

Efficient Financial Allocation and Productivity Growth in Brazil

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WORLD BANK GROUP

Finance, Competitiveness and Innovation Global Practice

June 2018

Abstract

This paper attempts to study the impact of Brazilian Development Bank credit on resource misallocation in Brazil, using manufacturing firm-level data from 2003–14. The paper first estimates measures of resource misallocation based on Hsieh and Klenow (2009), documenting high variation in firms' capital and output distortions. It then estimates the effect of financial frictions and access to Brazilian Development Bank loans on distortions and their dispersions. The analysis finds some preliminary evidence that the use of

Brazilian Development Bank credit is not associated with a more efficient allocation of resources. The lower cost of Brazilian Development Bank loans reduces the marginal cost of capital, as it induces firms to reallocate inputs from labor to capital, and this effect is amplified for more financially dependent firms. The findings, together with extant evidence on the economic additionality of the Brazilian Development Bank, suggest that there is room for improving the allocative efficiency of the earmarked credit system in Brazil.

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Efficient Financial Allocation and Productivity Growth in Brazil[#]

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JEL Classification Numbers: O40, O43, O47

Keywords: access to credit, Brazil, misallocation, productivity, public credit

[#] We would like to thank Martin Reiser, Mark Dutz, Antonio Nucifora and the participants of the SBE/ANPEC meeting held on December 13, 2017, in Natal, Brazil, for their useful comments. We would also like to acknowledge Brazilian Development Bank (BNDES) staff support in clarifying the details on microdata obtained according to *Lei de Acesso a Informação* (*pedido* 99903.000274/2016-68). Firm level data from IBGE's industry surveys were used only for statistical purposes and the output was cleared according to IBGE procedures (*processo* 03605.000346/2017-43). The results and interpretations represent the outcome of individual scholarly work and may not necessarily represent the position of BNDES, IBGE, The World Bank or institutions we are affiliated with. Any error or omission is only ours.acknowledge BNDES staff support in clarifying the details on microdata obtained according to *Lei de Acesso a Informação* (*pedido* 99903.000274/2016-68). Firm level data from IBGE's industry surveys were used only for statistical purposes and the output was cleared according to IBGE procedures (*processo* 03605.000346/2017-43). The results and interpretations represent the outcome of individual scholarly work and may not necessarily represent the position of BNDES, IBGE, The World Bank or institutions we are affiliated with. Any error or omission is only ours.

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1. Introduction

Aggregate productivity gains are usually thought as primarily driven by upgrades in processes, products and machinery used by firms, in turn affected by investments in human capital and R&D. In this context, low total factor productivity (TFP) growth is usually caused by barriers preventing the diffusion and adoption of new technologies (Parente and Prescott, 2002). However, recent studies have suggested an alternative explanation: low aggregate TFP growth can be explained by a number of policy and market failures that determine the allocation of resources across firms (see, for example, Restuccia and Rogerson, 2013, and references therein). One important source of distortions, widely studied in the literature, is represented by financial frictions.

The idea that an economy needs intermediation to match borrowers and lenders, channeling resources to their most efficient use, is a generalized conclusion of modern economics. There is a large literature on the relationship between finance and economic growth. Though recent evidence points to a non-monotonic relationship between financial development and economic growth (e.g. Cecchetti and Kharroubi, 2012, and Arcand et al., 2015), it is generally accepted that finance is good for growth (Goldsmith 1969; McKinnon, 1973; Shaw, 1973; Fry, 1978; Bencivenga and Smith, 1991; King and Levine, 1993a, 1993b), with causality running from finance to growth.¹ Productivity is the main channel through which financial development affects economic growth.

In the presence of financial market imperfections, this virtuous process of efficient allocation of resources can break up. Financial frictions can reduce aggregate productivity via two channels. First, they may distort entry and technology adoption decisions and thus reduce the productivity of individual firms (see Cole et al., 2012). Second, financial frictions may generate differences in the returns to capital across individual firms, thus generating efficiency losses through misallocation (Banerjee and Duflo, 2005; Restuccia and Rogerson, 2008; and Hsiew and Klenow, 2009).

The role of financial frictions for innovation and growth has been studied mainly in the development literature. Banerjee and Duflo (2005) provide evidence that firms in many emerging markets and developing economies face financing constraints. Brazil is no exception. In Brazil, private debt markets for firms, especially for long-term finance, remain relatively underdeveloped. While total market-based credit to non-financial firms accounted for 25 percent of GDP in 2016, long-term outstanding private debt was only about 5 percent, signaling the presence of market failures for long-term credit markets. There is evidence that Brazilian firms are financially constrained. Terra (2003), Aldrighi and Bisinha (2010) and World Bank (2012) all attest that Brazilian firms do face financing constraints, especially smaller and non-listed firms with limited export capacity.²

¹ See Levine et al. (2000) for cross-country evidence; Rajan and Zingales (1998) for industry-level evidence; and Beck et al. (2000) for firm-level evidence.

² See also Ambrozio et al. (2016), who recently investigated credit constraints using firm-level data in the manufacturing sector.

To help overcome financial frictions, the Brazilian government intervenes heavily in credit markets. Earmarked credit is particularly relevant for the Brazilian economy, representing about half of total credit outstanding. The main source of long-term financing to firms is the Brazilian Development Bank (Banco Nacional de Desenvolvimento Econômico e Social, BNDES), a government-owned development bank. The institutional mandate of BNDES is to improve the competitiveness of the Brazilian economy without neglecting broader social aspects. It does so by providing both debt and equity financing to a wide array of projects, from R&D to infrastructure and urban development. In the case of manufacturing, BNDES finances long-term projects aimed at the creation or enlargement of plants, the restructuring and modernization of production technologies, innovation and export promotion. Overall, BNDES is responsible for about 20 percent of the total credit to the economy.

This paper investigates the impact of BNDES on resource misallocation of Brazilian firms. If financially constrained Brazilian firms have access to cheap BNDES long-term financing, this in principle will help them access the technology they need to grow and to enter the market. At the same time, access to subsidized public financing will help firms optimize their capital-labor ratios. All this combined will result in improved aggregate TFP. However, Brazilian TFP growth has been sluggish over the past decade or so, a period coinciding with a manifold increase in BNDES assets in nominal terms, from R\$ 202.7 billion in 2007 to R\$ 867.5 billion in 2017, after peaking at R\$ 930.6 billion in 2015. While many factors may contribute to explain recent lackluster TFP growth in Brazil, it is interesting to assess whether BNDES has actually magnified rather than reduced financial frictions, therefore doing more harm than good to productivity growth. This paper analyzes the effect of BNDES financing on the intensive margin, i.e., the use of inputs among incumbent firms. While it would also be interesting to study the effects of BNDES financing on the extensive margin, i.e., on firm entry/exit and technological adoption, this is outside the scope of this paper. This paper aims to estimate the impact of inefficient allocation of finance on TFP in Brazil and contribute to the relevant literature with an original estimation of the misallocation effects.

