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**Relaxing Credit Constraints in Emerging Economies:
The Impact of Public Loans on the Performance of
Brazilian Manufacturers**

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Abstract

In emerging economies credit constraints are often perceived as one of the most important market frictions hampering firm innovation and productivity growth in manufacturing. Huge amounts of public money are devoted to the removal of such constraints but their effectiveness is still subject to an intense policy debate. This paper contributes to this debate by analyzing the effects of the Brazilian Development Bank (BNDES) loans. Exploiting the unique features of a dataset on BNDES loans to Brazilian manufactures, it finds that: (a) credit constraints facing Brazilian manufacturing firms are real, especially for firms that apply to BNDES repeatedly; (b) BNDES funding has been successful in relaxing those credit constraints; (c) BNDES support has allowed granted firms to match the performance of similar unconstrained firms, at least in the short run, but not to outperform them.

Keywords: credit constraints, firm performance, firm productivity, firm investment, public loans
JEL codes: G28; O38; H25

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1. Introduction

Large emerging economies, such as Brazil, China and India, are considered the “markets of the future” as promising destinations for sales as well as worrying origins of new tough competitors. At the same time, manufacturers from those countries feel they are not able to compete on a level playing field with manufacturers from more advanced economies due to all sorts of market failures. In particular, credit constraints are often perceived as one of the most important market frictions constraining innovation, growth and performance as they hamper the entrepreneurial efforts of local firms. While huge amounts of public money are being devoted to the removal of such constraints, their effectiveness is still subject to an intense policy debate. Banerjee and Duflo (2014) is an example of this recent literature.

The aim of this paper is to contribute to this debate by investigating the case of Brazil. The Brazilian government provides long-term loans through the *Banco Nacional de Desenvolvimento Econômico e Social* (henceforth, BNDES), a development bank whose main statutory goal is to improve Brazilian economic competitiveness without neglecting broader social and environmental aspects.¹ BNDES invests in several areas including research and development, infrastructure, export support, regional and urban development. More specifically, in the case of manufacturing, BNDES finances long-term projects aimed at the creation of new plants, the enlargement of existing ones, the restructuring and the modernization of production processes, innovation and technological development, export promotion. Overall, the importance of BNDES in the Brazilian economy is quite sizeable: in 2012 its disbursements reached the value of R\$ 156 billion (or US\$ 76 billion), representing 20% of aggregate investment.² When compared with that of other development banks, the size of BNDES financing becomes even more impressive. For instance, in 2012 the World Bank and the Inter-American Development Bank disbursed 19.8 and 6.9 billion dollars respectively.³ In comparison, BNDES financing reached nearly three times their combined disbursements.⁴

While acknowledging that BNDES project analysis involves several other dimensions including social and environmental aspects, this paper focuses on the narrower assessment of the overall impact on the competitiveness of Brazilian firms. Do BNDES loans help relax credit constraints that hamper productivity growth in Brazilian firms? We address this question by exploiting the unique features of a micro-dataset drawn from a variety of sources: the Annual Industrial Research of the Brazilian Institute of Geography and Statistics; the Annual Social Information Report of the Ministry of Labour; the Foreign Trade Secretary of the Ministry of Industrial Development and Foreign Trade; the Foreign Capital Census and the Central Bank Register of Brazilian Capital Abroad of the Brazilian Central Bank; and BNDES itself.⁵

Even though there is a growing literature evaluating government policies for business support (Bronzini and Blasio, 2006), there is a relative shortage of papers on the specific impact of government policies on private sector development (McKenzie,

¹ Carvalho (2014) provides a short history description of BNDES.

² Information accessed on May 29th, 2014 at

http://www.bndes.gov.br/SiteBNDES/bndes/bndes_en/Institucional/The_BNDES_in_Numbers/

³ According to World Bank (2013) and IADB (2013).

⁴ In their survey on development banks Luna-Martinez and Vicente (2012) classify BNDES as a ‘mega-bank’ together with other large development banks, such as the China Development Bank and Kreditanstalt für Wiederaufbau (KfW) from Germany.

⁵ A full description of the data sources is presented in Section 3.

2010), especially when it comes to firm productivity (see, e.g., Griliches, Klette and Moen, 2000; Criscuolo, Martin, Overman and Reenen, 2012). This is not due to a shortage of methods, since other areas have already developed different ways to deal with the issue. An example can be found in the literature of labour economics that evaluates to what extent government policies affect individuals' achievements (Heckman, LaLonde and Smith, 1999).

