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SWPS 2020-02 (February)

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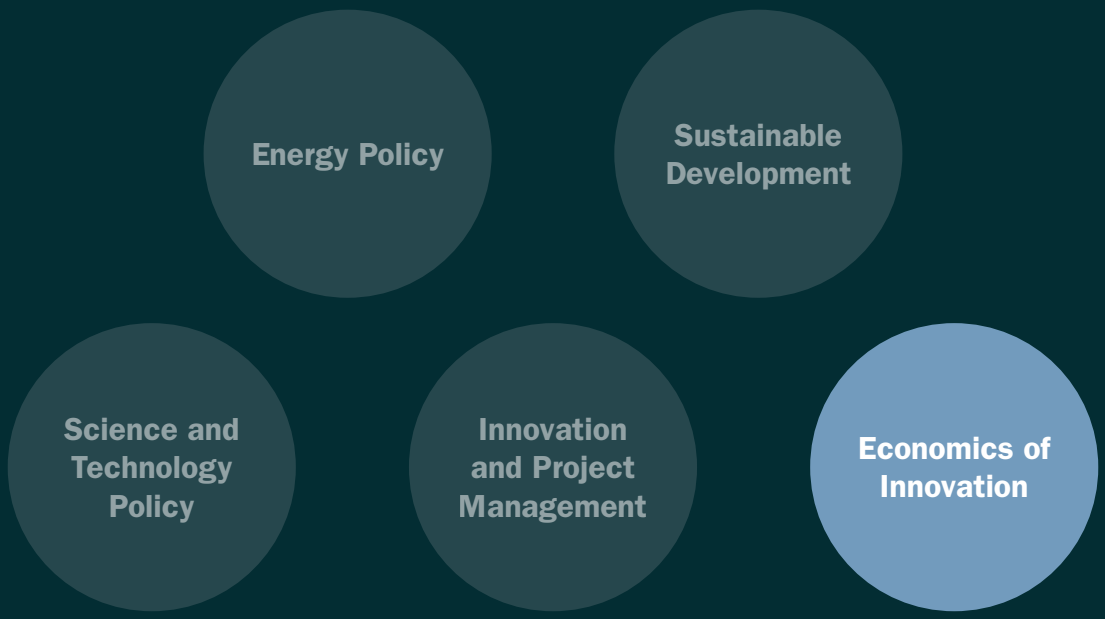

UNIVERSITY OF SUSSEX | BUSINESS SCHOOL

SPRU Working Paper Series (ISSN 2057-6668)

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Investigating the Role of BNDES as a Tool to Transmit Countercyclical Policy Decisions: Evidence from 2002-2016

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I evaluate the impact of BNDES disbursements on Brazilian commercial banks' disbursement using balance-sheet data for the period of 2002-2016. Using dynamic panel data techniques, I find BNDES disbursement for both investment in innovation and fixed capital investments crowded-in commercial banks' disbursement. Further, the results obtained considering the distribution before and after 2008, suggest the beginning of the crowding-in impact together with the countercyclical role adopted by the bank at the beginning of the financial crisis.

Keywords: *BNDES, development bank, countercyclical policies, crowding-in/out*[1]

1. Introduction

The role of public spending in the economy has always represented an academic and political topic of debate. With the well accepted paradigm of the role of the State as coordinator of industrial and economic strategies (Rodrik 2004), one of the main academic questions remains whether public financial resources hamper or foster the development of the national economy and of the national private financial sector.

Since the end of WWII, public financial institutions have represented the main tool for governments to address public disbursement and to transmit policies' decisions to the real economy (Mazzucato and Penna 2014). Their role has changed over time to address the economic and social challenges faced by the countries at each time (de Aghion 1999); still, the persistent critique is about the resource misallocation due to the inefficiencies of the central government, (Robinson and Torvik 2005; Torres and Zeidan 2016) and of non-virtuous crony capitalism (Carvalho 2014). Further, they are often accused of crowding-out either private companies' disbursement (Aschauer 1989) and private banks' disbursement (McKinnon 1973).

[1] I am grateful to the anonymous reviewers from the SPRU Working Papers Series for their positive evaluation and generous comments.

The 2008 global financial crisis brought back the discussion about the relationship between private and public financial resources in the economy. The necessity of public financial resources to support the economies hit by the crisis has not been questioned, yet there is still no agreement on which forms of public financial support should be more appropriate. USA enacted the "*Emergency Economic Stabilization Act*" right at the beginning of the financial crisis in 2008, supporting the US economy with an injection of $700 billion mainly addressed to the re-purchase of distressed financial assets. The Eurozone announced in 2015 an expansionary monetary policy, the quantitative easing, to buy-back roughly €60 billion (€ 80 billion from 2016) per month of bonds from the central governments of the euro-area. In other countries, such Brazil, China but also Germany, public development banks have represented the government tool to transmit countercyclical policies and to direct financial resources towards investments, both private and public.

This analysis, using balance-sheet data of commercial banks operating in Brazil for the period 2002-2016, looks at the impact of the disbursement of BNDES on their financial disbursement. Thus, this paper looks at the specific research question:

"Can a development bank be the government tool to transmit industrial policy decisions to the real economy without hampering the growth of the private financial sector by crowding-out its disbursement?

The analysis then proceeds by splitting the sample in two periods, before and after the 2008 global financial crisis. The countercyclical role adopted by the development bank at the beginning of the global financial crisis should evidence a different impact of BNDES disbursement due to the new additional role of the bank. If the use of BNDES as an additional government tool to transmit countercyclical policy decisions has been successful, the results should observe a different impact of BNDES disbursement before and after the 2008 crisis. Therefore, this analysis will also try to answer this following research question:

"Can development banks disbursement be used as an additional government instrument to transmit countercyclical policy decisions to the real economy without crowding-out commercial banks' disbursement?"

The results will shed light on the impact of public financial institutions used as additional government instrument for the development of the private national financial sector. The paper is organized as follows: Section 2 introduces the Brazilian Development Bank, BNDES; Section 3 presents the literature review on the relationship between public and private financial resources. Section 4 presents the econometric methodology followed by the presentation of the data used in the analysis in Section 5. Finally, Section 6 presents the results and the following Section 7 concludes the paper.

2. What is BNDES

BNDES is a 100% state owned development bank created in 1952 and has been under control of the Brazilian executive and the Ministry of Development, Industry and Foreign trade (MDIC). Since its creation and until 1980s, BNDES supported the industrialization process through government investment and funding. From the 1990s BNDES took part in the liberalization process undertaken by Brazil, changing the country's financial structure and reducing the bank's developmental role in favour of the private actors (Hermann 2010). In 2004, BNDES went back to its primary mission aimed at Brazilian economic development through innovation. The areas in which the Brazilian development bank operates are indicated in Table 1 below:

Table 1 - BNDES Areas of Operations

Cattle-Raising and agriculture	Infrastructure
Trade, Service and Tourism	Innovation
Culture	Environment
Social and Urban Development	Capital Market
Industry	Exports and international positioning

Source: BNDES (2014)

Even though innovation accounts for a small portion of the overall disbursement, the strength of BNDES activity is evidenced by the existence of an agenda that can be implemented with specific tools and a unique target defined by the government (Schapiro 2013). BNDES represents one of the largest development banks, with an amount disbursed in 2014 almost double compared to what disbursed by the World Bank the same year (Torres and Zeidan 2016).

Resources of the BNDES are guaranteed by different sources shown in the capital structure of the institution. Since 2010, mainly due to the new countercyclical role assigned to BNDES after the 2008 sub-prime financial crisis (Torres and Zeidan 2016), National Treasury has been the main creditor and the cost of these resources is largely (if not entirely) pegged to the Long-term interest rate (TJLP). The second main contributor is the Workers' Assistance Fund (FAT) that each year transfers automatically 40% of the revenues to BNDES in a quasi-equity funding mechanism and it is remunerated at the Long-term interest rate (TJLP) (Lazzarini, Musacchio et al. 2011; Torres and Zeidan 2016). Other voices are represented by Fundraising Abroad, the PIS/PASEP fund (social contributions fund for workers' insurance), the FI/FGTS fund (the investment arm of the worker's compensation fund), Repurchase Agreement, BNDESPAR Debentures and Other Obligations (Rezende 2015). BNDES portfolio comprises Corporate Stakes, Bonds and Securities and Other assets. Cash flow per source of resources shows that

return on operations account for almost 80% of the total cash flow; moreover, BNDES system's default rate in 2013 was at a record low, reflecting the strength of its credit and on-lending portfolio. The percentage was only 0.01% in the first 2014 quarter, lower than the 0.04% registered in the same period in 2013. According to the Brazilian Central Bank, the average default rate for the National Financial System was 3% in March 2014 (BNDES 2014).

