of human capital towards zero.

[6] Our interpretations would be compromised if quality of bank services, interest rates or other financial characteristics vary systematically between large, medium-sized and small municipalities. BNDES loans indeed tend to be more favorable for small firms, the opposite is true for loans from

If, on the other hand, the previous results are related to financial constraints, one would expect to find regional differences. The relief of constraints should lead to stronger real growth in locations where credit and intermediaries are rare and where the proper characteristics of firms hamper their financing options. Specifically, the lack of adequate collateral and other risk related factors result in larger difficulties for small firms to obtain loans (Gertler and Gilchrist, 1994). Moreover, the use of direct financing facilities such as equity or bonds is easier for larger firms. Another hypothesis we can evaluate is that the growth effects may be related to the interaction between the local business cycle and bank's credit supply.

For a first approximation, table 3 presents descriptive statistics concerning the distribution of credits and firm size across regions of different population size. According to the classification by the IBGE indicated in column (2) of panel A, we distinguish between large, medium and small municipalities. The distribution across the three classes of regions differs between all four types of loans but the divergence for private credit and indirect BNDES loans is outstanding. Private credit stock is primarily concentrated in municipalities with more than 100,000 inhabitants where it is equal to R$ 2,311 *per capita* compared to only R$ 382 and R$ 216 in medium and small municipalities, respectively. Public credit also tends to accumulate in more populated regions, but the difference is less striking. Loans by the BNDES, principally the indirect ones, show the opposite pattern. The *per capita* amount of indirect loans in municipalities with up to 20,000 inhabitants is R$ 2,320 while the average in large and medium regions is about half of this value. Direct BNDES loans show the highest concentration in medium-sized regions but, although significant according to a Wald test, the differences are no larger than R$ 240 *per capita*.

Panel B in table 3 supports the notion that Brazilian firms in small municipalities are more credit constrained than their competitors in more populated regions. A disproportionately large share of all firms (49%) in small municipalities are micro-enterprises with less than 5 employees, as compared to 27% and 39% in large and medium-sized regions, respectively. Vice versa, the share of large firms in the most populated municipalities is at least twice as high as in the two other classes of municipalities.

---

private institutions. As such differences would tend to cancel out. After all, we cannot rule out alternative explanations completely due to lack of data but, in our view, the financial restrictions explanation is the most compelling with respect to the differences between agglomerations and peripheral regions.

Table 3 – Distribution of loans and firms across municipalities by size

Municipality class	Population range (thousand)	population mean	private credit	public credit	direct BNDES	indirect BNDES
A) Distribution of population and loan characteristics						
large	100+	376,755	2,206	1,675	683	1,298
medium	20–100	40,556	373	1,226	820	1,336
small	Until 20	10,381	212	968	747	2,320
B) Distribution of firms by size						
Mun. class	[0 , 5 [	[5 , 10 [	[10 , 20 [	[20 , 50 [	[50 , 100 [	[100, 100+ [
large	0.27	0.20	0.18	0.17	0.08	0.10
medium	0.39	0.22	0.16	0.13	0.05	0.05
small	0.49	0.21	0.13	0.10	0.04	0.03

In panel A, columns 1 and 2 define the three municipality size classes according to the indication by the IBGE. Columns 3 to 7 present the average values of population size and the four type of credit stocks in the municipality size classes in the sample of municipalities with either a public or private bank.

In panel B, column 1 refers to municipality size classes and row 1 defines the classes of firm sizes according to the number of full-time employees. The remaining cells indicate the share of firms in each of these municipality-firm size combinations,where the shares in each row sum up to one.

Table 4 presents regressions where the sample is divided according to the three size classes of municipalities. For the sake of space, the coefficients for human and physical capital are omitted. Focus first on columns (1), (3) and (5) where the specification is exactly as in our baseline regression. The only variable that is statistically significant in all three regressions is lagged GDP. In line with the descriptive statistics in table 3, the results for the credit types in the three municipality size classes show substantial heterogeneity.

Indirect BNDES loans and loans from public banks only have a relevant relation to economic growth in the smallest municipalities. The coefficients are close to the ones in the complete sample. As in table 2, direct BNDES loans remain without any relevant relation to the growth of municipalities of whichever size. The only type of credit that has a significant, albeit small, effect on GDP in the most populated regions stems from private banks. According to column (1), an increase in private credit equal to R$ 10,000 *per capita* is associated with a GDP *per capita* growth of only 0.6% in the largest municipalities, while the same increase should raise GDP p.c. by 15% in the smallest municipalities. These observations clearly support the view that firms in smaller municipalities find it particularly

difficult to obtain external finance, and that additional credit stimulates local GDP. Within this group of municipalities, loans from private banks seem to be more effective than those of public banks or the BNDES.