The role of credit constraints for innovation and growth has been stressed mainly in the development literature. Banerjee and Duflo (2005) provide evidence that firms in many developing countries face credit constraints, using a sample of countries including Brazil. More specifically, Terra (2003), Aldrighi and Bisinha (2010) and Ambrozio et al (2013) provide evidence that Brazilian firms are credit constrained by investigating this issue at the firm level. The link between innovation and economic growth is well established with recent studies showing that 40% of productivity growth can be accounted by R&D (Reickard, 2011). However, despite extensive research, empirical findings on the effects of governments' innovation programs are still inconclusive, with results varying a lot across countries (Gao et al, 2016).⁶

BNDES effects on the Brazilian economy have been investigated in the international literature recently. Bandeira-de-Mello et al (2015) evaluate BNDES loans with reference to a range of firm performance indicators, including profitability and investment. Carvalho (2014) investigates whether elections shift investments supported by BNDES towards politically attractive regions. Both papers, however, do not assess the impact of BNDES financial support on firms' productivity, which is one of its main goals. In terms of productivity, Coelho and Lage de Sousa (2010) present a review of all studies using evaluation techniques investigating BNDES support. In total, six papers investigate whether firm productivity is related to BNDES loans. Still, the majority of them evaluate only labour productivity. These include De Negri et al (2008), Coelho and De Negri (2010) and Araújo et al (2010), who investigate the effects of all BNDES loans on firm performance, including those not aimed at improving productivity. Ribeiro and De Negri (2009) and Coelho and De Negri (2010) look at both labour productivity and Total Factor Productivity (TFP), but the former focus on a specific loan allotted to the acquisition of domestic capital goods (FINAME) whereas the latter analyse all types of BNDES loans.⁷

Closer to the spirit of the present paper, Ottaviano and Lage de Sousa (2008) and Lage de Sousa (2013) investigate the relationship between firms' performance and BNDES loans allocated to the modernization and enlargement of existing plants or to the creation of new ones. Both papers look only at labour productivity, whereas this paper looks also at TFP. Another feature that distinguishes the present paper from the others is the design of an estimation strategy that not only uses different sets of counterfactual groups but also tests whether granted firms indeed face tougher credit restriction.

Overall, we find that repeatedly granted firms were more credit constrained than comparable non-granted firms before receiving BNDES support. Moreover, with some exception, BNDES support did allow granted firms to match the performance of similar firms that were not credit constrained to start with, but not to outperform them. These findings suggest that government support of the type provided by BNDES can indeed help relax credit constraints that prevent constrained firms from performing as otherwise identical unconstrained ones. On the other hand, they also suggest that

⁶ In the case of Latin American countries Crespi et al (2014) list a number of papers in which innovation policies are found to have a positive impact on firm performance.

⁷ A description of BNDES loans are presented in Section 2.

BNDES support did not have the effect of making constrained firms select and implement their projects more effectively than unconstrained firms.

The paper is structured as follows. Section 2 details the financial support offered by BNDES to manufacturers. Section 3 introduces the data together with the alternative ‘treatment’ and ‘control’ groups we use to assess the impact of BNDES support. Credit constraints are investigated in Section 4, while Section 5 looks at the impact of BNDES support on firm performance. Section 6 concludes.

2. Overview of BNDES schemes

BNDES provides a wide range of financial tools to support Brazilian manufacturing firms: FINEM, Automatic BNDES, FINAME, Leasing FINAME, International Competition FINAME (BNDES-Exim) and Subscription of Securities. BNDES interest rates are subsidized which means that it reduces firms’ marginal cost to invest.⁸

FINEM (“Financing and Endeavours”) is a support scheme for projects with financial needs over R\$10 million offered by BNDES directly or indirectly through retail banks. Projects with financial needs below this threshold are instead supported solely indirectly through retail banks under the Automatic BNDES scheme. Both schemes contemplate several categories of expenses covering the creation of new plants, the enlargement of existing ones, the restructuring and the modernization of processes, innovation, and technological development.⁹

Through the FINAME (“Machines and Equipment”) and the Leasing FINAME schemes, BNDES supports the acquisition of new domestically produced machines and equipment either by buying them (FINAME) or leasing them (Leasing FINAME). Finally, the aim of BNDES-Exim is to provide financial support for exports while the aim of Subscription of Securities is to facilitate changes in firm ownership.

Our focus is on FINEM and Automatic BNDES as they are more focused on supporting investments in innovation and technological improvement that have stronger potential to directly affect firm productivity.¹⁰ Differently, FINAME and Leasing FINAME do not contemplate these types of investments, and anyway their impact on firms’ productivity has already been investigated by Ribeiro and De Negri (2009). Nonetheless, it is necessary to account for them in order to isolate the role of FINEM and Automatic BNDES. BNDES-Exim and Subscription of Securities have, instead, rather different objectives.¹¹

In order to receive FINEM or Automatic BNDES loans, firms need to send a supporting application form with some brief information of their projects to a retail bank or BNDES itself. The banks evaluate whether their projects are in line with the purpose of the loans. After getting their application approved, firms have to send complete and detailed project plans for in-depth evaluation in terms of whether they are economically viable, what collateral can be used to guarantee the loan, and so forth.

⁸ See De Bolle (2015) for a discussion of BNDES subsidized interest rates and their effects on the Brazilian economy.

⁹ A complete list is available at <http://www.bndes.gov.br>.

¹⁰ Regarding their importance, those two loans are quite representative in BNDES budget as they were on average 46% of the total disbursements from 2000 to 2009.

¹¹ Although changes of ownership might affect firms’ performance, we are interested in how productivity might be affected by the implementation of projects. Additionally, all firms being supported by this scheme are discarded as there are only few firms.