3. Literature Review

The crucial role of finance in a country's development process has been highlighted by Schumpeter in "*The Theory of Economic Development*" (1934), and remarked both in the National System of Innovation literature (Freeman 1987; Lundvall 1992; Lundvall 2010) and in the literature on economic development (Wade 1990; Chang 2002; Rodrik 2004). Whether public financial institutions play a positive or negative role in the economy is a long academic and political debate on the relationship between private and public financial institutions that has not yet arrived to a clear consensus (Tylecote 2007; Mazzucato and Penna 2014).

Academic literature has provided different theories and theoretical models to approach the debate on the relationship between government, public and private financial institutions. Shaw (1973) and McKinnon (1973) have been among the first authors to define the concept of financial repression; according to the authors, in both developing and developed countries, government interventions, regulations and public ownership of financial institutions have contributed throughout the years to hamper the development of competitive national financial systems by altering the capital allocation mechanism, therefore causing instability of prices and in the balance of payments. High reserve or liquidity ratios, capital controls, interest ceiling and public control of financial institutions are identified as the main determinants of financial repression.

Looking at the resources to be invested by financial institutions, McKinnon (1973) proposed the *complementarity hypothesis* based on the positive relationship between savings (investments) and real broad money balances, particularly in developing countries where domestic savings are equal to domestic financed investments because of banks' self-financing constraints. Shaw (1973), looking at countries with developed financial systems, proposed the *financial deepening hypothesis*. The development of a national financial system implies that money assets are not the only resource for investments anymore. Cash deposits can now also be used to increase the lending resources of financial intermediaries. Non-money assets can be accumulated and used to relax banks' constraints on cash availability and therefore altering the complementarity among savings and real money balances proposed by McKinnon. The positive relationship proposed by McKinnon will eventually turn into a negative relationship when the country will reach a higher degree of financial development, indicating the substitutability among financial and non-financial assets. Both

authors, besides the different interpretation on the role of deposits, had in common the idea that higher interest rate increases deposits which in turn will lead to higher bank lending activity and that, particularly in developing countries, the interest rate has systematically been kept below the equilibrium level by governments, hampering the economic and financial development of the country.

Contrary to financial repression, academic literature has identified financial liberalization, specifically in terms of freely floating interest rate, as one of the most effective government measures to support economic development of the countries through the development of the national financial systems (Shaw 1973). Empirical evidence on the relationship between interest rate and savings is however mixed and in many studies on financial liberalization has been associated with a reduced saving rate (Gmech 2003). Further, recent financial liberalization together with deregulation policies in the global markets have also led to the worst economic crisis the globalized economy ever experienced, raising some questions on the long term sustainability of liberalized financial markets (Rezende 2015). Concerns on whether financial liberalization would have automatically led to economic development have however being raised well before the 2008 economic crisis hit the world economy, particularly about risks of instability and excessive levels of risk embedded in complex financial markets (Minsky 1992; Knight 2005; Rajan 2006).

It is possible to distinguish three phases of the empirical literature on financial repression. The first phase, following the McKinnon-Shaw hypothesis, focused on the impact of financial repression on investment and savings, particularly in developing countries. Academic interest then moved towards other possible impacts of financial repression, namely economic growth and poverty. More recently, and increasingly after the 2008 global financial crisis, empirical literature started looking at the adverse impact of financial liberalization, particularly when combined with deregulated economies.

Looking at the history, the scarcity of financial resources provided by the private sector requires an alternative source of credit (Mazzucato 2013a; Mazzucato 2013b), particularly in developing countries where this scarcity is more exacerbated (Barone and Spratt 2015). Further, for both developed and developing countries, this lack of financial resources is more severe for long-term and high risks investments for which private financial sector has been proven over the years, at best, underbudgeted (Minsky 1981; Haldane and Davies 2011). The patient finance needed to promote social and economic development has generally been offered by the public sector (de Aghion 1999; Mazzucato 2013a) and in recent scenarios of commercial banks' credit crunch the question is on whether the private financial sector can distribute adequate financial resources. Historically, development banks (also called State Investment Banks or more generically public banks) have been the main public actors in providing long-term and committed financial

resources (Rodrik 2004; Mazzucato and Penna 2014; Torres and Zeidan 2016). The literature on National Systems of Innovation recognises the crucial role of finance and particularly of a long-term source of funding (Freeman 1987; Christensen 1992; Lundvall 1992). However, few authors of innovation studies have investigated the different types of finance that have characterised different systems of innovation (Tylecote 2007). Mazzucato (2013b) argues that this represents a problem since different types of firms require different types of finance, and what finance is actually received (stock market, VC, public grants, etc.) affects the kind of investment and innovation activities that can be carried out.

In both "*developmental*" (Gerschenkron 1962) and "*political*" (Shleifer and Vishny 1994) views of government participation in the economy, public ownership of financial institutions is considered as a means to promote government's goals, more efficient than providing financial resources through subsidies or influencing the direction of commercial banks' resources through regulations. However, in the theoretical neoclassical debate, public ownership of financial institutions is considered a determinant of countries' financial repression. This is mainly due to the lower-than-market interest rate applied to the loans, inefficiency, creation of distortions in the market for capital allocation (La Porta, Lopez-De-Silanes et al. 2002; World Bank 2012) and crowding-out both private financial institutions' (McKinnon 1973) and companies' financial resources (Aschauer 1989).

How monetary policy decisions are transmitted to the real economy is a topic that has not yet been fully explained (Bernanke and Gertler 1995). The role of commercial banks in the monetary policy transmission mechanism has been highlighted in the bank lending channel theory, postulating that a monetary policy shock affects not only the loan demand, as stated in the standard *money view* of monetary policy transmission, but also the loan supply through its impact on banks' reserves and consequently deposits. Also, the impact of a monetary policy shock is heterogeneous and differs according to the size of the bank. Empirical literature has so far tested the existence of a bank lending channel in different countries. Kashyap and Stein (1995; 2000) for US, Ehrmann et al. (2001) for the Euro area, Pruteanu-Podpiera (2007) for Czech Republic and, for Brazil, Takeda, Rocha et al. (2005) and Coelho, De Mello et al. (2010) are among the authors that have provided empirical evidence in support of the credit channel.

To understand the degree to which BNDES can have an impact on the credit market, this analysis will rely on the model widely used in the bank lending channel literature and adapt it to account for BNDES disbursement. Empirical evidence has so far highlighted how public financial institutions may have a crowding-out impact on the bank lending channel only through increased public borrowing (Hauner 2009). To the best of my knowledge, there is no micro empirical evidence on the impact of BNDES disbursement on commercial banks' disbursement. The only empirical evidence on such topic has been produced by Arnold (2011) that performed a macro

analysis finding "weak" crowding-out impact of BNDES disbursement on credit disbursed by private financial institutions.

4. Methodology

The econometric model departs from the specification firstly proposed by Bernanke and Blinder (1988) and further developed by Ehrmann et al. (2001) and, for Brazil, by Takeda et al. (2005). This model is adapted to the more recent stream of literature on loan supply reaction to monetary policy shocks using data on banks characteristics, such as size and capitalization, as introduced by Kashyap and Stein (1995). All these authors provided empirical evidence on the bank lending channel of the monetary transmission mechanism and analysed the reaction of commercial bank loans to governments' decisions of monetary policy, mainly operated through changes of the interest rate or of the reserve requirement ratio. For the purpose of this analysis, the role of BNDES is understood as an additional monetary policy instrument used by the Brazilian government to address financial resources to the real economy; as discussed in the previous sections, BNDES has been indeed recently used by the government to transmit decisions of industrial, innovation, but also social policies, channelling financial resources to the real economy. As a consequence, and in light of the existing literature previously discussed, any possible negative outcome resulting from an active government participation, such as misplacement of financial resources or "crowding-out" commercial banks, could likely be also a consequence of the active role of BNDES in the economy.

In this light this paper will consider the role of BNDES as complementary to traditional monetary policy instruments such as interest rate and reserve requirement ratio.