Table 4 – Results by municipality size group

mun. size:	(1) large	(2)	(3) medium	(4)	(5) small	(6)
L.GDP	0.951***	1.353***	0.935***	0.961***	0.862***	0.827***
	(0.014)	(0.120)	(0.014)	(0.079)	(0.030)	(0.059)
L2.GDP		-0.294*		-0.054		0.120**
		(0.177)		(0.072)		(0.059)
L3.GDP		-0.097		-0.039		-0.045
		(0.080)		(0.061)		(0.040)
private credit	0.057***	0.042***	0.571	0.810	1.534**	0.777
	(0.017)	(0.016)	(0.491)	(0.559)	(0.666)	(0.799)
public credit	-0.182	0.081	0.152	-0.555	1.070**	0.159
	(0.270)	(0.280)	(0.307)	(0.474)	(0.435)	(0.537)
BNDES direct	0.106	0.088	0.053	0.122***	0.024	0.069
	(0.102)	(0.078)	(0.035)	(0.040)	(0.063)	(0.080)
BNDES indirect	0.082	0.086	0.044	0.264	0.404**	0.350**
	(0.228)	(0.224)	(0.222)	(0.245)	(0.162)	(0.161)
AR(2) test p-val.	0.149	0.558	0.084	0.761	0.625	0.214
# of groups	311	309	1,404	1,380	1,850	1,816
Observations	2,587	2,052	11,712	9,155	15,941	12,313
Instruments	lags 2-4	lags 5-7	lags 2-4	lags 5-7	lags 2-4	lags 5-7

The dependent variable is log GDP per capita. The coefficients are obtained using the system GMM estimator which uses levels and first differences of two to four year lags as instruments for all explanatory variables in the table. "L." refers to variables with a one year lag. All specifications also include municipality and year fixed effects, as well as physical and human capital variables. Municipality clustered standard errors are in parentheses. * indicates $p < 0.10$, ** $p < 0.05$ and *** $p < 0.01$, respectively.

In order to shed more light on the potential reasons for the observed heterogeneities across regions, we present another extension of the scenario above. The regressions in columns (2), (4) and (6) include the second and third lag for the municipality's GDP. The idea is that these additional autoregressive components provide an approximation of the local business cycle. This extension serves as an additional robustness check and shows that it is not the autonomous medium-term business cycle that is driving the observed growth effects but indeed the credit supply. When banks adjust their future lending behavior to current shocks, the error term from past periods may be correlated with the current credit variables in eq. (1), although the Arellano-Bond test for serial autocorrelation of order 2, i.e., the AR(2) test in all estimations confirms with high statistical certainty that this was not the case. Thus, the second advantage of the specification with additional lagged GDP terms is that we need to adjust the instruments to values from the fifth to seventh lag, providing further support for the exogeneity of the IVs.

Table 4 shows that only the second lag shapes the curvature of the business cycle, while third order terms remain insignificant. Any higher order lags are thus unnecessary. The results in the even numbered columns point out that those positive effects on GDP p.c., that are independent from the business cycle, stem essentially from the BNDES loans. Indirect BNDES loans are still positively related to the economic activity in small municipalities and the coefficients are almost the same as in the previous estimations. In contrast, direct BNDES loans positively affect growth at least in medium-sized regions which are the ones that are mostly targeted by this type of loan facility. Another major difference is that controlling for the business cycle movement washes away the statistical significance of credits by public and private banks. Only the tiny effect of private credit on GDP in the most populated regions remains significant.[7]

Previous papers such as De Aghion (1999) highlight that providing capital resources independent of the business cycle is one of the main strengths of National Development Banks. In this sense, the private banks may have reacted to the (global) credit crunch and/or may have anticipated upcoming deterioration of the real economy. In line with the

---

[7] Note that the aggregate results in table 2 also sustain these conclusions once we control for the business cycle. As expected, the aggregate results roughly correspond to weighted means of the three subsamples in table 4. Overall, the coefficient of indirect BNDES loans is by far the largest and most significant.

results in Bertray et al. (2014), this constellation justifies why BNDES loans have a particularly positive impact once we condition our estimations on the business cycle.