If successful, the evaluation process culminates in a formal contract proposal in which the terms and conditions of the loan are established, including amount, period, and interest rate. After negotiations are completed, the loan contract is signed. It is important to note two crucial points here. First, there is a limit for BNDES participation in any project. This varies over time but is generally around 80%. A project is thus never fully financed by BNDES. Second, firms receive their loan in instalments according to the development of the project and following a schedule decided during negotiation.

In particular, firms receive the first instalment when the loan is approved and the remaining ones only after an evaluation of the project's progress. Before the second instalment, the firm should prove whether the money of the first disbursement was invested as dictated by the project plan. Any violation of the loan terms leads to a further investigation and instalments are interrupted until justifications are given. If no problems emerge, instalments continue until the end of the project. Since these are long-term projects, the period between contract signing and the end of instalments takes on average 5 years. Generally, only after all instalments have been paid, firms start to amortize their loans. The "conditionality" of instalments to projects' progress and completion implies that granted firms have to invest according to the approved plans so that their credit constraints (if they had any) are almost by definition relaxed by institutional design. The key issue then becomes whether they were credit constrained to start with.

3. Treatment and control groups

Do FINEM and Automatic BNDES loans help relax credit constraints that hamper the competitiveness of Brazilian manufacturers? Answering this question requires, first of all, identifying the group of granted ('treated') firms for which enough information is available. Then, it is crucial to define a 'valid' counterfactual highlighting what would have happened to the granted firms had they not been supported by BNDES. Compared with the counterfactual, one has to establish whether (i) firms granted BNDES loans were indeed credit constrained, and then (ii) check whether their performance actually changed after receiving the BNDES loans. Checking that they have implemented their projects is, instead, redundant given that, as already discussed, BNDES funds are transferred to firms in installments and, except for the first one, these are made conditional on firms having successfully followed the agreed implementation plan.

Our analysis relies on micro-data drawn from a variety of sources already used by the papers described by Coelho and Lage de Sousa (2010). In particular, our dataset combines information from: the Annual Industrial Research (*Pesquisa Industrial Anual* – [PIA]) of the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* – [IBGE])¹²; the Annual Social Information Report (*Relação Anual de Informações Sociais* – [RAIS]) of the Ministry of Labour; the Foreign Trade Secretary (*Secretaria de Comércio Exterior* – [SECEX]) of the Ministry of Industrial Development and Foreign Trade; the Foreign Capital Census and the Central Bank Register of Brazilian Capital Abroad of the Brazilian Central Bank; BNDES itself.¹³

¹² This is our main data source, since it contains the majority of the variables useful for this analysis, including those needed to measure firm productivity.

¹³ The construction of the dataset has followed procedures that guarantee the confidentiality of information so that individual data cannot be related to any specific firm.

3.1 Treatment groups

We select our ‘treated’ firms as follows. First, we use BNDES data to identify granted firms from 1995 to 2007.¹⁴ During this period, 756 new firms on average were ‘treated’ annually in that they received at least once one of the two targeted BNDES financial schemes (FINEM and/or Automatic BNDES). In total, these firms represent nearly 4% of all manufacturing firms in Brazil.¹⁵ Second, it is unfortunately impossible to use all these manufacturers as some of them are not available from PIA, especially small firms. The reason is that PIA covers only around 30,000 firms with more than 30 employees. These firms represent only 11% of all manufacturers but around 2/3 of overall manufacturing employment.¹⁶ Hence, the fact that we have to focus only on PIA firms reduces the number of firms granted in our sample by half. Third, the size of the ‘treated’ group is further reduced because we want to evaluate only the performance of *manufacturing firms* granted loans to implement projects in the manufacturing sector. BNDES records, however, concern all *manufacturing projects*. They thus report also manufacturing projects by non-manufacturing firms (e.g., those of large food retailers investing in the development of their own brands) and do not cover non-manufacturing projects of manufacturing firms (e.g., those implemented in agriculture). Fourth, some firms appear or disappear from records due to mergers. For example, if Firm A received a loan in 1997 and in 2000 merged with Firm B creating a new Firm C, the initial loan should be registered for firm C. As the past records of Firm C are impossible to reconstruct, we drop all information on loans projects granted to firms like A and B.¹⁷ Finally, there is a time lag of generally two to three years before a firm enters the Census part of PIA.¹⁸ Hence, some granted firms with more than 30 employees are not recorded by PIA at the moment they receive BNDES loans.

Further issues potentially affect the size our ‘treated’ group. Some firms are exposed to other government interventions apart from BNDES loans. Since BNDES is the largest financial institution in Brazil offering loans for long-term projects, we assume that its loans are the main type of policy tools affecting firms’ productivity. In addition, there may be a time lag for any impact to be detected, since outcomes do not necessarily appear immediately after the loans have been granted. As some projects last at least five years, we need a period beyond the five-year horizon to assess their impacts. Given the time spanned by our dataset (1996 to 2006), that is clearly not feasible for loans granted from 1999 onwards. On the other hand, as we will discuss later, to construct the ‘control’ group for firms treated in a certain year, one needs at least two years before treatment. Hence, the impact of BNDES schemes can be scrutinized only for firms granted Automatic BNDES and FINEM loans in 1998. Excluding all firms treated before 1998 leaves us with 227 firms which have received

¹⁴ Data on 1995 are used only to exclude any firm that received ‘financial treatment’ in that particular year. Data on 2007 are used for choosing a counterfactual group, as described in a later stage in this paper.