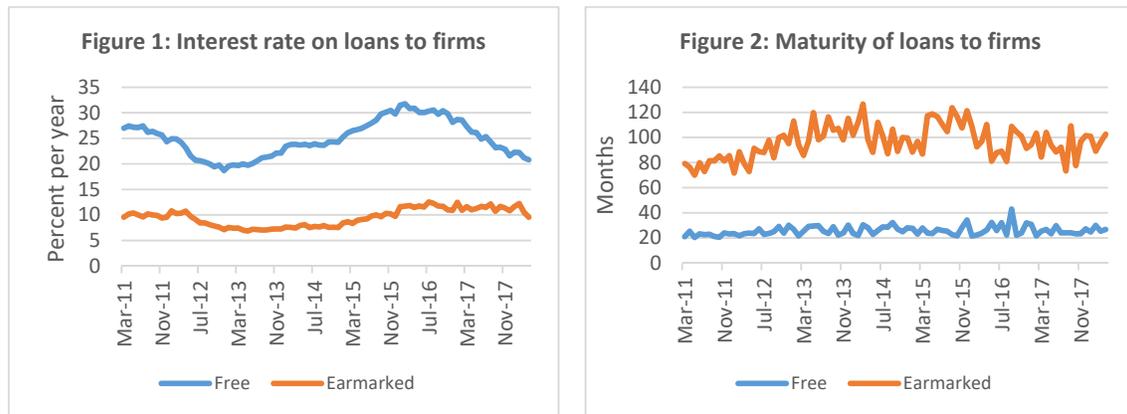
The paper is organized as follows. The next section provides an overview of the earmarked credit system in Brazil, with particular emphasis on the role played by BNDES. Section 3 reviews the extant literature on the economic additionality of BNDES in the context of cross-country studies on the impact of government-owned banks. Section 4 presents the methodology used to estimate the impact of BNDES financing on misallocation while section 5 presents the empirical results. Section 6 concludes, offering some policy implications.

2. Earmarked credit policies in Brazil and the role of BNDES

The Brazilian banking system is composed by a dual system in which public and private banks coexist. Almost half of the banking system is state owned and it is increasingly concentrated, suggesting (but not implying) that low competition may be a problem for the efficiency of financial intermediation. The largest six banks account for about 80 percent of system assets, while the three largest private banks account for about 70 percent of private bank assets. The two largest state-owned banks, Banco do Brasil and Caixa Econômica Federal, account for about 40 percent of system assets.

Macro-financial conditions have depressed financial intermediation in Brazil for decades, and finance for firms in the free market is characterized by high interest rates (Figure 1) and short maturities (Figure 2). The high interest rates are mainly driven by high inflation, perceived high default risk, and perhaps an unfortunate feedback mechanism from directed credit. This is because directed credit schemes aiming to mitigate high and volatile interest rates make extensively use regulated interest rates. This in turn limits the effectiveness of monetary policy, which may compensate for the low policy interest rate sensitivity in the earmarked market with greater policy rate amplitude and thus more volatile interest rates in the free market.

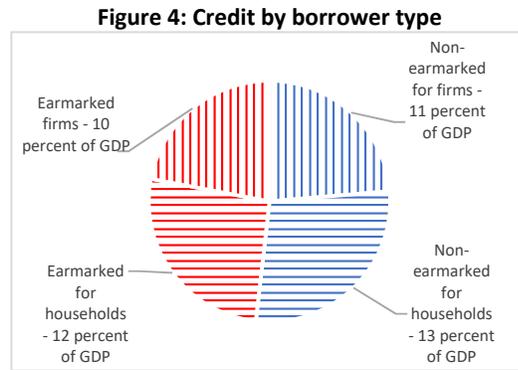
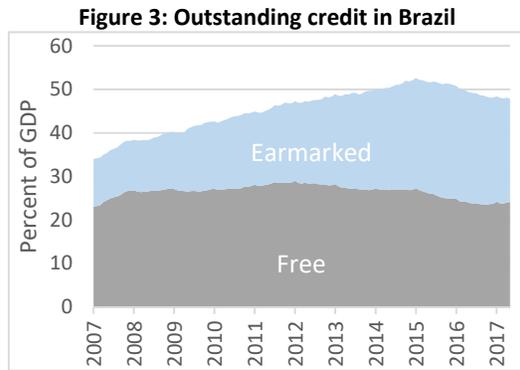
High banking spreads exacerbate the cost of credit and reflect a number of micro-economic and institutional factors. The burdens imposed by earmark requirements and the large part of credit provided at low rates may be important in explaining the high spreads for the free market credit. Deposit collection is associated with directed lending and high reserve requirements, leaving modest funding to be freely used. A financial intermediation tax, the Imposto Sobre Operações Financeiras (IOF), adds to the cost of finance, and, lastly, credit risk is high due in part to poor debt recovery by banks.³



Source: Banco Central do Brasil. Note: new credit operations.

The federal government intervenes in credit markets not only through direct ownership of commercial banks, but also in the form of direct quantity regulation through the earmarked credit system. Various schemes are used, which generally involve regulated and low interest rates with implicit embedded subsidies. Earmarked credit accounts for about half of total credit in the economy; it expanded rapidly after the global financial crisis (Figure 3), but started shrinking in 2016. Earmarked credit is mainly targeted to infrastructure and development projects, rural activities and housing. Total credit is roughly equally divided between firms and households, and within these categories, credit is roughly equally divided between earmarked and non-earmarked credit (Figure 4).

³ See, for example, World Bank (2012).



Source: Banco Central do Brasil

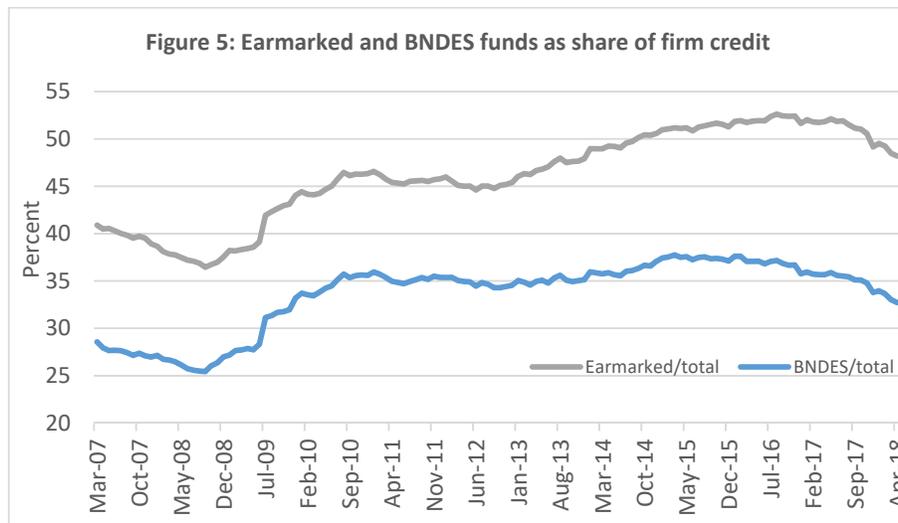
Whereas private banks participate in the earmarked credit system, accounting for about 6 percent of the total, the bulk of it comes through public banks: Banco do Brasil, Caixa Economica Federal and BNDES. Banco do Brasil and Caixa Economica Federal dominate the rural credit market and the residential housing lending market, with 55 percent and 73 percent market share, respectively.⁴ However, BNDES is the single largest intermediary of earmarked credit—directly and through on-lending via the large private banks—accounting for about half of total earmarked credit. Importantly, BNDES accounts for about three-quarters of earmarked credit to firms or one-third of total credit to firms (Figure 5), making the state-owned development bank the single largest provider of credit to the productive sector.

BNDES expanded credit rapidly in the aftermath of the global financial crisis, initially as a countercyclical policy, but continued to expand as economic growth strengthened. During the recent recession BNDES shrunk, and thus it cannot be said to have been countercyclical. BNDES lending is heavily subsidized and based on the regulated long-term interest rate, the Taxa de Juros de Longo Prazo (TJLP). BNDES has primarily funded itself at the TJLP from the federal government and other funds, most importantly the constitutionally mandated Fundo de Amparo ao Trabalhador (FAT). The TJLP has systematically been well below the government's funding costs and much more stable. The subsidies embedded in TJLP-based lending government borrowing and FAT funds were estimated at R\$ 48 billion or 0.76 percent of GDP in 2016.⁵ These implicit subsidies have since shrunk as market interest rates have declined, and a new long-term interest rate, the Taxa de Longo Prazo (TLP), has replaced the TJLP for new loans, providing for a lending rate based on the government's cost of funding.