Following the work of Ehrmann et al. (2001) and Pruteanu-Podpiera (2007), I specify a preliminary model that describes the indicators likely to affect the growth rate of commercial banks' financing activity, outlined in first differences (Δ) due to non-stationarities, excluding banks' characteristics:

$$\Delta \ln L_{it} = \sum_{j=1}^{m} \alpha_j \Delta \ln L_{i(t-1)} + \sum_{j=1}^{m} \gamma_j \Delta \ln r_t + \sum_{j=1}^{m} \theta_j \Delta \ln y_{(t-1)} + \sum_{j=1}^{m} \varphi_j CPI_{(t-1)} + \varepsilon_{it} \quad (1)$$

Where t=1,…,T is a given year and i=1,…,N with N being the total number of banks and m is the number of lags. The growth rate of commercial banks' loans (L_{it}) in a given year is related to its lag; a monetary policy indicator r - either interest rate or reserve requirement ratio; two indicators of the economic activity: GDP (y) and the consumer price index (CPI). Differently than the authors previously mentioned, the monetary policy indicator, calculated as a 12-month average, enters in the equation with no lag. This decision is due to the shorter time lag necessary for decision of monetary policy to get to get transmitted to the real economy with the interest

rate. The focus of this analysis will then move to equation (2) with the inclusion of bank characteristics[2].

$$\Delta \ln L_{it} = \sum_{j=1}^{m} \alpha_j \Delta \ln L_{i(t-1)} + \sum_{j=1}^{m} \gamma_j \Delta r_t + \sum_{j=1}^{m} \theta_j \Delta \ln y_{(t-1)} + \sum_{j=1}^{m} \varphi_j CPI_{(t-1)} + \lambda_1 \Delta x_{it} + \varepsilon_{it} \quad (2)$$

Where x represents commercial banks characteristic; according to the literature, commercial banks characteristics that are likely to affect the amount of financing activity are related to the size and liquidity of the financial institution. As in Takeda and Rocha (2005), Pruteanu-Podpiera (2007) among others, banks' characteristics are normalized with respect to the mean across all banks to avoid any possible trend as follows:

$$Size_{it} = \ln(Total\ Assets_{it}) - \frac{1}{N_t}\sum_i \ln(Total\ Assets_{it}) \quad (3)$$

$$Liquidity_{it} = \frac{Liquid\ Assets_{it}}{Total\ Assets_{it}} - \frac{1}{N_t}\sum_i \frac{Liquid\ Assets_{it}}{Total\ Assets_{it}} \quad (4)$$

Given the primary role played by BNDES in the last 20 years, this paper contributes to the literature by identifying to what extent this active participation of the Brazilian development bank contributed to foster or hinder the development of the commercial banks' system in Brazil. In detail, the focus of the analysis is on whether BNDES disbursement, addressed to foster the development of the Brazilian industrial sector, have stimulated additional financial resources from the private financial sector. This evidence would represent a scenario in which public resources, addressed to specific national goals such financing productive investments, create an additionality in the provision of loans, crowding-in the disbursement of commercial banks. Consequently, I add BNDES activity, measured in terms of annual disbursement, as an additional explanatory variable in Equations (1) and (2), that gives the following equations (5) and (6):

Without banks' characteristics

$$\Delta \ln L_{it} = \sum_{j=1}^{m} \alpha_j \Delta \ln L_{i(t-1)} + \sum_{j=1}^{m} \gamma_j \Delta \ln r_t + \sum_{j=1}^{m} \zeta_j \Delta \ln BNDES_{(t-1)} + \sum_{j=1}^{m} \theta_j \Delta \ln y_{(t-1)} + \\ + \sum_{j=1}^{m} \varphi_j CPI_{(t-1)} + \varepsilon_{it} \quad (5)$$

With banks' characteristics

$$\Delta \ln L_{it} = \sum_{j=1}^{m} \alpha_j \Delta \ln L_{i(t-1)} + \sum_{j=1}^{m} \gamma_j \Delta r_t + \sum_{j=1}^{m} \zeta_j \Delta \ln BNDES_{(t-1)} + \sum_{j=1}^{m} \theta_j \Delta \ln y_{(t-1)} + \\ + \sum_{j=1}^{m} \varphi_j CPI_{(t-1)} + \lambda_1 \Delta x_{it} + \varepsilon_{it} \quad (6)$$

As presented above, BNDES disbursement enters the equation with one lag to account for the time frame necessary for the financial resources to get first disbursed and further have an impact (if any) on commercial banks' disbursement. The signs of the coefficient (ζ) relative to BNDES disbursement will therefore give an indication on the relationship between commercial banks and

[2] This analysis not interested in the heterogeneity of commercial banks' responses, thus this model does not present any interaction of banks' characteristics with the monetary policy indicators.

BNDES activity. In detail, a positive (negative) and statistically significant coefficient would represent a situation a scenario in which public resources have "*crowded-in*" ("*crowded-out*") additional demand for financial resources from the private financial sector. Alternatively, if commercial banks disbursement is not affected by the disbursement of BNDES, the coefficients will do not report any statistically significant impact.

Given the model presented in equation (5) and (6) with lagged BNDES disbursement variable, the second period of the analysis starts in 2010 due to the beginning of the new countercyclical role of BNDES in 2009.

Concluding, banks with no disbursement have been dropped from the sample together with banks above (below) the 98th (2nd) percentile for the distributions of loans that have been considered as outliers. The final sample accounts for 123 commercial banks operating in Brazil during the years of the analysis.

5. Data

Information on banks characteristics are obtained from the Estatística Bancária Mensal (Monthly Banking Statistics), which include information on the balance position of commercial banks and multiple banks with commercial portfolio[3] in Brazil. The dataset includes information such as amount of total financing activity, total and liquid assets, amount of deposits, amount of reserves and other balance sheet's indicators. For the purpose of this analysis, data on bank loans are only referred to the financing activity of the banks, defined by the Accounting Chart for Institutions of the National Financial System (COSIF)[4] as:

"… operations carried out with specific destination, linked to the verification of the application of resources. Examples are the financing of industrial parks, machinery and equipment, durable consumer goods, rural and real estate."

This analysis will therefore not include other types of credit operations carried out by commercial banks, such as loans for working capital, personal loans, advances to depositors and securities discount operations. This strategy is explained by the focus of this analysis for the market for financial resources for long-term investments due the higher impact of fixed capital investments for countries' economic growth. Data on GDP, reserve requirement ratios and interest rates are obtained from BCB-DEPEC, whereas information on the inflation rate are produced by IBGE[5] and calculated as the 12-months accumulated monthly variation of the IPCA, the Brazilian

[3] The data are publicly available at http://bit.ly/2pPseyI
[4] Available at http://bit.ly/2wjPdVr
[5] All the variables are publicly available at http://bit.ly/2wNwOVm

consumer price index. Finally, data on BNDES disbursement are publicly available in the BNDES website[6]. A detailed explanation about BNDES data is provided in the following Section 3.1.

The analysis looks specifically at two types of loans issued by BNDES: loans issued by FINAME, one of the three main subsidiaries of BNDES issuing loans for fixed capital acquisitions, and loans issued by the entire BNDES system targeted at investments in innovation, including those issued by FINAME[7]. The FINAME disbursement is selected to compare similar indicators for commercial banks' and BNDES' disbursement, given the nature of BNDES which does not issue personal loans or other financial services usually carried by commercial banks. Investments in innovation are instead selected because characterized by very high embedded risk which causes commercial banks to not supply the necessary amount of financial resources (Mazzucato 2013a; Mazzucato 2013b). At the same time, these investments are the main drivers of industries' long-term economic growth which in turn stimulates additional demand for financial resources.

The BNDES system comprises a variety of different financial products and associated financial instruments, with determined targets of investments or customers. Further, the innovation policies put in place by Brazil including different industrial sectors of the economic scenario, made possible for BNDES to have different and targeted products and instruments to financially support the companies. Table 2 shows the number of loans issued by BNDES listed by financial product.

Table 2 – Number of loans for innovation by BNDES financial products BNDES Loans for Innovation

BNDES AUTOMÁTICO	561	BNDES LIMITE DE CRÉDITO	24
BNDES FINEM	480	FUNDOS	19
BNDES FINAME	120	DEBÊNTURES CONVERSÍVEIS	4
BNDES NÃO REEMBOLSÁVEL	117	OPERAÇÃO FINANCEIRA	3
BNDES FINAME AGRÍCOLA	59	OUTROS	2
RENDA VARIÁVEL	54	BNDES FINAME LEASING	1
	Total	**1,444**	

Table 2 reports the number of different BNDES' financial products for innovation disbursed in the period 2002-2016.