¹⁵ More precisely, 9,828 firms were granted during these 11 years and there were 274,515 active firms in the Brazilian manufacturing sector in 2007 (source PIA/IBGE).

¹⁶ Firms with less than 30 employees are also considered in this survey, but they are selected randomly for the survey each year. Since their sample varies annually, and is thus impossible to follow, we have decided to discard them.

¹⁷ All firms that have received financial support through Subscription of Securities are deleted from our sample as our focus is on firms implementing projects. Moreover, a very limited number of firms have received support by Subscription of Securities which does not provide enough information for any econometric investigation.

¹⁸ IBGE receives information of firms’ size (number of employees) for a particular year only at the end of the following year.

the first loan in this specific year (1998).¹⁹ Among these, 86 firms are not present in the PIA dataset for the whole period investigated.²⁰ In the end, we have two initial ‘treated’ groups: 141 firms and 227 firms, Groups 1 and 2 listed in Table 1, depending on whether we focus only on ‘survivors’ or not.

Group Name	Description	Survived?	Number of Firms
Group 1	Firms granted for the 1 st time in 1998	Yes	141
Group 2		No	227
Group 3	Firms granted only in 1998	Yes	75
Group 4		No	143
Group 5	Firms granted only Automatic BNDES	Yes	112
Group 6		No	190

On the other hand, it may be useful to further distinguish the firms in these ‘treated’ groups. First, to see whether there are any differential impacts between FINEM and Automatic BNDES, we consider firms that have received only Automatic BNDES whether surviving (Group 5) or not (Group 6). Second, to investigate the effects of repeated treatment, we also trim our sample to firms that were awarded BNDES support only in 1998 and not afterwards, whether surviving (Group 3) or not (Group 4).²¹

3.2. Control groups

How can we build a ‘valid’ counterfactual for the selected groups of ‘treated’ firms? Short of natural experiments or randomized control trials, the answer is not straightforward. We, therefore, try various alternatives in order to control for observable as well as unobservable characteristics using our judgement to identify ‘control’ groups that are likely to share similar pre-treatment characteristics with the ‘treated’ ones.

3.2.1. Granted versus non-granted

The first naïve control group (Group A) consists of all 21,380 Brazilian firms (above 30 employees) that did not receive any BNDES loans during the period of analysis. Firms, however, are not randomly selected by BNDES and systematic differences between granted and non-granted firms do exist. Table 2 summarizes the main characteristics of treated and non-treated firms before BNDES intervention.²² First, credit constraints seem indeed to be stricter for ‘treated’ than ‘non-treated’ firms:

¹⁹ Considering that on average 756 firms receive BNDES financial support per year, our reduced sample to 227 firms seems to be a representative number of granted firms, especially if we consider that only around half of them (circa 378 firms) are available in PIA, our main dataset to estimate productivity.

²⁰ There are three possible explanations for why a firm leaves the PIA dataset: first, it goes bankrupt; second, its employment level falls short of the threshold of 30 employees; third, the main part of its revenue does not come anymore from manufacturing.

²¹ We have also investigated different treated groups (such as firms financed through Automatic BNDES only in 1998), but results were similar to those presented for the chosen treated groups.

²² Table A.2 presents descriptive statistics for all variables in Appendix II. Description and sources are shown at Table A.1 in Appendix I. Similar results are obtained with non-surviving firms (Groups 2, 4 and 6).

whereas cash flow over capital is lower for the former than the latter, the reverse holds for the investment rate (investment over capital). While this is consistent with ‘treated’ firms facing stricter constraints, it may also be due to the fact that granted firms are more present in riskier sectors, as evidenced by the OECD technological classification.

Table 2: Average of Granted and Non-Granted Firms One Year Before Treatment

Groups	Non Treated Firms	Treated Firms		
		All Firms over 30 employees	All First Time in 1998	Automatic BNDES 1st Time 1998
Labour Productivity	26.6	35.5	29.7	31.8
Labour Productivity Growth	30.3%	31.7%	27.6%	34.6%
TFP Levinhson-Petrin	100	115	107	106
TFP Growth	-3.2%	0.5%	-1.6%	0.0%
Number of Employees	175	620	332	468
Investment / Capital	3.7%	6.6%	6.9%	5.5%
Cash Flow / Capital	12.3%	10.5%	10.4%	11.2%
Export Status	32.2%	58.9%	54.5%	49.3%
OCDE Classification				
High & Medium-High Tech	22%	32%	32%	35%
Low & Medium-Low Tech	78%	68%	68%	65%
Number of Firms	21,380	141	112	75

* All values from 1997

Turning to performance, on average treated firms are larger and tend to exhibit higher productivity. This is so in terms of both total factor productivity (TFP) and labour productivity (value added per worker), though the difference is more pronounced for the latter.²³ While the labour productivity of firms granted for the first time in 1998 (Group 1) is more than 30% higher than that of non-granted firms, the TFP of the former is only 2.6% higher than that of the latter. Compared with the period before treatment, both measures of productivity grow faster for treated than non-treated firms.