Given its prominent role in financial intermediation to the productive sector, BNDES is central to the question about the impact of earmarked credit on productivity. The next section reviews the extant empirical literature on the impact of government-owned banks in general and of BNDES in particular against the main theoretical paradigms regarding government intervention in credit markets.

⁴ Banco do Brasil had 63 percent market share in agriculture finance among households and an 18 percent market share among firms as of end-2016.

⁵ See Byskov and Clavijo (2017).



Source: Banco Central do Brasil

3. Economic additionality of BNDES financing

Despite decades of liberalization and privatization, partially reversed by widespread bailouts following the global financial crisis, government bank ownership remains pervasive around the world (Cull et al., 2017). There are two sets of complementary theories on government’s participation in financial markets. On the positive side, the “development view” argues that government-owned banks can be a useful tool for promoting industrialization and more generally economic development by helping to overcome market failures (Gerschenkron, 1962). The related “social view” posits that state-owned banks can promote socially desirable welfare-enhancing investments by supporting projects with high externalities beyond pure profitability (Atkinson and Stiglitz, 1980). Finally, government-owned banks can play an active countercyclical role, helping stabilize credit flows during crisis times, according to the “macroeconomic view” (see Brei and Schlarek, 2015; and Bonomo et al., 2015).

On the other hand, government bank ownership can have important negative consequences. According to the “agency view”, state-owned bank managers are poorly selected and lack incentives to pursue efficiency and profitability, leading to resource misallocation and inefficiencies (Banerjee, 1997; Hart et al., 1997). In the same vein, the “political view” posits that governments (and their political coalitions) will use state-owned banks to benefit cronies and politically connected borrowers or channel funds to firms singled out as “national champions”, again resulting in misallocation and economic inefficiencies (Shleifer and Vishny, 1998).

A large literature has examined the role and impact of state-owned banks across economies, with results that are generally consistent with the “political view” and the “agency view”: state-owned banks may misallocate credit by targeting firms based on criteria other than the merit of target firms’ projects. State-owned banks increase their lending during an election year and in emerging markets they finance the government to a greater degree than do private banks (Dinç, 2005). Moreover, state-owned banks have lower profitability and higher costs than commercial banks and that gap widens during election years (Micco et al., 2007). Government ownership of banks has distorting effects on the allocation of financial

resources. In particular, the lending behavior of state-owned banks is affected by the electoral results of the political party with which they are affiliated.⁶ Not only is state bank lending more politicized and inefficient, it also generally does not serve the more credit-constrained segments of the population, such as small and medium enterprises (Berger et al., 2008; Ongena and Şendeniz-Yüncü, 2011). Overall, government ownership of banks is associated with slower subsequent financial development, lower economic growth, and lower productivity growth (La Porta et al., 2002). However, state banks can play a useful role in stabilizing credit over the business cycle as well as during periods of financial instability (Bertay et al., 2015).

As mentioned, government-driven credit, especially through BNDES, had an important countercyclical role in staving off the recessionary effects of the private credit crunch in Brazil during the recent global financial crisis, in line with the “macroeconomic view” (see Coleman and Feler, 2015). However, BNDES financing continued to expand after the economy recovered, reaching much higher levels than those observed before the crisis (see Figure 3 above). This has raised concerns about its impact on resource allocation among sectors and firms. As a result, a growing body of studies has investigated the effects of BNDES on a host of performance variables, including productivity. While there is inconclusive evidence of a positive impact on firm performance or on greater incentives to invest (in line with the “development view” or the “social view”), non-financial considerations may have played a non-negligible influence on the way BNDES finances projects (as suggested by the “agency view” and the “political view” and consistently with the findings of recent literature on bank state ownership). All this points to potential allocative efficiency issues.

Using a large sample of Brazilian firms, Ottaviano and Sousa (2008) find that BNDES loans increase productivity only for large projects but not for small loans, yet the aggregate effect is not statistically different from zero. Ribeiro and De Negri (2009) find no effect of BNDES subsidized credit on TFP growth. Coelho and De Negri (2010), on the other hand, find that BNDES loans have positive effect on labor productivity, and that this is larger on firms that are more productive. On the other hand, De Negri et al. (2011) find a positive effect of BNDES loans on export and employment, but not on productivity. Oliveira (2014) finds a positive though modest impact of BNDES lending on firm investment. This contrasts with the findings of Inoue et al. (2013) and Machado et al. (2014), who provide evidence of a strong association between BNDES financing, both equity and lending, and investment levels. More recently, using a sample of listed firms Lazzarini et al. (2015) find that BNDES financing has no significant effect on firm-level performance, with the exception of reducing interest expenses due to the subsidies embedded in the loans. Bonomo et al. (2015) find similar results while Antunes et al. (2015) find negligible effect of BNDES financing on output. Finally, De Bolle (2015) finds some evidence that BNDES lending is associated with lower aggregate TFP. However, Cavalcanti and Vaz (2017) find that eligibility and access to better BNDES loan conditions is associated with higher investment and productivity rates for small firms.

⁶ See, for example, Sapienza (2004) for Italy; Khwaja and Mian (2005) for Pakistan; Cole (2009) for India; and Bailey et al. (2011) for China.

While evidence on the impact of BNDES on productivity is inconclusive at best, there is mounting evidence that BNDES financing may be subject to political capture or non-financial considerations. Firms that donate to winning candidates are more likely to obtain financing from BNDES (Sztutman and Aldrighi, 2013; Lazzarini et al., 2015) as are those in regions governed by politicians allied with the federal government, contributing to shift employment to politically attractive regions (Carvalho, 2012). This result is consistent with recent findings that in the aftermath of the global financial crisis regions with the greater prevalence of government bank branches received more loans (Coleman and Feler, 2015). BNDES tends to target large, established firms that would probably be able to borrow from private sources, both domestic and foreign private sources of capital such as foreign loans and bond markets (Bonomo et al., 2015). Although financing support for small businesses has been growing recently, large firms still represent the largest share of BNDES financing. Moreover, BNDES does not appear to be lending to underperforming firms (Lazzarini et al., 2015), as evidenced by its historically low level of nonperforming loans (0.07 percent on average during 2011-2015 compared to 3.37 percent for overall banking system).⁷ Though politically connected firms tend to be less efficient than unconnected firms (Faccio, 2010), political connections also bring returns (see, for example, Cooper et al., 2010; and Calomiris et al., 2010). Several studies have unveiled a positive association between campaign donations in Brazil and several firm-level outcomes such as higher profitability (Bandeira de Mello and Marcon, 2005) and higher stock market returns (Claessens et al., 2008).

To summarize, there is limited and inconclusive evidence supporting the view that BNDES financing addresses existing financial frictions and promotes productivity growth. At the same time, there is increasing evidence that factors other than the intrinsic merit of the project may play an important role in the way BNDES deploys its balance sheet. Given that the firms typically targeted are less likely to be financially constrained, BNDES may be *de facto* transferring subsidies to a substantial set of firms that would not need subsidies in the first place. Moreover, BNDES may be serving firms that want to benefit from subsidies but that could fund their projects with other sources of capital. Either way, BNDES financing may negatively affect (directly or indirectly) the use of inputs among incumbent firms. This is the topic of the next section.

4. The impact of BNDES lending on resource misallocation: Methodology

When markets function perfectly with no informational failures, inequality reflects differences in effort, innate ability to acquire and use skills, manage the labor force or deploy capital. Even when initial wealth is unequal, more talented entrepreneurs with low initial wealth can borrow to acquire capital, offsetting their initial disadvantage vis-à-vis less talented peers with higher initial wealth. Hence, perfect credit markets equalize the marginal products of capital among firms, and allocation is optimal. In the presence of financial frictions, marginal products generally are not equal, and underinvestment can occur. High ability but low initial wealth entrepreneurs have higher marginal products of capital relative to low ability but high initial wealth entrepreneurs, resulting in resource misallocation and lower TFP.

⁷ Banco Central do Brasil; BNDES.