As it is possible to notice from Table 2, BNDES mainly relies on four financial products to finance investments in innovation. The BNDES AUTOMATICO and FINEM, financing indirect and direct operations, represent the two main products used by BNDES, followed by the FINAME product, dedicated to fixed capital acquisitions and by the BNDES non-refundable disbursements. Table 3 shows the top 2 financial instruments associated to the main BNDES financial products[8].

[6] Available at http://bit.ly/2pPakMN

[7] The classification of loans for investment in innovation has been kindly provided by BNDES.

[8] For the complete list of financial instruments by BNDES product, please refer to Table in the Appendix.

Table 3 – Number of loans for innovation by top 2 BNDES financial instruments associated to main financial products

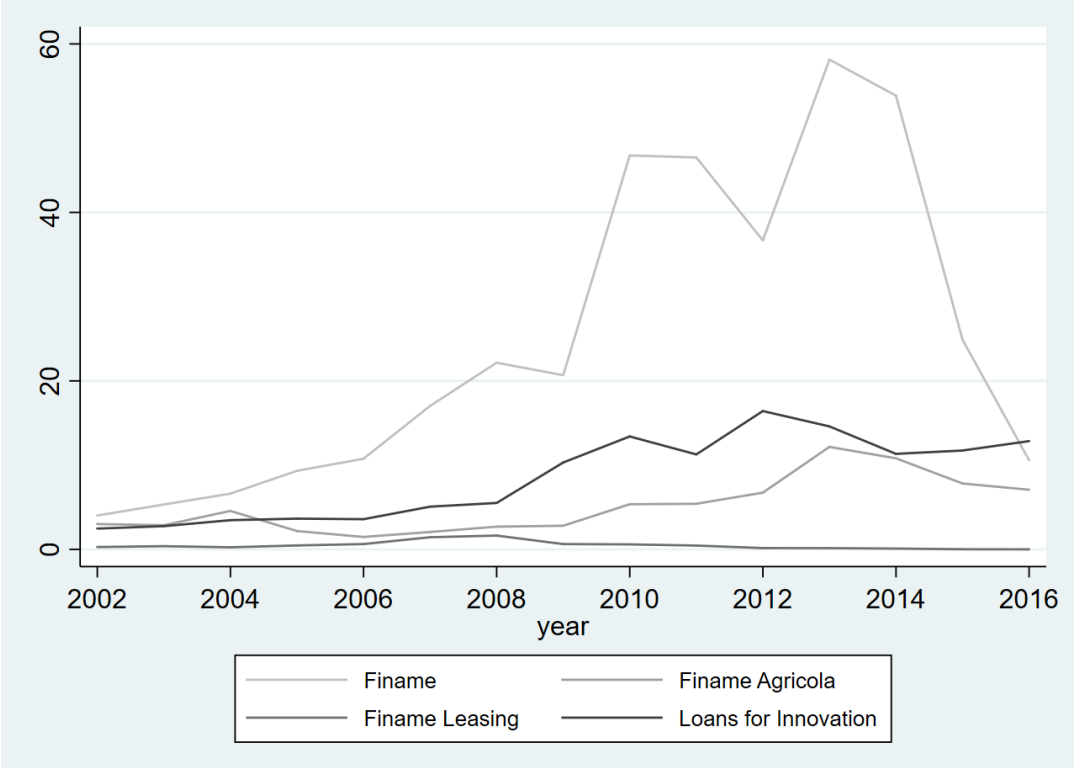
Financial Product	Financial Instrument	N
BNDES AUTOMÁTICO	Inovagro	443
	PSI - Inovação	76
BNDES FINEM	Bndes Prosoft	166
	PSI - Inovação	86
BNDES FINAME	PSI - BK - Tecnologia Nacional	90
	PSI - Inovação - BK Eficientes	27
BNDES NÃO REEMBOLSÁVEL	Funtec	109
	Fundo Amazônia	8
BNDES FINAME AGRÍCOLA	Inovagro	59

Table 3 reports the number of loans of the top 2 instruments associated to the main BNDES product for the year 2002-2016

As reported above in Table 3, the variety of targeted products and instruments issued by BNDES allows the development bank to differentiate its disbursement throughout most of the Brazilian industrial scenario.

Regarding the disbursement of BNDES FINAME, it is composed by three main products: FINAME, FINAME AGRÍCOLA and FINAME LEASING. Figure 1 shows the overall disbursement of the FINAME by product together with the overall disbursement for investments in innovation.

Figure 1 –Disbursement in innovation and FINAME by product (r$ Billion) – 2002-2016



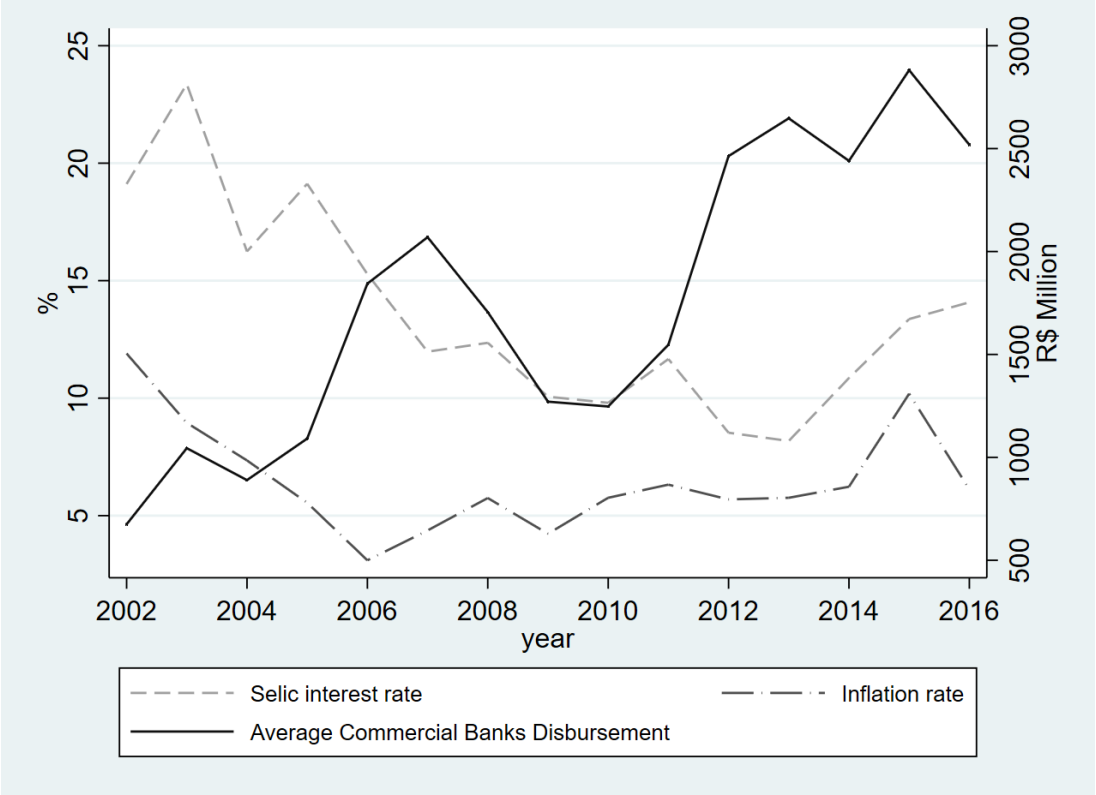
Source: Author's own elaboration

Figure 1 shows that BNDES FINAME has by far the largest development, followed by the disbursement on innovation, which already includes the disbursement of FINAME for investments in innovation. It is therefore possible to notice how the amount of financial resources addressed towards innovation represent a very limited portion of BNDES disbursement. Finally, in the recent years BNDES disbursement consistently decreased due to the political instability and following changes in the economic targets of the new Brazilian administration. However, due to lagged variables used in the model explained in Section 4, data on 2016 will not be considered.

6. Results

After the financial turbulences during the 90s, characterized by high and volatile interest rate, the Selic interest rate had a constant decline until 2013, briefly interrupted at the beginning of the first Lula's administration in 2002. Figure 2 shows the evolution of the Selic interest rate together with the evolution of commercial banks' disbursement over the period 2002-2016.

Figure 2 – Selic interest rate and Commercial banks disbursement 2002-2016



Source: Author's own elaboration

As shown by Figure 2, commercial banks' disbursement dropped with the global financial crisis to then observe a modest growth between 2009 and 2011, and eventually increased in the

following three years. In 2013, Brazilian private financial system experienced a second crisis with a one year drop in terms of disbursed financial resources.