3.2.2. Observable characteristics

Differences shown in the previous section suggest a presence of selection bias. By minimizing the differences between ‘treated’ and ‘non-treated’ groups in terms of the observable characteristics shown in Table 2, our intention is to reduce this selection bias. In so doing we use one-to-one Propensity Score Matching (PSM).²⁴ This method creates a counterfactual group by pairing each granted firm with a similar non-granted one. Treated firms that cannot be paired with any non-granted firm are discarded.

Ideally one would like to compare granted with non-granted, yet eligible, firms. In our case, matching is based on pre-treatment observable characteristics that can be considered as relevant for firms to be eligible for support. The idea behind choosing characteristics related to eligibility follows from the fact that we would like to have firms that could have applied for BNDES financial support and yet decided not to apply. In this respect, by having eligible firms for government intervention in our control group, we can argue that granted and non-granted firms have similar observable characteristics and differences between them occur only in terms of being granted (or unobservable characteristics; more in this below). As Arraiz et al (2014) and Castillo et

²³ Appendix VI describes the estimation procedures of TFP à la Levinsohn and Petrin (2003).

²⁴ See Arnold and Javornik (2005) who use PSM to evaluate the impact of foreign investment on firm productivity in Indonesia.

al (2014) have shown that pre-intervention time trends (e.g. revenue growth) tend to differ between granted and non-granted firms, our eligibility characteristics should include both static performance indicators (e.g. size) and dynamic performance indicators (e.g. revenue growth) as well as additional financial information (e.g. availability of collateral and solvency).²⁵

To pin down the subset of characteristics that are indeed relevant, we use a Probit model in which the outcome is the ex-ante probability of receiving financial support from BNDES. We then pair granted and non-granted firms with similar ex-ante probability of being funded. We start looking for matches at the seventh decimal digit of probability. For unmatched firms we gradually relax the requirement until the second decimal digit. Granted firms that at that point cannot find a non-granted match are dropped.²⁶

Starting with all non-granted firms, we find six different ‘control’ groups depending on each ‘treated’ group. A summary of how many firms are matched is shown in Table 3. More than 70% of treated firms find their non-treated ‘twin’.

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Treated Matched	118	169	65	108	99	144
Treated Not Matched	23	58	10	35	13	46
Percentage Matched	84%	74%	87%	76%	88%	76%

Table 4 illustrates the extent to which matched pairs are similar in terms of the observable characteristics. It reports averages for these characteristics as well as t-statistics and p-values for the test of mean difference between matched pairs.²⁷

	Non-Treated		Treated		Testing Matched Firms	
	Not Matched	Matched	Matched	Not Matched	t Value	P-value
Capital Stock	19	53	66	179	-0.55	58.0%
Number of Employees	192	420	526	1.102	-1.03	30.2%
Solvency	3.0%	2.5%	2.7%	3.2%	-0.44	66.0%
Profit	6.7%	6.2%	6.4%	2.0%	-0.20	84.3%
Profit Growth	49%	82%	38%	125%	1.78	7.8%
Employment Growth	4%	5%	8%	14%	-0.71	47.6%
Revenue Growth	21%	21%	20%	7%	0.18	85.7%
Market Share	0.1%	0.1%	0.2%	0.9%	-1.91	5.8%
Multinational Status	8%	11%	16%	9%	-1.14	25.6%
Rich	87%	87%	89%	83%	-0.40	68.9%
Labour Productivity	26.8	30.3	35.1	37.6	-1.21	22.7%
TFP Productivity	101.7	97.1	97.1	103.3	0.04	9.6%
Investment	2.3	5.6	11.9	33.5	-1.41	16.0%
Cash Flow / Capital	16.8%	10.6%	10.4%	11.4%	0.14	88.8%
Investment / Capital	4.0%	4.3%	6.8%	6%	-3.23	0.2%
Number of Firms	6.226	118	118	23		

²⁵ More details of each variable are available in Appendix III.

²⁶ More information on PSM results are presented in Appendix III.

²⁷ It is important to notice that for performing the Probit model, all continuous variables are in logs, where averages reported in Table 5 as well as test of means are in levels. Additionally, for parsimony, we are presenting only results related to Group 2. Results using the other groups are available upon request.

Generally, it is possible to observe that treated and non-treated firms are much more alike in Table 4 than in Table 2. At the 5% level of significance nearly all averages do not exhibit any statistically difference. Most notably, although some observable characteristics are not considered in our Probit model since they are not eligibility criteria for BNDES support, matched firms are quite similar also with respect to those characteristics. An important example is productivity: matched firms exhibit similar productivity levels before treatment even though productivity is not used to match them.²⁸ The same holds for the ratio of cash flow to capital. In this respect, one may argue that, although the investment level remains higher for granted than non-granted firms, their abilities to generate funds for investment have become more alike after PSM.