Resource misallocation denotes a situation in which capital and labor are poorly distributed so that less productive firms receive a larger share of capital and labor than they should according to their level of productivity. Such misallocation arises in the presence of distortions. For the purpose of this paper, misallocation implies that aggregate TFP could be higher given the same amount of capital, labor and firm-level TFP were financial frictions preventing factors of production from being allocated to their best use to be reduced or eliminated. For example, Vasconcelos (2017) and Busso et al. (2012) suggest that manufacturing TFP in Brazil could grow by 40 percent should distortions be reduced to benchmark US levels. This is a significant figure. The existence of financial frictions provides a rationale for government policies to reduce allocative inefficiency. One common policy intervention designed to improve access to credit for firms is the use of state-owned development banks and credit institutions, of which BNDES is a notable example.

Against this background, we want to test empirically the quantitative importance of financial frictions, access to BNDES loans and their interactions for the determination of the dispersion of distortions. While not original and only suggestive, our analysis aims to uncover additional channels through which BNDES can affect aggregate outcomes, therefore adding to the extant literature reviewed in the previous section. We do not, however, consider in our analysis the cost of setting up and running BNDES and the fiscal cost of subsidized credit; hence, our study is not an impact assessment.

BNDES provides a wide range of tools to support Brazilian firms. Our focus is on FINAME, the largest subsidized credit scheme aimed to support the acquisition of new domestically produced machines and equipment targeting firms of different size. The FINAME program is very large and accounts for approximately 45 percent of mean firm investment outlays in manufacturing firms. FINAME loans have, therefore, the potential to affect firms' productivity since their extension is guided by improvements in production and/or creation of new and/or more sophisticated goods.

The analysis covers the period from 2003 to 2014, when BNDES significantly increased its role in the Brazilian economy, as discussed above. Data were drawn from the annual surveys of manufacturing (Pesquisa Industrial Annual; PIA) of the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística; IBGE). The PIA longitudinal sampling frame covers firms with more than 30 employees only; hence, our analysis is limited to medium-sized and large firms. During the period under analysis, about 4,800 firms received BNDES/FINAME loans per year in the manufacturing sector, whereas 40,000 firms per year on average were available to construct the counterfactual group.

Although the treated group had a reasonable size, potential drawbacks remain. First, we do not have clear policy changes to provide a natural experiment for our data frame. For example, the PSI policy experiment with reduced rates was horizontal across sectors and reached all firm types. Second, any of the firms under analysis (both granted and not) may be affected by other government interventions apart from BNDES loans. However, BNDES is the largest financial institution offering subsidized loans for long-term projects, which are the main type of subsidies to affect firms' productivity. Third, there may be a time lag for any impact to be detected since outcomes do not necessarily appear immediately after the loan has been granted. Yet BNDES loans typically encompass six months before the project may

be considered eligible for analysis. This means that when the loan is approved the project is already being implemented, so considering the effects on the current and subsequent period is not a strong assumption.

Our aim is to uncover the effect of financial frictions and access to BNDES loans on measures of misallocation. We measure misallocation by firm-level distortions derived from the seminal work of Hsieh and Klenow (2009). Firms may be able to obtain tax breaks or input costs subsidies that lead them to reach a firm size and input use that does not reflect their underlying, fundamental productivity. These distortions prevent firms from achieving their TFP-related size, thereby leading to aggregate TFP losses. Since misallocation depends on the distribution of these distortions, we are interested in uncovering the effect of BNDES loans on their dispersion.

Our baseline measures of heterogeneity in allocation of inputs used to generate value added across firms are the capital to labor expenditure ratio (relative factor cost shares) and the labor to revenue ratio. The heterogeneity in these measures across firms is informative of the extent of potential misallocation of resources in an economy (see Hsieh and Klenow, 2009). The differential between the firm-level capital-labor ratio and a sector-level average is denoted as factor distortion. While some differences across firms may exist, competition in factor markets should equalize these factor shares. Difficulties in access to credit and conversely a too high cost of capital for, say, smaller firms, may lead to too little use of capital and high marginal revenue product of capital for some firms. Labor cost differentials or access to ineffective technology generates differences in labor to revenue shares across firms, revealing what is known as output distortion. It can be shown that the extent of resource misallocation, as measured by factor and output distortion standard deviations and the covariance between these distortions, are negatively related to aggregate output and aggregate TFP.

Public credit use can have different ex-ante effects on aggregate productivity in the intensive margin. It may deepen cost of capital differentials across firms, increasing capital distortion levels and sector heterogeneity. Cost of capital differences and size differences may work through output distortions as well. Alternatively, access to public credit may reduce firm financial frictions and overreliance on internal investment funding when a firm is unable to finance its investment at the market rate, reducing capital distortion levels (relative to sector averages) and heterogeneity.⁸ These mechanisms highlight the rationale for empirically evaluating the effect of BNDES credit on distortions interacted with firms' financial restrictions.

A priori we expect a negative effect of BNDES credit on aggregate productivity through a deepening of heterogeneity, as credit users are typically older and larger and would, in principle, have been able to finance investment anyway (i.e., no or limited additionality). To the extent that BNDES credit does not reach firms homogeneously within a sector benchmark, capital shares would not adjust to credit use and differentials would reflect increased misallocation. Put differently, to the extent that BNDES credit (i) does not reach firms compensating financial friction effects, i.e., does not reach more distorted, too high

⁸ Similar mechanisms may be at play at the extensive margin as well, i.e., given financial constraints BNDES/FINAME credit would allow firms to enter and grow more in a given sector.

capital marginal product firms; and (ii) does not reach all firms in a sector homogeneously, altering marginal product dispersion, we expect a negative effect of BNDES credit on aggregate productivity.

We present our approach more formally. Following the seminal work of Hsieh and Klenow (2009) - HK thereafter - we assume that within-sector firms face the same value-added technology and input (capital and labor) prices. Actual prices faced by a firm may differ for idiosyncratic reasons. This heterogeneity generates input and output firm allocation that differs from first best, denoted as distortions. We use capital and output distortions as in HK. Capital distortions, denoted by τ_{kit} , are defined by:

$$(1+\tau_{kit}) = (wL_{it}/rK_{it}) (\alpha_s/1-\alpha_s), \quad (1)$$

and output distortions, denoted by τ_{yit} , are defined by:

$$(1-\tau_{yit}) = (wL_{it}/VA_{it}) \eta/(\eta-1)/(1-\alpha_s), \quad (2)$$

where wL is the wage bill, rK is the cost of capital, α_s is the capital coefficient on a Cobb-Douglas production function, measured as capital services, i.e., rK on markup $(\eta/(\eta-1))$ adjusted value added, and VA is a measure of value added. We allow for market power within sectors, so that prices are marked-up costs. The mark-up depends on η , the demand elasticity.

The marginal revenue product of capital depends on both distortions and may be expressed as $MRPK_{it} = r(1+\tau_{kit})/(1-\tau_{yit})$. The marginal product of capital may increase (or decrease) given access to BNDES if it increases (decreases) capital distortions and reduces (raises) output distortions. In the HK framework, if all firms have the same wL/rK ratio, there is no capital distortion. A firm that has a high wL/rK ratio is said to have a high capital distortion. In this case, the firm-specific capital cost is above market rate and the firm capital stock below what would be expected given market input and output prices. The interpretation of the $(1-\tau_{yit})$ measure is similar to that of capital distortions: if all firms have the same wL/VA ratio, there is no output distortion. A firm that has a high wL/VA ratio is said to have a high output distortion. The key result we use to infer aggregate effects of BNDES credit use on distortions and aggregate productivity growth relates sector TFP to distortions variance:

$$\sigma^2_Y = V[\log(1 - \tau_{yit})], \quad (3)$$

and

$$\sigma^2_K = V[\log(1 + \tau_{kit})], \quad (4)$$

and σ_{YK} covariance between distortions.