Moving the focus on bank characteristics, Table 4 presents the main descriptive statistics for the commercial banks considered in this analysis by size quartile.

Table 4 – Main descriptive statistics of Brazilian commercial banks by quartile of size 2002-2016

	0%-25%	25%-50%	50%-75%	75%-100%	All Sample
Loans (R$ million)	68	561	1604	5266	1852
Total Assets (R$ million)	2080	12579	47445	530618	145663
Total Deposits (R$ million)	4.9	26.5	98.6	188.6	78.9
Number of banks	**33**	**31**	**29**	**30**	**123**

Source: Author's own elaboration

Table 4 highlights the heterogeneity of commercial banks in the Brazilian private financial sector, with remarkable differences between large and small commercial banks in terms of size and disbursement. Large commercial banks lend almost one-hundred times more than the smaller private banks and present a higher leverage with respect to both total assets and total deposits.

Focusing on the model, the inclusion of the lagged dependent variable as an explanatory variable requires the estimation of a dynamic panel data. This analysis implements the Generalized Method of Moments (hereinafter "GMM") designed by Arellano and Bond (1991). This strategy removes individual effects by applying a first difference on the autoregressive model and it further instruments the dependent variable with its own lagged values. As in most of the empirical literature (Takeda, Rocha et al. 2005; Pruteanu-Podpiera 2007), all other variables are considered exogenous. However, in the robustness check section, the analysis will also be performed considering banks' characteristics as endogenous, where the overall results do not change. GMM methodology is efficient in presence of large *N* and small *T* and in absence of serial correlation in ε_{it}, which is indicated by a significant negative first-order correlation. Further, in presence of small number of instruments, the validity of the set of instruments is tested by the Sargan test, or in case of a heteroscedasticity, by the Hansen test. Due to different specifications of the individual weighting matrix, the model estimates both one-step and two-steps estimates. According to Arellano and Bond (1991), the asymptotic standard errors of the two-steps estimator can be misleading even though they should be more efficient being based on the one-step residuals. This analysis will therefore present the one-step estimates as main results, including the two-steps results in the Table A11 in the Appendix. Due to the presence of a downward bias caused by weak instruments in the first-differenced estimator, the model has been estimated using a forward orthogonal transformation as suggested by Blundell and Bond (2000). This analysis observes 123 commercial banks for the period 2002-2016. Table 5 presents the results for the models in equations (5) and (6). Correlation coefficients are instead presented in Table A11 in the Appendix.

Table 5 – GMM One-step estimation results – All Sample with Selic interest rate

	(1)	(2)	(3)	(4)	(5)	(6)
$BNDES\ Innovation_{t-1}$	**0.144***	**0.145****	**0.138***			
	(0.076)	**(0.068)**	**(0.074)**			
$BNDES\ FINAME_{t-1}$				**0.571****	**0.641*****	**0.548****
				(0.275)	**(0.218)**	**(0.268)**
$Loans\ growth\ rate_{t-1}$	0.806***	0.705***	0.791***	0.796***	0.710***	0.785***
	(0.081)	(0.079)	(0.078)	(0.083)	(0.081)	(0.080)
$GDP\ growth\ rate_{t-1}$	-1.603	-1.647*	-1.476	-3.295*	-3.741***	-3.112*
	(1.015)	(0.908)	(0.986)	(1.707)	(1.364)	(1.650)
$Interest\ Rate\ (Selic)_t$	0.008	0.014	0.005	-0.006	-0.001	-0.008
	(0.021)	(0.018)	(0.021)	(0.020)	(0.018)	(0.020)
$Inflation_{t-1}$	-0.046	-0.039	-0.045	-0.027	-0.019	-0.027
	(0.029)	(0.025)	(0.029)	(0.028)	(0.025)	(0.028)
$Size_t$		0.592***			0.594***	
		(0.054)			(0.054)	
$Liquidity_t$			0.140**			0.138**
			(0.064)			(0.065)
Observations	940	940	940	940	940	940
Number of groups	123	123	123	123	123	123
Sargan p-value	0.0834	0.133	0.0776	0.0588	0.171	0.0608
Hansen p-value	0.271	0.322	0.231	0.238	0.325	0.233
AR1	-5.132	-4.930	-5.119	-5.232	-5.078	-5.230
AR1 p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR2	0.515	-0.416	0.423	0.480	-0.371	0.394
AR2 p-value	0.607	0.678	0.672	0.631	0.711	0.694
Number of Instruments	95	96	96	95	96	96

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5 presents the results of the GMM one-step regressions with exogenous banks' characteristics. Columns (1), (2) and (3) refer to the model with the inclusion of BNDES loans directly aimed at innovation activities. Columns (4), (5) and (6) refer to the model with the inclusion of BNDES loans of the category FINAME.

All model specifications in Table 5 above are consistent as indicated by the negative and significant coefficient relative to the first order correlation, AR1, ensuring the absence of serial correlation in ε_{it} and by the non-rejection of the Hansen test that confirms the validity of all set of instruments.

Results in column (1) and (4) are to be referred to the benchmark model in equation (5), the remaining show the results for the model presented in equation (6) with the two different bank characteristics. Regarding the main variables of interest, BNDES disbursement for investment in innovation and for fixed capital acquisition, the overall significance and positive sign indicate the presence of a crowding-in of BNDES disbursement on commercial banks' financial activity. These interesting results provide evidence of a scenario in which the disbursement of public financial institutions did not harm the development of the private financial sector but, on contrary, it contributed to the growth of available financial resources in the economy.

Among the variables accounting for the demand side, GDP has a negative and significant coefficient in all specifications except two, whereas the inflation rate does not have any significant impact on commercial bank loans. The negative sign of the GDP coefficients can be explained by the increased interest of Brazilian banks for financial assets other than loans for investment following recent development and globalization of financial markets. Finally, the interest rate does not have any impact on the amount of loans disbursed by commercial banks. This quite surprising non-significance of the coefficient might however indicate a situation in which the Brazilian government have been unable to transmit decisions of monetary policy through changes in interest rate. Moving the focus to bank characteristics, as expected bigger and more liquid banks tend to lend more as it is shown by the positive and significant coefficients.

The analysis then moves by splitting the sample into two periods, before and after the 2008 economic crisis, to assess any possible difference in the impact of BNDES disbursement following the countercyclical role adopted by the bank in response to the global financial crisis. Table 6 presents the coefficients of both BNDES disbursement variables[9]. As explained in Section 4, due to the model specification in difference, the two periods have been divided in two subperiods, 2002-2009 and 2010-2016, to account for the disbursement of BNDES in 2009, considered as the beginning of Brazilian countercyclical policies.

Table 6 - GMM One-step estimation results – Two periods: Coefficients of Growth rate of BNDES Loans

BNDES Loans for Innovation			BNDES FINAME		
Results	**2002-2009**	**2010-2016**	**Results**	**2002-2009**	**2010-2016**
(1)	-0.005 (0.114)	0.262 (0.264)	*(4)*	-0.544 (0.774)	0.596* (0.346)
(2)	0.023 (0.098)	0.388** (0.191)	*(5)*	-0.287 (0.710)	0.720*** (0.275)
(3)	0.001 (0.112)	0.271 (0.260)	*(6)*	-0.555 (0.769)	0.610* (0.341)

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Table 6 presents the coefficients of the main variables of interest (BNDES loans for innovation and loans from the FINAME product) for two-periods split sample.

As highlighted in Table 6, BNDES disbursement for investment in innovation does not have any impact if not in the second period, consistently with the main results in Table 5, when the model controls for size of the bank. The impact of BNDES disbursement for fixed capital investments instead, while not significant in the period 2002-2008, is showing a positive and significant impact on commercial bank loans in the second period. This indication of crowding-in in the after-crisis

[9] For the complete set of results with two periods, please refer to Table A12 in the Appendix

is particularly interesting in the light of the countercyclical role adopted by BNDES during the economic crisis (Mazzucato and Penna 2014). According to the above results, the crowding-in impact of BNDES disbursement starts when the bank has been used as one of the tools of the government to transfer countercyclical policy decisions to the real economy. Before this role, BNDES disbursement had no impact on commercial banks' financial disbursement. As important conclusion, these findings do not show any evidence of *crowding-out* of BNDES activity on commercial banks' disbursement, even before the 2008 economic crisis when the disbursement of the Brazilian development bank did not have any impact in the supply of credit of private financial institutions.