3.2.3. Unobservable characteristics

Although firms might be fairly similar in terms of observable characteristics after PSM, differences in terms of unobservable characteristics might still exist so that the problem of selection bias persists. We deal with time-invariant unobservable characteristics by estimating the impact by difference-in-differences (more details in Section 5). Then we are left with time-variant unobservable characteristics that might distort our results. Management quality or the capability to generate projects, for instance, are unobservable characteristics that might change over time, especially due to different economic situations faced by firms, such as increase in competition and/or macroeconomic shocks. In order to tackle this issue, we use some observable facts that might affect those unobservable time-variant characteristics. This allows us to design additional control groups to be used for robustness checks.

There are three observable facts that can be used for this purpose: investment, survival and ability to access BNDES funds. First, as granted firms are among those interested in making investments, we consider the group of all non-granted firms that during the investigated period have both invested and survived. This provides us with a group of firms (Group B) that have managed to invest and remain active during the whole period we investigate; therefore having, for instance, similar management quality and capability to generate projects to those of granted firms. There are 6,344 such firms. Still, for unobservable reasons, these non-granted firms might still not be eligible for BNDES financial support. To deal with this issue, we consider another refined group composed by the firms that did receive BNDES loans but *not* during the investigated period. The logic behind this is that one may argue that these firms were likely to be eligible for BNDES support during our investigated period but did not apply. Specifically, given that the information we use to test whether BNDES financial support had any impact begins in 1996 and ends in 2006, we place in the refined group (Group C) all firms granted in 2007 for the first time. There are 128 of them. It is important to stress that firms in Group C are contained also in Group A and B, and firms in Group B also belong to Group A. In other words, our controls groups A, B and C are labelled in increasing order of refinement.²⁹

²⁸ Not only previous productivity measures (either labour or TFP) but also previous investment level and cash flow over capital are not considered as eligible criteria when BNDES analyses a project. They are, therefore, not included in the Probit model we use to match treated and non-treated firms.

²⁹ Descriptive Statistics for Groups B and C compared to other control and treated groups are available in Table A.2 in the Appendix.

Now that we have identified the ‘treatment’ and ‘control’ groups, we are ready to check (i) whether granted firms are indeed credit constrained before receiving BNDES support, and then (ii) whether their performance improves after receiving BNDES support.

4. Were granted firms credit constrained before ‘treatment’?

We investigate credit constraints by looking at the correlation between firms’ investment and cash flows.³⁰ The underlying idea (we already used to comment on Table 2) is that, when firms are credit constrained, investment has to rely on own liquidity thus leading to a positive correlation between investment and cash flow (Fazzari et al 1988). This measure has been criticized by Kaplan and Zingales (1997) among others and alternative approaches have been proposed in the literature, such as that by Almeida et al (2004).³¹ This approach, however, requires information on how much cash each firm has, which unfortunately is not available in our dataset. On the other hand, recent papers following Fazzari et al (1988) -- such as Carpenter and Guariglia (2008), Guariglia (2008) and Guariglia et al (2011) -- show that their idea is still valid for the purpose of investigating credit constraints, especially when information needed to implement other approaches is not available.

Specifically, we test for the presence of credit constraints that are particularly relevant for granted firms by running the following regression:

$$\text{Inv}_{it}/K_{it-1} = \beta(\text{CashFlow}_{it}/K_{it-1}) + \alpha(\text{CashFlow}_{it}/K_{it-1}) * \text{BNDES}_i + \gamma X_{it} + \varepsilon_{it} \quad (1)$$

where i identifies the firm and t denotes time, Inv_{it} is the level of investment, K_{it-1} is the capital stock, CashFlow_{it} is the amount of cash flow generated, BNDES_i is a dummy for ‘treated’ firms, X_{it} is a set of controls and ε_{it} is the error term. As the capital stock is lagged in time, this specification requires two-period information and, as our treated group includes 1998 granted firms, we are restricted to use information from 1996 and 1997. We are thus able to estimate this specification only with OLS in the cross section. In order to eliminate as much as possible firm specific characteristics, we introduce different sets of dummies, including OECD technological classification, size, region and multinational status, as well as current and lagged sales over capital. For investment opportunities, we follow the literature by including sectoral value added variation and investment. The parameter of interest is α . A significant positive estimate would mean that, before receiving BNDES support in 1998, granted firms faced indeed stricter credit constraints than non-granted firms.

Table 5 reports the estimation results for equation (1) for treated Group 1. Columns correspond to the different counterfactuals. Since the coefficient of cash flow interacted with the BNDES dummy is positive and significant in all entries, the table shows that granted firms are indeed more credit constrained than all control groups before being awarded BNDES financial support. These findings are confirmed also in the case of firms granted Automatic BNDES, but not for those granted only once.³² This means that firms that requested BNDES financial support only once were not credit

³⁰ See also Aldrichi and Bisinha (2010), Ambrozio et al (2013), and Terra (2003) for other papers investigating credit restriction using Brazilian firm-level data.

³¹ See Ambrozio et al (2013) for additional details.