Formally,

$$\text{Log TFP}_s = \Delta + (\eta/2) [2 \alpha_s \sigma_{YK} - \sigma^2_Y - \sigma^2_K (\alpha_s + (1-\alpha_s)/\eta) \alpha_s], \quad (5)$$

where Δ is a term that depends on within-sector firm mean TFP.⁹ Note that higher capital and output distortions variance and a negative correlation between capital and output distortions depress sector-level TFP. The latter is the sum of firm-level TFP adjusted for markup. Under a joint log normal distribution assumption, the expected value of sector-level TFP depends on distortions variance.

We estimate the effect of BNDES credit use on distortions covariance considering a conditional model for capital and output distortions. If coefficients on the BNDES variable differ in the sign across distortions equations, the BNDES contribution to the distortions covariance is negative. Following Leon-Ledesma and Christopolous (2016), we explore a little used result by Foster (2003), who decomposes model dependent variable variance on the explanatory variables effects. This allows us to measure the association between BNDES credit use and distortions variance from the output of a conditional mean model. Given an estimated multivariate regression model:

$$Y = b_1X_1 + \dots + b_kX_k + e, \quad (6)$$

the proportion of the Y variance $V(Y)$ explained by variable x_j is given by:

$$V(Y) = b_j \frac{V(Y|X_1, \dots, X_j)}{V(Y)} \quad (7)$$

The first term in (7) is the regular OLS coefficient from the multivariate regression. The second term is the coefficient from a simple ‘reverse’ regression of x_j on the dependent variable Y. Note that the term may be positive or negative. A negative effect would surface if the conditional and unconditional variable effects are of different signs.

As mentioned in the introduction, central to the role of credit in productivity growth is the presence of financial frictions. To capture the possibility that subsidized credit alters financial frictions, we include a measure of financial frictions in the model and interact it with BNDES credit use. Financial frictions are measured following the well-known Rajan and Zingales (1998) measure of dependency on internal financing of firm capital outlays. The intuition is that credit constrained firms use relatively more internal funds to finance their investment, so their investment minus cash flow over investment (a financial dependency for investment measure) is smaller. Conversely, firms that use more credit relative to internal resources to finance their investments have a higher financial dependency measure. More than half of firms in our sample do not record investment in a given year. This would render the usual financial dependency measure undetermined for the median firm. We therefore use an equivalent measure of financial dependency, that is, investment over cash flow, denoted FD.

The empirical method to evaluate financial frictions on the intensive margin is the well-known differences-in-differences model. This allows us to control for time invariant firm differences and aggregate time effects. For the distortions models, we interpret the public credit use effect as a binary treatment, controlling for financial restrictions across firms. Namely, we estimate whether BNDES/FINAME credit (BND_{it}) alters the factor use distortion and the output distortion measures. For each of the distortions D_{it} (capital and output

⁹ See equation 16 in the online appendix of Hsieh and Klenow (2009).

distortions) in firm i and period t the empirical model, in the spirit of Leon-Ledesma and Christopolous (2016), is:

$$D_{it} = \alpha + \beta_1 \text{BND}_{it} + \beta_2 (\text{BND}_{it} * \text{FD}_{it}) + \beta_3 \text{FD}_{it} + \delta Z_{it} + u_i + \mu_t + \varepsilon_{it} \quad (8)$$

Our variables of interest, BNDES credit use (BND_{it}) and financial dependency (FD_{it}), enter interacted with each other in our empirical model. Marginal effects (and the contribution) of BNDES credit on conditional expected distortions would be given by $\beta_1 + \beta_2 \text{FD}_{it}$. This could create difficulties in the use of the Foster decomposition formula as discussed in the original paper. But note that a simple manipulation of equation (7) yields the equivalent expression for the contribution of explanatory variable j to the regression dependent variable variance:

$$\text{Cov}(f_j, Y)/V(Y) \quad (9)$$

where

$$f_j = X_j b_j + Y|X_1, \dots, X_j. \quad (10)$$

This is the population equivalent of the simple regression coefficient of f_j explained by Y . We expand the formula so that the share of the variation of a dependent variable explained by an interaction variable is given by:

$$f_j = X_j b_j + (X_k * X_j) b_k. \quad (11)$$

Public credit use and financial dependency may be associated with size, a time variable dimension. To partially control for this confounding variable, we use lagged size measures (value added and revenues) as Z variables in equation (8) above.

5. Empirical results

We present capital distortions variance and output distortions variance in Table 1. We find a high level of dispersion for both capital and output, with capital distortions variance larger than output distortions variance. This is consistent with international patterns and with previous findings for Brazil in the manufacturing sector.¹⁰

Table 1: Distortions standard deviation – selected years

Year	$\ln(1+\tau_{kit})$	$\ln(1-\tau_{yit})$
2003	1.72	0.88
2008	1.66	0.90
2013	1.74	0.93

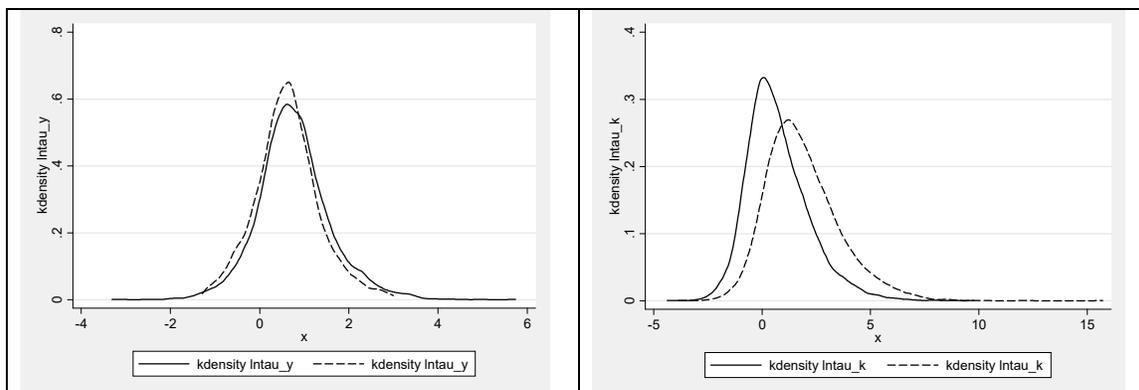
Source: authors' calculations based on IBGE data.

Figure 1 presents a visual representation of the distortions in the manufacturing sector. Scales are not standardized across graphs, but it is possible to see the larger capital distortions variance, with the dispersion increasing over time. Results on the effects and interactions between credit use for financing investment (our financial dependency variable) and

¹⁰ See Vasconcelos (2017).

BNDES/FINAME credit use are reported in Table 2. We find a significant interaction between these variables, which influences the trajectory of output and capital distortions.

Figure 1: Log Output (left) and Capital (right) distortions – 2003 (solid line), 2014 (dashed lines)



Source: Authors' analysis

We begin the interpretation of results with the BNDES credit use variables (Table 2, lines (a) and (b)). We find that for any level of financial dependency, more BNDES credit use increases output distortions and decreases capital distortions (line (a)). The capital distortions effect is expected, as BNDES credit is provided at below market rates, inducing capital expansion relative to employment use and sector averages. Line (b) of Table 1 presents the interaction between BNDES and our financial dependency measure. We find that the more firms use credit to finance their investment (i.e. higher financial dependency) the stronger the BNDES credit effects are, particularly for capital distortions. The effect of BNDES credit use on the marginal revenue product of capital, as measured in the Hsieh and Klenow (2009) framework, is amplified the less financially constrained firms are, i.e., the higher the financial dependency variable. Were financially constrained firms to be the target of BNDES credit, one would expect the opposite effect.