4.3. A simple cost-benefit analysis

To get an idea about how the present estimates can be applied to calculate (part of) the merit of BNDES' loans relative to their cost, we provide a back-of-the-envelope calculation. Note that in line with the present econometric specification and data availability, the benefits are only measured in terms of GDP. That is, many other potentially relevant aspects of social welfare, such as employment creation, are not taken into account and the benefits calculated below can be interpreted as lower bounds.

We include only BNDES loans because unlike the other banks, its actions are subordinate to the government and because these loans are subsidized. Regarding the benefits, we use the estimations without distinguishing between the size of municipalities in table 2. The regression in column (2) indicates that direct loans do not have an effect on GDP *per capita* which is statistically different from zero and indirect loans (measured in R$ 10,000) have a semi-elasticity of 0.36. Regarding the cost of BNDES loans, the Secretary for Economic Monitoring at the Ministry of Finance (SEAE 2017) compiled the total yearly subsidies from the federal government to its development bank which were practically nonexistent before 2007 but then increased until reaching around R$ 53 billion in the year 2015. The lending generated a total implicit cost of R$ 185 billion between 2008 and 2016. If we consider that the average share of direct and indirect loans is equal to 55% and 45% over our observation period, direct BNDES loans account for R$ 83 billion in the public accounts, while the provision of the indirect ones costs R$ 102 billion.

From the variation of credit stocks and the estimated semi-elasticity, we compute the implied benefits. For the direct loans, the balance is clearly negative (even if we would consider the estimated coefficient of 0.06). The aggregate supply of indirect loans increased annual *per capita* income by an average of R$ 147, generating a cumulative gain in GDP in these years of R$ 265 billion. Therefore, the indirect loans brought an economic gain of R$ 153 billion. Note, however, that this calculation only

captures direct, first-round effects, without considering potential benefits of alternative public investments and the loss through interest payments due to the increased public deficit.

5.   Discussion

Within the framework of a financial market characterized by several forms of failures, there are several possible justifications for why the type and source of credit may have distinct growth effects. Moreover, it is important to recognize that given the econometric specification derived from the Cobb-Douglas production function, the relation between credit supply and eocnomic growth is conditional on the level of physical and human capital. That is, the growth effects can be understood as externalities that manifest themselves as an additional consequence of the credit supply rather than due to increased productive capacity (a higher capital stock). Notwithstanding, mitigating market failures that result in sub-optimal levels of investment, and consequently physical capital is another important part of the BNDES' mission, as discussed in Barboza et al. (2020), for example.

The following arguments are frequently found in similar papers and are intended to guide the interpretation of the present results without claiming causality or integrity. First, private and public banks offer few long-term loans, as the uncertainty about future inflation is often quite high. Long-term investments tend to generate greater economic growth and increases in productivity (Aghion et al., 2010). Because the BNDES was created and instructed precisely to offer long-term loans, a positive edge over other public or private banks is expected.

Second, public banks and, above all, NDBs are suspect of neglecting efficient credit allocation in favor of political motives. If project evaluation takes place more cautiously in private banks, and if public banks allocate more funds to more risky and unproductive projects, their private competitors should have the highest effect on regional growth (Ru, 2018, Musacchio et al., 2017). The detrimental behavior may be more pronounced in case of direct BNDES loans because they are negociated on a one--by-one basis (Carvalho, 2014). In contrast, indirect BNDES loans as well

as loans from public banks are sometimes approved automatically, but in general, the lending decisions are more decentralized and thus less prone to political influence. On the other hand, Sztutman and Aldrighi (2019) do not find support for the hypothesis that politically connected firms receive a higher amount of (direct and indirect) BNDES loans during the federal election in 2006.

Third, heterogeneous growth effects may simply be due to the inherent differences between free and directed credit, or be related to the permitted credit purposes. For example, most BNDES credit lines are designed to finance productive investments. According to this hypothesis, we would expect to see differences between the loans from both private and commercial banks as opposed to both types of BNDES loans.

Fourth, growth differentials may be due to the bank's mission and regional focus. Public banks, as well as the BNDES, should not only fund the most profitable projects, in the monetary sense, as do private banks. The government and taxpayers expect that credit from public banks will foster economic development, even in regions where the financial return on credit may be lower, for example, because the cost of maintaining a bank branch in remote, less developed regions is higher. In that sense, public banks may mitigate market failures and lender moral hazard problems and thus propagate local growth (Cole, 2009).