³² Results for other groups are available in Appendix IV.

constrained whereas those that requested it more than once were. Such divergence suggests that repeated treatment can indeed be considered as a marker of a firm being credit constrained while single treatment cannot. This will enable us to provide a more nuanced picture of how BNDES loans affect firm performance depending on the number of treatments.

Table 5: Credit Restriction for Group 1

Dependent Variable: Invest / K	Group A (1)	Group B (2)	Group C (3)	Paired Firms (4)
Cash Flow / K	0.000816*** (0.00041)	0.000436 (0.00110)	-0.00704 (0.0159)	0.0508 (0.0394)
BNDES * Cash Flow / K	0.131*** (0.0302)	0.128*** (0.03)	0.128*** (0.0419)	0.120** (0.0532)
Sales / K	-0.00029*** (3.45e-05)	-0.000413*** (0.000158)	-0.00124 (0.00355)	-0.0247*** (0.00721)
Sales / K lagged in time	0.000352*** (1.96e-05)	0.000290*** (2.44e-05)	0.000518*** (0.000188)	0.0168*** (0.00406)
OCDE Tech. Dummy	Yes	Yes	Yes	Yes
Region Dummy	Yes	Yes	Yes	Yes
Multinational Dummy	Yes	Yes	Yes	Yes
Size Dummy	Yes	Yes	Yes	Yes
Observations	18.104	6.485	271	216
R-squared	0.111	0.132	0.215	0.181

Standard errors in parentheses

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

5. Do granted firms improve their performance after ‘treatment’?

After checking that, before accessing BNDES funds, repeatedly granted firms faced more severe credit constraints than non-granted ones, we can now investigate whether BNDES support affected their subsequent performance. We do this through a difference-in-differences (DID) approach to eliminate time-invariant unobservable characteristics that are different between ‘treated’ and ‘non-treated’ firms. In particular, we adopt the specification in Bronzini and de Blasio (2006):

$$y_{it} = \beta BNDES_i + \sum_t \alpha_t D_t + \sum_t \delta_t (BNDES_i \cdot POST_t) + X_{it} \gamma + \varepsilon_{it} \quad (2)$$

where y_{it} is a productivity measure, $BNDES_i$ is a dummy variable indicating granted firms, D_t is a year dummy, $POST_t$ is a set of dummies for each year after the firm received the loan, and X_{it} is the vector of control variables. The parameter of interest is δ_t , whose estimated value measures the impact of BNDES support on firm productivity in a given year. Note that the estimation of (2) allows us to assess not only whether BNDES support affects firm productivity in general but also when its impact eventually materializes.

Table 6 presents the estimation results using treatment Groups 1 and 2. Control groups are Group A and paired firms through PSM. Columns of each counterfactual group are divided into two types of productivity measures: labour productivity and total

factor productivity (TFP) estimated following the procedure by Levinhson and Petrin (2003).³³

Table 6: Results of Difference-in-Differences (More than Once)

Treated Group Control Group Dependent Variable	Group 1				Group 2			
	Group A		Paired		Group A		Paired	
	Labour	TFP	Labour	TFP	Labour	TFP	Labour	TFP
Effect in 1998	0.130** (0.0577)	0.00176 (0.00870)	0.103 (0.102)	0.00371 (0.00319)	0.0562 (0.0625)	0.00904 (0.00845)	0.0531 (0.0951)	-0.000451 (0.00176)
Effect in 1999	0.150*** (0.0549)	-0.00273 (0.00916)	0.0940 (0.0983)	0.00188 (0.00291)	0.0922 (0.0573)	0.00208 (0.00993)	0.0838 (0.129)	-0.00264 (0.00181)
Effect in 2000	0.181*** (0.0562)	-0.0853 (0.0714)	0.194 (0.118)	0.00112 (0.00286)	0.124* (0.0665)	-0.0829 (0.0700)	0.0589 (0.122)	-0.00167 (0.00115)
Effect in 2001	0.163*** (0.0589)	-0.0115 (0.0109)	0.195* (0.119)	0.00101 (0.00278)	0.137*** (0.0513)	-0.00943 (0.0108)	-0.00842 (0.0757)	-0.00216* (0.00115)
Effect in 2002	0.169*** (0.0567)	-0.0165* (0.00976)	0.0724 (0.0736)	0.00245 (0.00285)	0.126** (0.0495)	-0.0136 (0.00982)	0.0906 (0.0848)	-0.00113 (0.00126)
Effect in 2003	0.126** (0.0529)	-0.0117 (0.0103)	0.104 (0.0743)	0.000838 (0.00276)	0.0703 (0.0500)	-0.00960 (0.0114)	0.0553 (0.0865)	-0.00198* (0.00113)
Effect in 2004	0.0993* (0.0583)	-0.0269** (0.0125)	0.0918 (0.0760)	-0.000126 (0.00309)	0.0424 (0.0537)	-0.0259** (0.0131)	0.0638 (0.0910)	-0.00217* (0.00120)
Effect in 2005	0.0573 (0.0587)	-0.0300* (0.0164)	0.0717 (0.0763)	-6.61e-05 (0.00307)	0.0176 (0.0515)	-0.0289* (0.0168)	0.0282 (0.0856)	-0.00317** (0.00151)
Effect in 2006	0.0122 (0.0581)	-0.0528*** (0.0174)	0.0789 (0.0744)	0.000593 (0.00276)	-0.0216 (0.0516)	-0.0516*** (0.0179)	-0.0242 (0.0800)	-0.00248** (0.00125)
Multiple Treatments	0.00255 (0.00802)	0.0129*** (0.00403)	0.0120 (0.0102)	0.000218 (0.000148)	0.0182** (0.00882)	0.0137*** (0.00431)	0.0315*** (0.00969)	0.000259** (0.000121)
Domestic Capital	0.0194*** (0.00450)		-0.0217 (0.0301)		0.0190*** (0.00450)		-0.0156 (0.0326)	
Imported Capital	0.0181** (0.00904)		0.0529** (0.0225)		0.0189** (0.00906)		0.0357 (0.0360)	
Observations	203.418	175.963	2.336	2.317	203.943	176.488	2.703	2.689
R-squared	0.693	0.481	0.779	0.495	0.694	0.481	0.754	0.547