The effect of BNDES credit for the median financially dependent firm is reported at the bottom of Table 2, where we evaluate $\beta_1 + \beta_2 \text{FD}_{it}$ for the median FD level. Significance tests indicate that these effects are significant, with point estimates of 0.0198 and -0.0359 for output distortions and capital distortions, respectively. One should not take much of the level of the distortions estimate from our model. The important message from the estimates is that the opposing effects of BNDES credit on capital and output distortions contribute to a reduction in aggregate TFP. The opposing effects and signs we find in the data suggest that firms that accessed BNDES credit reduced their marginal revenue product of capital compared to firms that did not use BNDES credit. Using the Fields (2003) measure, we estimate that the effect of BNDES credit on capital distortions is positive, suggesting that firms that used BNDES credit already had a lower capital distortion and BNDES credit use influenced distortions unevenly across the capital distortions distribution, increasing its overall dispersion. As expected, the effect is small, however. As is typical in firm panel data, there is significant variation in the data that is not explained by the regressors (R^2 is in the 11-13 percent range for our estimates).

Table 2 – Financial Dependency and BNDES Credit on Distortions: Main results

		(1)	(2)
VARIABLES		$\ln(1 - t_{yit})$	$\ln(1 + t_{kit})$
(a)	BNDES Creditit	0.0195*** (0.00450)	-0.0346*** (0.00464)
(b)	BNDES Cred * Fin.Depit	0.00183 (0.00338)	-0.00797** (0.00349)
(c)	Financial Depit	-0.0391*** (0.00186)	0.129*** (0.00192)
	Observations	104,092	104,092
	Number of ii	36,598	36,598
	R-squared	0.138	0.113
	BNDES Cred. Contrib to Var	-0.13%	0.09%
	Median Fin Dep.	0.166	0.166
	BNDES Credit Eff.	0.0198	-0.0359
	p-value	0.000	0.000

Note: authors' calculation based on raw IBGE manufacturing data, 2003-2014. BNDES credit is a dummy which takes value 1 if firm i used BNDES/FINAME credit in year t and zero otherwise; Financial Dep equals investment outlays / cash flow, where cash flow is value added minus wage bill; Firm and Year dummies included; lagged log revenue and log value added included as controls. BNDES Cred. Contrib. is the proportion of the variance of the dependent variable explained by BNDES Credit variables, following eq. (7). BNDES Credit Eff. is BNDES credit effect on distortion evaluated for the median firm, i.e., BNDES Credit coefficient plus the interaction coefficient times Median Financial Dependency; P-value is a significance test p-value of BNDES Credit Eff. Standard errors given in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Line (c) of Table 2 provides information on the effect of financial dependency on distortions for firms that do not use BNDES credit (the BNDES dummy is null). The estimates suggest that firms that use relatively less internal funds for their investment, i.e., a high finance dependency variable, have a lower output distortion and a higher capital distortion. The opposing directions of the effect on distortions suggest that an increase in credit use to finance investments worsens misallocation and decreases aggregate TFP.

When we compare the effect of financial dependency on distortions across firms that use and do not use BNDES credit for their equipment outlays (line (b) of coefficients), the financial dependency effect on distortions is dampened, i.e., we find a relatively lower capital distortion and a smaller (in absolute value) negative effect of financial dependency on output distortions (although the interaction effect is not significant). The dampening effect of BNDES credit on financial dependency effects should, therefore, ease the negative effect of financial dependency on TFP.

In Table 3 we present the BNDES/FINAME credit effects and the financial dependency effects for large and small firms, according to the BNDES sector classification. Large firms are those with yearly turnover of at least R\$60 million up to 2009 and R\$90 million from 2010 onwards. Results are reported in columns (3)-(6). At the bottom of the table note that larger firms have a higher financial dependency variable, i.e., 0.219 compared to 0.161 for smaller firms. This is expected as larger firms may find it easier to finance their investment through credit. Coefficients in lines (a) and (b) suggest that BNDES credit use effects on

distortions tend to be stronger on capital distortions for smaller firms in our sample. For larger firms there is no significant effect of financial dependency on output distortions at standard confidence levels (line (c)). This is in line with previous results suggesting that for large firms BNDES credit does not significantly influence firm outcomes, including investment (e.g. Lazzarini et al. 2015).

Table 3 – Financial Dependency and BNDES Credit on Distortions: Subsample analysis

VARIABLES	(3)	(4)	(5)	(6)	(7)	(8)
	ln(1 - tyit)		ln(1 + tkit)		Ever used BNDES	
	Large	Small	Large	Small	ln(1 - tyit)	ln(1 + tkit)
(a) BNDES Creditit	0.0235*** (0.00842)	0.0176*** (0.00500)	-0.0205 (0.0127)	-0.0356*** (0.00503)	-0.00852 (0.00708)	-0.0297*** (0.00770)
(b) BNDES Cred * Fin.Depit	-0.0150** (0.00651)	0.00206 (0.00374)	0.000474 (0.00983)	-0.0108*** (0.00376)	0.00896 (0.00610)	-0.00509 (0.00662)
(c) Financial Depit	-0.00412 (0.00399)	-0.0433*** (0.00203)	0.130*** (0.00602)	0.129*** (0.00204)	-0.0516*** (0.00470)	0.123*** (0.00511)
Observations	9,790	94,302	9,790	94,302	20,892	20,892
Number of ii	3,003	34,743	3,003	34,743	10,312	10,312
R-squared	0.377	0.115	0.173	0.108	0.097	0.140
BNDES Cred. Contrib to Var	-0.02%	-0.15%	0.31%	0.07%	-0.23%	-0.14%
Median Fin Dep.	0.219	0.161	0.219	0.161	0.273	0.273
BNDES Credit Eff.	0.0202	0.0179	-0.0204	-0.0374	-0.0061	-0.0311
p-value	0.011	0.000	0.088	0.000	0.342	0.000

Note: authors' calculation based on raw IBGE manufacturing data, 2003-2014. BNDES credit is a dummy which takes value 1 if firm i used BNDES/FINAME credit in year t and zero otherwise; Financial Dep equals investment outlays / cash flow, where cash flow is value added minus wage bill; Firm and Year dummies included; lagged log revenue and log value added included as controls. BNDES Cred. Contrib. is the proportion of the variance of the dependent variable explained by BNDES Credit variables, following eq. (7). BNDES Credit Eff. is BNDES credit effect on distortion evaluated for the median firm, i.e., BNDES Credit coefficient plus the interaction coefficient times Median Financial Dependency; P-value is a significance test p-value of BNDES Credit Eff. Standard errors given in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

As a robustness estimate, we restrict the sample to firms that ever used BNDES credit over the sample period. Even if BNDES credit is relatively cheap, no more than 20 percent of firms in our sample used such credit. These firms may differ significantly from other firms, violating identification hypotheses for our differences-in-differences estimates. Therefore, in columns (7)-(8) we use as control group firms that have not used credit in the same year as the treated firms. Our main results for the negative effect of BNDES credit on capital distortions and marginal revenue product of capital are confirmed. Yet the contribution of BNDES credit on distortions variance is now negative. This suggests that for the specific group of firms that do use BNDES credit such credit use reduces heterogeneity. When empirically evaluated, the opposing effects of external financial dependency and BNDES credit on distortions point to the dominance of the BNDES credit effect for the median financially dependent firm. The inverse relationship between BNDES credit and these distortion effects yields a negative contribution on aggregate productivity, as in the Hsieh and Klenow (2009) analytical framework.

These results should be interpreted with caution. The total effect on productivity or aggregate distortions is not trivially measured. Investment experiences across firms are very heterogeneous. Not only investment is very lumpy for about half the firms in the sample not reporting net capital goods outlays in a single year, but less than half of the firms in the sample actually use BNDES credit, despite their supposed attractiveness.¹¹ Together with the relatively small size of the coefficients, this yields a low contribution of BNDES credit to explain the cross-sectional dispersion of distortions. Therefore, we preliminarily conclude that financial frictions and BNDES/FINAME credit are one among many sources of distortions in the Brazilian economy.