Our findings lend support to the second and fourth hypotheses. Contrary to hypotheses one and three, we observe that even among the long-term, directed BNDES loans, there are divergent relative returns on the local economy. The present data clearly show that indirect BNDES loans are more effective than direct loans in terms of their contribution to local growth. This finding, however, is in line with the political economy concerns in Carvalho (2014) because the main difference between the direct and indirect BNDES loans is of administrative nature rather then purposive. Further differences between the two types of loans may arise due to differences in recipient firms' size, type and credit profile. The apparently higher growth effect of indirect loans stresses the importance of incentive and risk management issues NDBs need to address.

Interestingly, the positive effects of BNDES loans are not driven by the national or regional economic business cycle as opposed to the loans from private or public banks. Hence, one of the strengths of the BNDES seems

to be the anti-cyclical lending policy during the recent global financial crises, in line with Gutierrez et al. (2011) and Bertray et al. (2013).

The differences in the credit effect between regions support the forth proposition above. Leveraged by the differential regional credit exposition, these differences explain a large part of the diverging aggregate effects. The insight here is is that public, private and indirect BNDES loans have their highest and most significant growth effect in small municipalities where a disproportionately large share of small-sized firms is registered. According to our estimations, the concentration of public banks and indirect BNDES loans on small municipalities seems to be part of the reason for the observed superior overall growth effect. Our results thus lend support to the finance-growth literature following Gertler and Gilchrist (1994), where it is well-known that small firms are most likely to suffer from liquidity constraints and additional credit has a highly positive effect. On the flipside, the low relevance of loans from any type of bank in the largest municipalities can be explained by the prevalence of large firms which have access to other finance sources and rely much less on loans.

6.   Conclusion

The present study analyzed how credits from either public, private and the national development bank BNDES are related to the GDP in Brazilian municipalities over the period 2007–2016. In particular, our findings contribute to the discussion about the usefulness of National Development Banks and about the effectiveness of state-owned banks in general. To date, there is no consolidated opinion among economists and the results from empirical studies vary substantially.

We find that the the relation between economic growth of credit supply depends on the recipient municipality's size and on the whether BNDES loans are provided directly or indirectly via an accredited financial institution. According to our estimates, an increase in *per capita* indirect loans by R$ 10,000 should lead to a GDP *per capita* growth of 3.1%. The same credit increase from private and public banks is associated with a 1.6% and 5.3% higher GDP p.c., respectively. We also found that the

majority of positive effects of credit supply from either of these three sources becomes manifest in the least populated regions where credit supply is likely to be more scarce. On the other hand, credit from public commercial banks has the highest effect on economic growth but it is concentrated in the most populated municipalities. Once we control for the business cycle in municipalities, virtually only the positive growth effects of indirect BNDES loans remain.

From our perspective, the following lessons can be learned from the present research. First, an important growth facilitator seems to be the sheer availability of external finance, when and where it is most scarce. Although our analysis does not explicitly include the interest rates of loans, the difference between the subsidized BNDES across regions suggests that receiving loans at low rates alone does not automatically stimulate positive growth rates. This interpretation is also in line with previous evidence, see Ehrl (2021). Our results rather indicate that place and timing are more important determinants for the growth effects of loans.

Second, we cannot confirm that lending from the private sector is most efficient. Yet, a clear downside of private credit in Brazil is that it is not very widespread to the least populated regions. It is therefore comforting to see from a development perspective that public banks follow their mission to provide financial services even in unprofitable and remote areas of a country with continental dimension. In light of the present findings, the BNDES may even consider intensifying lending to SMEs in the most remote municipalities.

Third, when the BNDES takes advantage of the knowledge, risk evaluation practices and the network of the existing financial intermediaries, its credit supply is related to higher growth rates than when it distributes large credit volumes directly to firms which, in most cases of direct loans, are large and tend to suffer less from credit constraints. In this way, commercial banks appear to be complementary to the BNDES and their partnership in the credit allocation process may mitigate one of the main criticisms of development banks, the political influence. Finally, the data indicates that the great advantage of National Development Banks is their capability to provide financial resources in emergency situations. In the present case, the BNDES was used to cushion an economic crisis when firms suffered from temporarily limited credit access. After all,

policy makers need to recall that, like any other counter-cyclical measure, the intervention ought to be cut back when the situation (in the private credit market) has returned to normal.

Apart from the limitations of the present research mentioned in the two previous sections, it would also be interesting to include spatial spillovers or long-run growth effects. The combination of a dynamic panel model with instrumental variables and spatial econometrics, however, is not trivial and left for future research.