6.1. Robustness Checks

The analysis will now present the coefficients of the lagged dependent variable compared to its coefficients in the OLS and Fixed Effect results. In the OLS regression, the lagged dependent variable is supposed to be upward biased due to the presence positive correlation with ε_{it}. On contrary, the coefficients of the Fixed Effect estimations, particularly in contexts of small *N* large *T* are likely to be downward affected by the Nickell bias (Nickell 1981) due to the negative sign on ε_{it-1}. Table 7 presents the coefficients of the lagged dependent variable compared to the OLS and Fixed Effects results to ensure the right calibration of the model[10].

Table 7 –Robustness check – Comparison coefficients Loans Growth Rate (Lagged)

Results	OLS	FE	GMM	Results	OLS	FE	GMM
(1)	0.876***	0.587***	0.806***	*(4)*	0.877***	0.588***	0.796***
	(0.023)	(0.053)	(0.081)		(0.022)	(0.053)	(0.083)
(2)	0.739***	0.525***	0.705***	*(5)*	0.740***	0.528***	0.710***
	(0.035)	(0.052)	(0.079)		(0.035)	(0.051)	(0.081)
(3)	0.875***	0.590***	0.791***	*(6)*	0.876***	0.591***	0.785***
	(0.023)	(0.053)	(0.078)		(0.022)	(0.053)	(0.080)

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Table 7 presents a comparison between the lagged loan growth rate coefficients of the OLS, FE and GMM one-step regressions. A correct specification of the model implies the GMM one-step coefficient to be between the OLS and FE estimated coefficients.

In all model specifications presented in Table 7, the coefficients of the lagged dependent variable lie between the OLS and the fixed effect estimates, indicating a correct measurement of the GMM estimator. In most of the empirical literature and in the model presented in this paper, banks characteristics are considered exogenous to the model. As additional robustness check, as in Ehrmann et al. (2001), banks characteristics are considered endogenous and instrumented with

[10] For the complete OLS results, please refer to Table A13 in the Appendix

their lagged values. Table 8 shows the GMM One-step results with banks characteristics considered as endogenous determinants of commercial banks' disbursement[11].

Table 8 – Robustness check – GMM One-step results with endogenous bank characteristics

	(7)	(8)	(9)	(10)	(11)	(12)
$BNDES\ Innovation_{t-1}$	**0.144***	**0.129****	**0.135***			
	(0.076)	**(0.064)**	**(0.073)**			
$BNDES\ FINAME_{t-1}$				**0.571****	**0.590*****	**0.533****
				(0.275)	**(0.204)**	**(0.266)**
$Loans\ growth\ rate_{t-1}$	0.806***	0.537***	0.759***	0.796***	0.554***	0.753***
	(0.081)	(0.071)	(0.074)	(0.083)	(0.071)	(0.075)
$GDP\ growth\ rate_{t-1}$	-1.603	-1.092	-1.357	-3.295*	-3.109**	-2.939*
	(1.015)	(0.889)	(1.000)	(1.707)	(1.305)	(1.646)
$Interest\ Rate\ (Selic)_t$	0.008	0.021	0.007	-0.006	0.007	-0.006
	(0.021)	(0.018)	(0.021)	(0.020)	(0.018)	(0.020)
$Inflation_{t-1}$	-0.046	-0.034	-0.045	-0.027	-0.016	-0.027
	(0.029)	(0.024)	(0.029)	(0.028)	(0.025)	(0.028)
$Size_t$		0.807***			0.824***	
		(0.082)			(0.084)	
$Liquidity_t$			0.092			0.092
			(0.102)			(0.104)
Observations	940	940	940	940	940	940
Number of groups	123	123	123	123	123	123
Sargan p-value	0.0834	0.000	0.0223	0.0588	0.000	0.0172
Hansen p-value	0.271	0.652	0.729	0.238	0.677	0.691
AR1	-5.132	-4.126	-5.167	-5.232	-4.225	-5.269
AR1 p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR2	0.515	-0.938	0.456	0.480	-0.837	0.427
AR2 p-value	0.607	0.348	0.648	0.631	0.403	0.670
Number of Instruments	95	133	133	95	133	133

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8 presents the results of the GMM one-step regressions with endogenous banks' characteristics. Columns (7), (8) and (9) refer to the model with the inclusion of BNDES loans directly aimed at innovation activities. Columns (10), (11) and (12) refer to the model with the inclusion of BNDES loans of the category FINAME.

As reported in Table 8, the overall results do not change if not for the coefficients of liquidity that become insignificant once instrumented with its own lagged value. Looking at the main variables of interest, results are still consistent with the main model. BNDES disbursement from the FINAME subsidiary is persistently positive and statistically significant, while BNDES disbursement for investments in innovation is significant only when the model controls for size. The original model presented in Section 3 accounts only for past BNDES disbursement, not considering the contemporaneous financial resources disbursed by the public bank. In a scenario of perfect substitutability among the two financial resources, the amount of financial resources

[11] For the Two-steps results, please refer to Table A14 in the Appendix

disbursed by public banks are resources that would otherwise be provided by the private financial sector. Consequently, an increase (decrease) in public financial resources has a detrimental (incremental) impact on the amount of private banks' disbursement. In this light, as previously highlighted in Section 3.1, the size of BNDES FINAME disbursement might represent a source of crowding-out of contemporaneous commercial banks resources. The following Table 9 presents the result of the model accounting for both contemporaneous and lagged disbursement.

Table 9 – Robustness check – GMM One-step results - Model accounting for contemporaneous BNDES disbursement

	(13)	(14)	(15)
$\boldsymbol{BNDES\ FINAME_t}$	**0.027**	**-0.126**	**0.019**
	(0.153)	**(0.145)**	**(0.151)**
$\boldsymbol{BNDES\ FINAME_{t-1}}$	**0.559****	**0.749*****	**0.543****
	(0.277)	**(0.219)**	**(0.271)**
$Loans\ growth\ rate_{t-1}$	0.812***	0.723***	0.800***
	(0.083)	(0.080)	(0.080)
$GDP\ growth\ rate_{t-1}$	-3.351**	-4.025***	-3.179**
	(1.664)	(1.308)	(1.610)
$Interest\ Rate\ (Selic)_t$	-0.005	-0.009	-0.007
	(0.023)	(0.020)	(0.022)
$Inflation_{t-1}$	-0.027	-0.023	-0.027
	(0.027)	(0.025)	(0.028)
$Size_t$		0.594***	
		(0.054)	
$Liquidity_t$			0.139**
			(0.064)
Observations	940	940	940
Number of groups	123	123	123
Sargan p-value	0.0441	0.124	0.0447
Hansen p-value	0.291	0.358	0.275
AR1	-5.181	-5.085	-5.178
AR1 p-value	0.000	0.000	0.000
AR2	0.486	-0.390	0.397
AR2 p-value	0.627	0.697	0.691
Number of Instruments	96	97	97

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9 presents the results of the GMM one-step regressions with exogenous banks' characteristics, accounting for contemporaneous and past BNDES FINAME disbursement. Columns (13) refers to the model without banks' characteristics, Columns (14) and (15) refer to the model with the inclusion of, respectively, size and liquidity

The results show no relationship between BNDES disbursement and contemporaneous amount of loans disbursed by commercial banks. These findings also confirm the previous crowding-in indication of past BNDES disbursement on the financial activity of commercial banks.

Finally, as highlighted by Takeda, Rocha et al. (2005), in a context with undeveloped financial markets like the Brazilian economy, other tools such as the required reserve ratio can act as valid

monetary policy instruments. The main advantage of using in the analysis reserve requirement rates over short-term interest rate is given by the fact that the coefficient of interest rate might capture the impact on the loan demand effect on the bank loans equation, problem that does not arise when considering reserve requirement rates. The following Table 10 proposes the GMM One-step results with reserve requirements on overall deposit, demand, time and saving deposits used as monetary policy instrument instead of the Selic interest rate[12].