6. Concluding remarks and policy implications

This paper discussed the impact of BNDES on firm productivity in the light of the extant literature and presented novel preliminary evidence on the distortionary effects of subsidized credit on resource misallocation. BNDES plays a central role in the country's massive earmarked credit system, accounting for about half of the total and three-quarters of the proportion allocated to firms. Therefore, assessing its role and impact is an important policy question, which has attracted growing interest in academic and policy circles. Our main finding is that there is some evidence that financial frictions and BNDES credit are associated with resource misallocation. However, the impact is relatively small, suggesting that other sources of distortions are at play as well.

While the pervasiveness of market failures in long-term financing markets in Brazil justifies in principle an active government intervention, the extant evidence on the role of BNDES in easing financing constraints of firms and contributing to productivity growth is inconclusive at best. We believe that the results of the novel empirical analysis conducted for this paper offer a valuable contribution to the debate on which credit policy instruments should be used to support the development of a productive enterprise system in Brazil. Sound and wide access to credit has always been considered a fundamental ingredient of any private sector development strategy. Contrary to expectations, our preliminary results show that BNDES may have contributed to deepen the misallocation of capital across firms.

As in the case of most empirical studies, a good dose of caution is needed when impact evaluation findings are used in a debate on alternative uses of public funding schemes. The validity of our results is limited to the specific analysis of a subset of financing schemes intermediated by BNDES, which is FINAME. Therefore, our results only reflect the effectiveness of that particular product line. Expanding the significance of our results to other schemes would require a set of well-defined interpretative assumptions. Moreover, because of data constraints, we could only focus on a particular cohort of credit recipients, that is, firms with more than 30 employees. Though relatively large firms are the main recipients of BNDES financing, the impact of BNDES on smaller firms may well be different.

Despite these limitations, the overall lack of positive evidence from increased BNDES operations over time suggests that a more focused approach is desirable. Fiscal consolidation in Brazil implies a tapering of the BNDES balance sheet, which is already underway, offering

¹¹ The very low delinquency rates of BNDES loans, below private credit market levels, may suggest that credit screening is binding for many firms.

an opportunity to rethink the role of the development bank in long-term financing markets from a *provider* of funds to an *enabler* of private capital. Recent reforms aimed at phasing out the regulated and implicitly subsidized interest rate, the TJLP, and adopting a new rules-based interest rate, the TLP, reflecting the government's funding costs, are welcome. This is expected to clearly separate subsidies from BNDES lending and to encourage the institution to allocate lending to firms that can generate an economic return on the funds. Other complementary interventions may contribute to crowd-in private finance. Leveraging on its long experience in assessing projects, BNDES may, for example, provide advisory services to private investors for project preparation, as the lack of ready-to-implement projects has been recurrently mentioned as a bottleneck to investments in Brazil. BNDES may further develop risk-sharing instruments aiming to de-risk certain private sector investment by improving the investors' risk-return profile. Financial mitigation could rely, for example, on guarantee instruments, mezzanine debt, credit enhancements and other sector-specific tools.

This paper attempted to study the role of financial frictions and credit policy responses in resource misallocation. However, financial frictions can also reduce productivity at the extensive margin, by distorting entry and technology adoption decisions (selection channel). There is evidence that the selection channel is relatively more important than the misallocation channel (Midrigan and Xu, 2014). While self-financing can alleviate capital misallocation (Moll, 2014), it is more difficult to do so in sectors with larger scale (e.g., manufacturing) and larger financing needs, which are then affected disproportionately more by financial frictions (Buera et al., 2014). Investigating the impact of BNDES credit on firm selection is in our agenda.

References

- Aldrighi, D.M and Bisinha, R. (2010). Restrição financeira em empresas com ações negociadas na Bovespa. *Rev. Bras. Econ.* [online], 64 (1), pp.25-47.
- Ambrozio, A.M.H.P, Sousa, F.L., Faleiros, J.P.M, Sant'anna, A.A. (2017). Credit scarcity in developing countries: An empirical investigation using Brazilian firm-level data. *Economia*, 2017, 17 (1), pp. 73-87.
- Antunes, A., Cavalcanti, T. and Villamil, A. (2015). The Effects of Credit Subsidies on Development. *Economic Theory*, SAET, 58, pp. 1-30.
- Arcand, J.L, Berkes, E. and Panizza, U. (2015). Too Much Finance? *Journal of Economic Growth*, 20(2), pp. 105-148.
- Atkinson, A.B. and Stiglitz, J. (1980). *Lectures on Public Economics*, McGraw-Hill, New-York.
- Bailey, W. B., W. Huang, and Z. Yang. (2011). Bank loans with Chinese characteristics: some evidence on inside debt in a state-controlled banking system, *Journal of Financial and Quantitative Analysis*, 46, pp. 1795–1830.
- Bandeira-de-Mello, R.; Marcon, R. (2005). Unpacking firm effects: modelling political alliances in variance decomposition of firm performance in turbulent environments. *BAR-Brazilian Administration Review*, 2(1), pp. 21-37, 2005.
- Banerjee, A.V. (1997). A Theory of Misgovernance. *The Quarterly Journal of Economics*, 112(4), pp. 1289–1332.
- Banerjee, A.V. and Duflo, E. (2005). Growth Theory through the Lens of Development Economics. *Handbook of Economic Growth*, in: Philippe Aghion & Steven Durlauf (eds.), *Handbook of Economic Growth*, edition 1, 1(7), pp. 473-552. Elsevier.
- Bencivenga, V. e Smith, B. (1991). Financial Intermediation and Endogenous Growth. *The Review of Economic Studies*, 58(2), pp. 195-209.
- Berger, A., DeYoung, R., Flannery, M., Lee, D.K. and Oztekin, O. (2008). How Do Large Banking Organizations Manage Their Capital Ratios? *Journal of Financial Services Research*, 34(2-3).
- Bertay, A., Demirguç-Kunt, A. and Huizinga, H. (2015). Bank ownership and credit over the business cycle: Is lending by state banks less procyclical? *Journal of Banking and Finance*, 50, pp. 326-339.
- Bonomo, M., Brito, R.D and Martins, B. (2015). The after crisis government-driven credit expansion in Brazil: a firm level analysis. *Journal of International Money and Finance*, 55, pp. 111-134.
- Brei, M. and Schclarek, A. (2015). A theoretical model of bank lending: Does ownership matter in times of crisis? *Journal of Banking & Finance*, 50(C), pp. 298-307.
- Buera, F. J., R. Fattal-Jaef, and Y. Shin (2014). Anatomy of a Credit Crunch: From Capital to Labor Markets. Working Paper 19997, National Bureau of Economic Research.