References

ACEMOGLU, D.; NAIDU, S.; RESTREPO, P.; ROBINSON, J. A. (2019). Democracy does cause growth. *Journal of Political Economy*, 127 (1), 47-100.

ARELLANO, M.; BOND, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, 58 (2), 277-297.

BANERJEE, A. J.; DUFLO, E. (2014). Do Firms Want to Borrow More? Testing Credit Constraints Using a Directed Lending Program. *Review of Economic Studies,* 81 (2), 572-607.

BARBOZA, R. d. M., FURTADO, M., GABRIELLI, H. (2019). A atuação histórica do BNDES: o que os dados têm a nos dizer?. Brazilian Journal of Political Economy 39 (3), 544-560.

BARBOZA, R. D. M.; PESSOA, S. D. A.; RIBEIRO, E. P.; e ROITMAN, F. B. (2020). O que aprendemos sobre o BNDES? BNDES Textos para Discussão 149.

BECK, T., and LEVINE, R. (2002). Industry growth and capital allocation:: does having a market-or bank-based system matter?. *Journal of Financial Economics*, 64 (2), 147-180.

BECK, R., GEORGIADIS, G., and STRAUB, R. (2014). The finance and growth nexus revisited. *Economics Letters*, 124 (3), 382-385.

BERGER, A. N.; HASAN, I.; ZHOU, M. (2008). Bank ownership and efficiency in China: What will happen in the world's largest nation?. *Journal of Banking & Finance,* 50, 326-339.

BERTAY, A. C.; DEMIRGÜÇ-KUNT, A.; HUIZINGA, H. (2014). Bank Ownership and Credit Over the Business Cycle: Is Lending by State Banks Less Procyclical?. *Journal of Banking & Finance.* 50, 326-339.

BEZEMER, D., GRYDAKI, M., ZHANG, L. (2016). More mortgages, lower growth?. *Economic Inquiry*, 54 (1), 652-674.

BLUNDELL, R.; BOND, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87, 115–143.

BONOMO, M.; BRITO, R.; MARTINS, B. (2014). Macroeconomic and Financial Consequences of the After Crisis Government-Driven Credit Expansion in Brazil. *Banco Central do Brasil Working Papers*, n. 378.

BURGSTALLER, J. (2013) Bank Office Outreach, Structure and Performance in Regional Banking Markets, *Regional Studies*, 47(7), 1131-1155

CARVALHO, D. (2014). The Real Effects of Government-Owned Banks: Evidence from an Emerging Market. *Journal of Finance*, 69 (2), 577-609.

CAVALCANTI, T.; VAZ, P. H. (2017). Access to Long-Term Credit and Productivity of Small and Medium Firms: A Causal Evidence. *Economics Letters,* 150, 21-25.

COLE, S. (2009). Financial Development, Bank Ownership, and Growth: Or, Does Quantity Imply Quality?. *Review of Economics and Statistics,* 91 (1), 33-51.

CROCCO, M.; FARIA-SILVA, F.; PAULO-REZENDE, L.; RODRÍGUEZ-FLUENTES, C. J. (2014). Banks and Regional Development: An Empirical Analysis on the Determinants of Credit Availability in Brazilian Regions. *Regional Studies.* 48 (5), 883–895.

DE AGHION, B. A. (1999). Development banking. *Journal of Development Economics*, 58 (1), 83-100.

DE GUEVARA, J. F.; MAUDOS, J. (2009). Regional Financial Development and Bank Competition: Effects on Firms' Growth. *Regional Studies,* 43 (2), 211-228.

DINÇ, S. (2005). Politicians and Banks: Political Influences on Government – Owned Banks in Emerging Markets. *Journal of Financial Economics,* **77** (2), 453-479.

EHRL, P. (2021). Live large or die young: subsidized loans and firm survival in Brazil. Empirical Economics, 61, 3479–3503.

EHRL, P.; MONASTERIO, M. (2019). Empréstimos do BNDES e a sobrevivência de empresas. *IPEA Working Paper No 2518*.

EHRL, P.; & PORTUGAL, R. (2021). Distribuição de crédito e crescimento no Nordeste: Uma comparação entre BNDES e BNB 2010-2019. *IPEA Working Paper* No. 2678.

FACCIO, M. (2006). Politically Connected Firms. *American Economic Review,* 96 (1), 369-386.

GERTLER, M.; GILCHRIST, S. (1994). Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms. *Quarterly Journal of Economics*, 109 (2), 309-340.