Table 10 – Robustness check – GMM Two-steps estimation results - Average requirement ratio as monetary policy indicator

	(16)	(17)	(18)	(19)	(20)	(21)
$BNDES\ Innovation_{t-1}$	**0.181** **(0.078)**	**0.150** **(0.076)**	**0.172** **(0.078)**			
$BNDES\ FINAME_{t-1}$				**0.642** **(0.269)**	**0.671** **(0.218)**	**0.604** **(0.262)**
$Loans\ growth\ rate_{t-1}$	0.806*** (0.082)	0.706*** (0.080)	0.791*** (0.079)	0.803*** (0.083)	0.708*** (0.080)	0.791*** (0.080)
$GDP\ growth\ rate_{t-1}$	-2.143** (1.076)	-1.952* (1.026)	-1.941* (1.050)	-3.612** (1.587)	-3.892*** (1.294)	-3.315** (1.531)
$Reserve\ Requirement_t$	3.437 (3.838)	1.117 (3.686)	3.060 (3.851)	2.542 (3.471)	1.053 (3.271)	2.164 (3.460)
$Inflation_{t-1}$	-0.048** (0.022)	-0.029 (0.018)	-0.049** (0.022)	-0.040* (0.022)	-0.022 (0.018)	-0.041* (0.022)
$Size_t$		0.591*** (0.054)			0.594*** (0.054)	
$Liquidity_t$			0.138** (0.064)			0.137** (0.065)
Observations	940	940	940	940	940	940
Number of groups	123	123	123	123	123	123
Sargan p-value	0.0892	0.145	0.0819	0.0543	0.174	0.0554
Hansen p-value	0.353	0.271	0.297	0.235	0.305	0.231
AR1	-5.235	-5.018	-5.220	-5.376	-5.151	-5.370
AR1 p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR2	0.512	-0.443	0.423	0.463	-0.379	0.382
AR2 p-value	0.608	0.658	0.672	0.643	0.704	0.702
Number of Instruments	95	96	96	95	96	96

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10 presents the results of the GMM one-step regressions with exogenous banks' characteristics and reserve requirement as monetary policy instrument instead of the Selic interest rate. Columns (16), (17) and (18) refer to the model with the inclusion of BNDES loans directly aimed at innovation activities. Columns (19), (20) and (21) refer to the model with the inclusion of BNDES loans of the category FINAME

[12] For the two-steps results, please refer to Table A15

Results shown in Table 10 are consistent with all previous results shown in this paper, with BNDES disbursement for both investment in innovation and fixed capital showing a crowding-in impact on commercial banks' resources.

7. Conclusions

The aim of this analysis has been to evaluate whether BNDES disbursement have contributed to the development of the Brazilian private financial sector or hampered it by crowding-out its disbursement. Results show that, over the period 2002-2016, BNDES activity crowded-in Brazilian commercial banks disbursement. Further, due to the 2008 financial crisis, we split our data in *before* and *after* the crisis and we observe that, while during the period 2002-2008 BNDES had no impact on commercial banks' disbursement, the countercyclical role assumed by BNDES at the beginning of the financial crisis in 2008 had a positive impact on the amount of financial resourced disbursed by Brazilian private banks. Such positive evidence on the use of a development bank as an additional instrument for central governments to transmit policy decisions, should encourage additional research on this topic.

These findings shed light on the long debate about additionality/substitutability of private and public financial resources providing evidences of a virtuous interaction, in the short-term, between these two sources in a country with one of the most active development banks. To overcome the impossibility of this study in generalizing the findings for a longer timescale, further analysis may investigate the extent to which such virtuous interaction lasts in the long term. Although, due to the evolution of the Brazilian political situation and the change in role of BNDES over the last year, the long-term effects of an active role of the development banks will be hardly measurable.

In terms of policy recommendation, with the recent need of countercyclical policies to offset the economic and social downturns emerged since 2008, this paper provides evidence on how development banks, or public banks in general, can be the tool of central government to transmit policy decisions to the real economy while directing the financial resources towards national targets defined by economic, industrial and social policies. The possibility of having both these roles, as government financial instrument and as a support for the achievement of national goals, can represent the value added of using development banks' financial resources instead of changes in interest rate when transmitting government decisions to the real economy. In such way, government can channel the additional resources to targets that otherwise would not be possible to reach using the traditional instruments, as the interest rate or the reserve requirement ratio. Finally, if the public financial resources succeed in stimulating additional demand, all scenarios of

possible crowding-out of commercial banks' disbursement should disappear due to the increased demand for loans faced by private banks.

This analysis demonstrates that the implicit neoclassical assumption of public resources hampering the development of a national private financial system is not always straightforward. At least for the Brazilian case, the active role of BNDES after the 2008 financial crisis has generated an increase of financial resources from private banks, indicating a crowding-in impact.

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Appendix

Table A11 – GMM Two-steps estimation results – All Sample with Selic interest rate

	(1)	(2)	(3)	(4)	(5)	(6)
$Loans\ growth\ rate_{t-1}$	0.822***	0.704***	0.804***	0.807***	0.728***	0.797***
	(0.087)	(0.082)	(0.085)	(0.087)	(0.084)	(0.082)
$GDP\ growth\ rate_{t-1}$	-1.663	-1.586*	-1.585	-3.139*	-4.124***	-3.147**
	(1.048)	(0.898)	(1.010)	(1.624)	(1.433)	(1.533)
$Interest\ Rate\ (Selic)_t$	0.011	0.017	0.008	-0.003	-0.005	-0.007
	(0.020)	(0.017)	(0.021)	(0.021)	(0.019)	(0.021)
$Inflation_{t-1}$	-0.043	-0.039*	-0.043	-0.025	-0.013	-0.023
	(0.028)	(0.023)	(0.029)	(0.026)	(0.024)	(0.027)
$BNDES\ Loans\ Innovation_t$	0.157**	0.145**	0.153**			
	(0.075)	(0.066)	(0.072)			
$BNDES\ FINAME_{t-1}$				0.561**	0.680***	0.561**
				(0.247)	(0.227)	(0.238)
$Size_t$		0.598***			0.599***	
		(0.055)			(0.054)	
$Liquidity_t$			0.158**			0.133*
			(0.070)			(0.070)
Observations	940	940	940	940	940	940
Number of groups	123	123	123	123	123	123
Sargan p-value	0.0834	0.133	0.0776	0.0588	0.171	0.0608
Hansen p-value	0.271	0.322	0.231	0.238	0.325	0.233
AR1	-4.123	-3.894	-4.093	-4.221	-3.968	-4.204
AR1 p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR2	0.513	-0.425	0.413	0.470	-0.380	0.389
AR2 p-value	0.608	0.671	0.680	0.638	0.704	0.697
Number of Instruments	95	96	96	95	96	96

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A12 – Gmm One-Step results two periods – All Sample with Selic interest rate

	2002-2008	2009-2016	2002-2008	2009-2016	2002-2008	2009-2016	2002-2008	2009-2016	2002-2008	2009-2016	2002-2008	2009-2016
	(1)	**(1)**	**(2)**	**(2)**	**(3)**	**(3)**	**(4)**	**(4)**	**(5)**	**(5)**	**(6)**	**(6)**
$Loans\ growth\ rate_{t-1}$	0.887***	0.769***	0.795***	0.701***	0.869***	0.788***	0.878***	0.838***	0.790***	0.764***	0.860***	0.868***
	(0.091)	(0.142)	(0.099)	(0.115)	(0.086)	(0.135)	(0.091)	(0.152)	(0.099)	(0.125)	(0.086)	(0.145)
$GDP\ growth\ rate_{t-1}$	-0.950	-1.749	-1.341	-4.145	-0.926	-2.239	1.798	-1.467	0.352	-2.665	1.935	-1.920
	(1.303)	(4.376)	(1.092)	(3.205)	(1.290)	(4.410)	(4.069)	(2.500)	(3.706)	(2.038)	(4.040)	(2.578)
$Interest\ Rate\ (Selic)_t$	-0.025	0.039	-0.025	0.088	-0.026	0.041	-0.028	-0.024	-0.028	0.001	-0.030	-0.025
	(0.027)	(0.066)	(0.024)	(0.054)	(0.027)	(0.065)	(0.026)	(0.040)	(0.023)	(0.038)	(0.026)	(0.039)
$Inflation_{t-1}$	-0.005	-0.073	0.003	-0.052	-0.006	-0.067	0.006	-0.054	0.012	-0.040	0.006	-0.048
	(0.036)	(0.053)	(0.033)	(0.039)	(0.036)	(0.052)	(0.036)	(0.053)	(0.034)	(0.045)	(0.037)	(0.054)
$BNDES\ Innovation_{t-1}$	-0.005	0.262	0.023	0.388**	0.001	0.271						
	(0.114)	(0.264)	(0.098)	(0.191)	(0.112)	(0.260)						
$BNDES\ FINAME_{t-1}$							-0.544	0.596*	-0.287	0.720***	-0.555	0.610*
							(0.774)	(0.346)	(0.710)	(0.275)	(0.769)	(0.341)
$Size_t$			0.495***	0.775***					0.495***	0.770***		
			(0.073)	(0.131)					(0.073)	(0.124)		
$Liquidity_t$					0.099	0.348**					0.099	0.360**
					(0.061)	(0.172)					(0.061)	(0.169)
Observations	562	378	562	378	562	378	562	378	562	378	562	378
Number of groups	108	86	108	86	108	86	108	86	108	86	108	86
Sargan p-value	0.0643	0.0450	0.0183	0.359	0.0647	0.0477	0.0948	0.381	0.0164	0.942	0.0918	0.447
Hansen p-value	0.116	0.148	0.148	0.183	0.120	0.141	0.157	0.319	0.109	0.335	0.158	0.290
AR1	-4.887	-4.139	-4.440	-4.172	-4.904	-4.201	-4.982	-4.060	-4.494	-4.101	-5	-4.155
AR1 p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR2	0.327	0.583	-0.402	-0.407	0.277	0.387	0.152	0.493	-0.615	-0.595	0.0838	0.258
AR2 p-value	0.744	0.560	0.688	0.684	0.782	0.699	0.879	0.622	0.538	0.552	0.933	0.796
Number of Instruments	22	34	23	35	23	35	22	34	23	35	23	35