- Busso M., Madrigal L. and Pagés, C, 2013. Productivity and resource misallocation in Latin America, *The B.E. Journal of Macroeconomics* 13(1), pp. 1-30.
- Byskov, S. and M. Clavijo (2017). Understanding the effects of the Taxa de Longo Prazo (TLP) reform in Brazil. Staff Note, The World Bank.
- Calomiris, C.W. (2010). The political lessons of Depression-era banking reform. *Oxford Review of Economic Policy*, 26(3), pp. 540–560.
- Carvalho, D. (2013). The Real Effects of Government-Owned Banks: Evidence from an Emerging Market. *The Journal of Finance*, 69(2), pp. 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, pp. 21-25.
- Cecchetti, S, and Kharroubi, E. (2012): “Reassessing the impact of finance on growth”, BIS Working Papers 381.
- Claessens, S., Feyen, E. and Laeven, L. (2008). Political Connections and Preferential Access to Finance: The Role of Campaign Contributions. *Journal of Financial Economics*, 88(3).
- Coelho, D. and De Negri, J.A. (2011). Impacto do Financiamento do BNDES sobre a Produtividade das Empresas: Uma Aplicação do Efeito Quantílico De Tratamento. *Anais do XXXVIII Encontro Nacional de Economia, ANPEC*.
- Cole, S. (2009). Fixing Market Failures or Fixing Elections? Agricultural Credit in India. *American Economic Journal: Applied Economics* 1(1), pp. 219-50.
- Coleman, N. and Feler, L. (2015). Bank ownership, lending, and local economic performance during the 2008–2009 financial crisis. *Journal of Monetary Economics*, 71(C), pp. 50-66.
- Cooper, M. J., Gulen, H., and Ovtchinnikov, A. V., 2010. Corporate political contributions and stock returns. *Journal of Finance* 65, pp. 687 – 724.
- Cull, R., Peria, M.S.M. and Verrier, J. (2017). Bank Ownership: Trends and Implications. IMF Working Paper, WP/17/60.
- De Bolle, M. (2015). Do Public Development Banks Hurt Growth? Evidence from Brazil. Peterson Institute for International Economics, PB15-16.
- De Negri, J.A., Maffioli, Rodriguez, C. and Vázquez, R.G. (2011). The Impact of Public Credit Programs on Brazilian Firms. Inter-American Development Bank, Working Papers IDB-WP-293.
- Dinc, S. (2005). Politicians and Banks: Political Influences on Government-Owned Banks in Emerging Markets *Journal of Financial Economics*, 77, pp. 453-479.
- Faccio, M. (2010). Differences between Politically Connected and Non-connected Firms: A Cross-Country Analysis. *Financial Management*, 29(3), pp. 905-928.
- Fields, G. S. (2003). Accounting for Income Inequality and Its Change: A New Method with Application to the Distribution of Earnings in the United States. *Research in Labor Economics* 22, pp. 1–38.

- Fry, M.J. (1978). Money and Capital or Financial Deepening in Economic Development?. *Journal of Money, Credit and Banking*, 10(4), pp. 464-75.
- Gerschenkron, A. (1962). *Economic Backwardness in Historical Perspective*. Cambridge, MA: Belknap Press of Harvard University Press.
- Goldsmith, R. W. (1969). *Financial Structure and Development*. New Haven: Yale University Press.
- Hart, O. (2003). Incomplete Contracts and Public Ownership: Remarks, and an Application to Public-Private Partnerships. *The Economic Journal*, 113(486), pp. C89-C76.
- Hsieh, C.T. and Klenow, P.J. (2009). Misallocation and Manufacturing TFP in China and India. *The Quarterly Journal of Economics*, CVVIV(4).
- Inoue, C.F, Lazzarini, S.G and Musacchio, A. (2013). Leviathan as a minority shareholder: firm-level implications of state equity purchases. *Academy of Management Journal*, 56(6), pp. 1775-1801.
- Kalemli-Ozcan, S. and Sorensen, B.E. (2012) Misallocation, Property Rights, and Access to Finance: Evidence from Within and Across Africa. NBER Working Paper 18030
- Khwaja, A. and Mian, A. (2005). Do Lenders Favor Politically Connected Firms? Rent Provision in an Emerging Financial Market. *The Quarterly Journal of Economics*, 120(4), pp. 1371-1411.
- King, R.G. and R. Levine, (1993a). Finance and growth: Schumpeter might be right, *Quarterly Journal of Economics* CVIII, pp. 717-738.
- King, R.G. and R. Levine, (1993b). Finance, entrepreneurship, and growth: Theory and evidence, World Bank Policy Research Working Paper (World Bank, Washington, DC).
- La Porta, R., F. Lopez-de-Silanes, and A. Shleifer (2002). Government ownership of banks. *Journal of Finance* 57 (1), pp. 265-301.
- Lazzarini, Sergio G., Aldo Musacchio, Rodrigo Bandeira-de-Mello, and Rosilene Marcon. 2014. What Do State-Owned Development Banks Do? Evidence from BNDES, 2002–09. *World Development* 66, pp. 237–53.
- León-Ledesma, M. and Chrisopoulos, D. (2016) Misallocation, Access to Finance, and Public Credit: Firm-Level Evidence. *Asian Development Review* 33(2), pp. 119–143.
- Levine, R., Loayza, N. e Beck, T (2000). Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics*, 46, pp. 31-77.
- Machado, L. et al. (2014). Effects of BNDES PSI on investment of Brazilian industrial companies: impact estimates based on a matching approach. In: ENCONTRO NACIONAL DE ECONOMIA - ANPEC, 42, 2014, Natal. Anais eletrônico. Accessed on: 15 October 2017.
- McKinnon, Ronald I. (1973). *Money and Capital in Economic Development*, (Washington: The Brookings Institution).

- Medeiros, A. and Aldrighi, D.M. (2014). Financiamento Das Campanhas Eleitorais de 2006 Por Grupos Econômicos E Empréstimos Do Bndes. Anais do XL Encontro Nacional de Economia [Proceedings of the 40th Brazilian Economics Meeting], ANPEC.
- Micco, A., Panizza, U. and Yañez, M. (2007). Bank ownership and performance. Does politics matter?. *Journal of Banking and Finance*, 31, pp. 219–241.
- Midrigan, V. and Xu, D.Y. (2014). Finance and Misallocation: Evidence from Plant-Level Data. *American Economic Review*, 104(2), pp. 422-58.
- Moll, B. (2014). Productivity Losses from Financial Frictions: Can Self-financing Undo Capital Misallocation? *American Economic Review*, 104(10), pp. 3186–3221.
- Oliveira, F. (2014). Investment of Firms in Brazil: do financial restrictions, unexpected monetary shocks and BNDES play important roles? Banco Central do Brasil, Working Paper 366.
- Ongena, S. and Şendeniz-Yüncü, İ. (2011). Which firms engage small, foreign, or state banks? And who goes Islamic? Evidence from Turkey. *Journal of Banking & Finance*, Elsevier, 35(12), pp. 3213-3224.
- Ottaviano, G. e Sousa, F. (2008). O efeito do BNDES na Produtividade das Empresas in Políticas de Incentivo à Inovação Tecnológica organized by De Negri, J. and Kubota, L., IPEA, Brasília.
- Parente, S. and Prescott. (2002). *Barriers to Riches*. MIT Press Books, The MIT Press, Ed. 1, V.1
- Pazarbasioglu, C.; Byskov, S.; Bonomo, M.; Carneiro, I.; Martins, B.; Hernandez Perez, A., (2017). Brazil -Financial intermediation costs and credit allocation. Discussion Paper, The World Bank.
- Rajan, R. and Zingales, L. (1998). Financial Dependence and Growth. *The American Economic Review*, 88(3), pp. 559-586.
- Restuccia, D. and Rogerson, R. (2008). Policy Distortions and Aggregate Productivity with Heterogeneous Plants. *Review of Economic Dynamics*, 11(4), pp. 707-720.
- Restuccia, D. and Rogerson, R. (2013). Misallocation and productivity. *Review of Economic Dynamics*, 16(1), pp.1–10.
- Ribeiro, E. and DeNegri, F., (2009). Public Credit use and Productivity in Brazil. LACEA/LAMES 2009 Meeting.
- Sapienza, P. (2004). The effects of government ownership on bank lending. *Journal of Financial Economics*, 72(2), pp. 357-384.
- Shaw, E. (1973). *Financial Deepening in Economic Development*, (New York: Oxford University Press).
- Shleifer, A. and Vishny, R.W. (1994). Politicians and Firms. *Quarterly Journal of Economics* 109(4), pp. 995-1025.

Sztutman, A. M., and Aldrighi, D. M. (2013). Financiamento das campanhas eleitorais de 2006 por grupos econômicos e empréstimos do BNDES, Paper presented at the XII Encontro Brasileiro de Finanças, Rio de Janeiro.

Vasconcelos, R. (2017). Misallocation in the Brazilian manufacturing sector. *Brazilian Review of Econometrics* 37(2).

World Bank 2012. *The Real Paradox: Untangling Credit Market Outcomes in Brazil*. Washington, DC: World Bank.