GRIFFITH-JONES, S. (2016). Development banks and their key roles. *Bread for the World Discussion Paper n.59*.

GRIMALDI, D. S.; MADEIRA, R. F. (2016). Financiamento de longo prazo e bancos públicos: uma análise dos repasses do BNDES Finame no período 2005-2015. *Revista do BNDES*, 46, 5-38.

GUTIERREZ, E.; RUDOLPH, H. P.; HOMA, T.; BENEIT, E. B. (2011). Development Banks: Role and Mechanisms to Increase their Efficiency. *Policy Research Working Papers,* n. 5729.

KARLAN, D., ZINMAN, J. (2009). Expanding credit access: Using randomized supply decisions to estimate the impacts. *Review of Financial Studies*, 23 (1), 433-464.

KLAGGE, B., MARTIN, R. (2005). Decentralized versus centralized financial systems: is there a case for local capital markets? *Journal of Economic Geography*, 2005, 5(4), 387-421.

LA PORTA, R.; LOPEZ DE SILANES, F.; SHLEIFER, A. (2002). Government Ownership of Banks. *Journal of Finance*, 57 (1), 265-301.

LAZZARINI, S. G.; MUSACCHIO, A.; BANDEIRA DE MELLO, R.; MARCON, R. (2015). What Do State- -Owned Development Banks Do? Evidence from BNDES, 2002–09. *World Development*, 66, 237–253.

LEVINE, R. (2005) Finance and growth: theory and evidence. Handbook of Economic Growth, Ed. 1., 865-934.

LIMA, R.C. A.; SILVEIRA NETO, R. M. (2016). Physical and Human Capital and Brazilian Regional Growth: A Spatial Econometric Approach for the Period 1970–2010. *Regional Studies,* 50 (10), 1688–1701.

MCKENZIE, D.; WOODRUFF, C. (2008). Experimental Evidence on Returns to Capital and Access to Finance in Mexico. *World Bank Economic Review,* 22 (3), 457-482.

MESLIER-CROUZILLE, C., NYS, E. and SAUVIAT A. (2012) Contribution of Rural Banks to Regional Economic Development: Evidence from the Philippines, Regional Studies, 46(6), 775-791

MUSACCHIO, A.; LAZZARINI, S.; MAKHOUL, P; SIMMONS, E. (2017) The Role and Impact of Development Banks: A Review of their Founding, Focus, and Influence. *Study for the World Bank.*

PAIVA, M. D. (2012) BNDES: um banco de história e do futuro. São Paulo: Museu da Pessoa.

ROODMAN, D. (2009). A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics*, 71 (1), 135-158.

RU, H. (2018). Government Credit, a Double-Edged Sword: Evidence from the China Development Bank. *Journal of Finance*, 73 (1), 275-316.

SAPIENZA, P. (2004). The effects of government ownership on bank lending. Journal of Financial Economics, 72(2), 357-384.

SEAE - SECRETARIA DE ACOMPANHAMENTO ECONÔMICO DO MINISTÉRIO DA FAZENDA. (2017). *Nota Técnica: Benefícios Financeiros e Creditícios da União*. Brasília.

STIGLITZ, J. E. (1993) The role of the state in financial markets. *World Bank Economic Review*, 7 (1), 19-52.

SZTUTMAN, A. M., Aldrighi, D. M. (2019). "Political Connections and Access to Brazilian Development Banks Loans." Working Papers, Department of Economics 2019_13. University of São Paulo (FEA-USP).

TAROZZI, A., DESAI, J., JOHNSON, K. (2015). The impacts of microcredit: Evidence from Ethiopia. *American Economic Journal: Applied Economics*, 7(1), 54-89.

ULYSSEA, G. (2018). Firms, Informality, and Development: Theory and Evidence from Brazil. *American Economic Review*, 108(8), 2015-47.

USAI, S., VANNINI, M. (2005) Banking structure and regional economic growth: lessons from Italy. *The Annals of Regional Science*, 39(4), 691-714.

VALVERDE, S. C., LÓPEZ DEL PASO, R., RODRÍGUEZ FERNÁNDEZ, F. (2007) Financial innovations in banking: Impact on regional growth. *Regional Studies*, 41(3), 311-326.

WORLD BANK. (2001). Finance for Growth: Policy Choices in a Volatile World. *New York: Oxford University Press.*

WORLD BANK. (2012). Global Financial Development Report 2013 – Rethinking the role of the state in finance. *Washington, DC: The World Bank.*