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A13 – OLS and Fixed Effects estimation results – All Sample with Selic interest rate

	OLS (1)	FE (1)	OLS (2)	FE (2)	OLS (3)	FE (3)	OLS (4)	FE (4)	OLS (5)	FE (5)	OLS (6)	FE (6)
$Loans\ growth\ rate_{t-1}$	0.876***	0.587***	0.739***	0.525***	0.875***	0.590***	0.877***	0.588***	0.740***	0.528***	0.876***	0.591***
	(0.023)	(0.053)	(0.035)	(0.052)	(0.023)	(0.053)	(0.022)	(0.053)	(0.035)	(0.051)	(0.022)	(0.053)
$GDP\ growth\ rate_{t-1}$	-0.962	-0.650	-0.745	-0.896	-0.938	-0.607	-2.616*	-1.926	-2.201*	-2.604*	-2.601*	-1.846
	(0.801)	(0.995)	(0.755)	(0.875)	(0.795)	(0.982)	(1.467)	(1.676)	(1.312)	(1.356)	(1.446)	(1.631)
$Interest\ Rate\ (Selic)_t$	0.013	0.014	0.019	0.020	0.012	0.011	-0.000	0.003	0.006	0.007	-0.001	0.001
	(0.022)	(0.020)	(0.019)	(0.018)	(0.022)	(0.020)	(0.021)	(0.020)	(0.019)	(0.018)	(0.021)	(0.020)
$Inflation_{t-1}$	-0.049*	-0.041	-0.046*	-0.035	-0.048*	-0.040	-0.031	-0.027	-0.029	-0.018	-0.030	-0.027
	(0.029)	(0.028)	(0.026)	(0.024)	(0.029)	(0.029)	(0.028)	(0.027)	(0.026)	(0.025)	(0.028)	(0.028)
$BNDES\ Loans\ Innovati$	0.139*	0.115	0.138**	0.123*	0.139*	0.112						
	(0.073)	(0.070)	(0.066)	(0.062)	(0.073)	(0.069)						
$BNDES\ FINAME_{t-1}$							0.551**	0.437	0.512**	0.532**	0.553**	0.425
							(0.265)	(0.270)	(0.236)	(0.215)	(0.262)	(0.263)
$Size_t$			0.274***	0.630***					0.274***	0.632***		
			(0.032)	(0.059)					(0.032)	(0.059)		
$Liquidity_t$					0.080***	0.127*					0.080***	0.126*
					(0.029)	(0.071)					(0.029)	(0.072)
Observations	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063
R-squared	0.724	0.328	0.761	0.487	0.726	0.333	0.724	0.329	0.761	0.489	0.726	0.334
Number of groups		123		123		123		123		123		123

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A14 – Robustness check – GMM Two-steps results with endogenous bank characteristics

	(7)	(8)	(9)	(10)	(11)	(12)
$Loans\ growth\ rate_{t-1}$	0.822***	0.536***	0.762***	0.807***	0.554***	0.753***
	(0.087)	(0.071)	(0.074)	(0.087)	(0.071)	(0.075)
$GDP\ growth\ rate_{t-1}$	-1.663	-1.093	-1.375	-3.139*	-3.122**	-2.937*
	(1.048)	(0.890)	(1.004)	(1.624)	(1.303)	(1.648)
$Interest\ Rate\ (Selic)_t$	0.011	0.021	0.007	-0.003	0.007	-0.006
	(0.020)	(0.018)	(0.021)	(0.021)	(0.018)	(0.020)
$Inflation_{t-1}$	-0.043	-0.034	-0.045	-0.025	-0.015	-0.027
	(0.028)	(0.025)	(0.029)	(0.026)	(0.025)	(0.028)
$BNDES\ Innovation_{t-1}$	0.157**	0.131**	0.135*			
	(0.075)	(0.064)	(0.074)			
$BNDES\ FINAME_{t-1}$				0.561**	0.592***	0.534**
				(0.247)	(0.203)	(0.266)
$Size_t$		0.805***			0.824***	
		(0.083)			(0.084)	
$Liquidity_t$			0.091			0.093
			(0.102)			(0.103)
Observations	940	940	940	940	940	940
Number of groups	123	123	123	123	123	123
Sargan p-value	0.0834	0.000	0.0223	0.0588	0.000	0.0172
Hansen p-value	0.271	0.652	0.729	0.238	0.677	0.691
AR1	-4.123	-3.522	-4.107	-4.221	-3.617	-4.118
AR1 p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR2	0.513	-0.932	0.451	0.470	-0.838	0.422
AR2 p-value	0.608	0.352	0.652	0.638	0.402	0.673
Number of Instruments	95	133	133	95	133	133

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A15 – GMM Two-steps estimation results – All Sample with reserve requirement rate

	(16)	(17)	(18)	(19)	(20)	(21)
$Loans\ growth\ rate_{t-1}$	0.819***	0.713***	0.800***	0.812***	0.720***	0.797***
	(0.088)	(0.079)	(0.086)	(0.093)	(0.086)	(0.087)
$GDP\ growth\ rate_{t-1}$	-2.526**	-2.008**	-2.361**	-3.574**	-4.014***	-3.345**
	(1.117)	(0.996)	(1.092)	(1.490)	(1.250)	(1.417)
$Reserve\ Requirement\ Rate_{t-1}$	4.740	1.389	4.110	2.486	0.708	1.946
	(3.711)	(3.626)	(3.968)	(3.477)	(3.337)	(3.466)
$Inflation_{t-1}$	-0.044**	-0.026	-0.045**	-0.035*	-0.019	-0.036*
	(0.021)	(0.018)	(0.022)	(0.020)	(0.018)	(0.020)
$BNDES\ Loans\ Innovation_{t-1}$	0.213***	0.155**	0.205**			
	(0.080)	(0.077)	(0.081)			
$BNDES\ FINAME_{t-1}$				0.634***	0.679***	0.604**
				(0.244)	(0.218)	(0.236)
$Size_t$		0.596***			0.601***	
		(0.057)			(0.052)	
$Liquidity_t$			0.142**			0.124*
			(0.069)			(0.073)
Observations	940	940	940	940	940	940
Number of groups	123	123	123	123	123	123
Sargan p-value	0.0892	0.145	0.0819	0.0543	0.174	0.0554
Hansen p-value	0.353	0.271	0.297	0.235	0.305	0.231
AR1	-4.098	-3.915	-4.059	-4.160	-3.934	-4.137
AR1 p-value	0.000	0.000	0.000	0.000	0.000	0.000
AR2	0.514	-0.455	0.427	0.456	-0.391	0.384
AR2 p-value	0.607	0.649	0.669	0.649	0.696	0.701
Number of Instruments	95	96	96	95	96	96

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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Suggested citation:
Marco Carreras (2020). Investigating the Role of BNDES as a Tool to Transmit Countercyclical Policy Decisions: Evidence from 2002-2016. SPRU Working Paper Series (SWPS), 2002: 1-29. ISSN 2057-6668. Available at: www.sussex.ac.uk/spru/swps2002

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