Robust standard errors in parentheses

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

As the TFP measure accounts for differences in capital stock among firms, the corresponding regressions do not feature investment in either domestic capital or imported capital as a covariate.³⁴ These are, instead, included in the case of labour productivity. Interestingly, investment in imported capital and labour productivity are positively correlated while no clear cut correlation appears in the case of domestic capital. This may suggest that imported capital goods are technologically more advanced.

As for our parameter of interest, in the case of labour productivity results are mixed depending on control groups. In our least refined control group (Groups A), we find a positive impact of BNDES support on labour productivity until 2004 for treatment Group 1 and until 2002 for treatment Group 2. Nonetheless, no effect is evidenced afterwards, suggesting that loans improve the relative performance of granted

³³ Outcomes for treated groups 5 and 6 are very similar to those in groups 1 and 2 when estimating for controls groups A and Paired. Results are available in the Appendix V, as well as complete table with all covariates for tables shown in this section.

³⁴ We have included them but results remained qualitatively similar.

firms for seven or five years, depending on the treatment group. However, this does not happen when we consider the most refined control groups (Paired). Compared to these groups, 'treated' firms do not perform any different.

Results are not mixed in the case of TFP, in which no effect of BNDES support is detected in the first years after 'treated' firms are granted whatever comparison group is considered. From 2003, BNDES financial support consistently impacts negatively granted firms when compared with those non-granted, including matched firms for Group 2. This means that after projects' implementation, granted firms tend to perform worse than non-granted ones. A possible explanation could be that, as BNDES loans are also designed for the expansion or enlargement of existent plants, most of granted projects are simply replicating the existent technology at a larger scale leading to smaller improvements in productivity than those observed in non-granted firms.

As the number of treatments is positively correlated with firms' productivity, it is relevant to investigate BNDES effects on firms granted only once.³⁵ Table 7 shows outcomes for treatment Groups 3 and 4, which are those supported by BNDES only in 1998 and not until the end of our investigated period (2006). The effects of loans on firms' productivity become less evident for these groups. The positive effect on labour productivity vanishes completely and independently of which control group is considered, from the most naïve (Group A) to the most sophisticated (Paired). This shows that granted firms tend to perform similarly to other firms not only while projects are being implemented but also after their full implementation. In terms of TFP, a negative impact occurs at the end of our investigated period (last two years: 2005 and 2006), yet only when granted firms are compared with the most naïve control group (Group A). The effect disappears completely in the case of paired firms.

³⁵ We have also estimated the model using two strategies for multiple treatment. First, we considered two dummies for multiple treatment: one dummy for those firms financed twice to four times; another dummy for those financed five times or more. Another strategy was considering a dummy for each multiple treatment, such as one dummy for those with double treatment, another for those treated three times, and so on. Nonetheless, all estimations remained similar to those presented in this paper and are available upon request.

Table 7: Results of Difference-in-Differences (Just Once)

Treated Group Control Group Dependent Variable	Group 3				Group 4			
	Group A		Paired		Group A		Paired	
	Labour	TFP	Labour	TFP	Labour	TFP	Labour	TFP
Effect in 1998	0.0261 (0.0822)	0.0194** (0.00868)	0.00939 (0.104)	-0.0165 (0.0174)	0.0493 (0.0902)	0.0119 (0.0109)	0.113 (0.135)	-0.000821 (0.00237)
Effect in 1999	0.0508 (0.0722)	0.00920 (0.00931)	-0.0456 (0.103)	-0.00399 (0.00354)	0.0763 (0.0821)	0.00202 (0.0121)	0.0163 (0.158)	-0.00253 (0.00253)
Effect in 2000	0.0432 (0.0972)	-0.0759 (0.0724)	-0.0694 (0.109)	-0.000177 (0.00291)	0.0730 (0.1000)	-0.0825 (0.0706)	-0.0322 (0.163)	-0.00112 (0.00135)
Effect in 2001	0.0752 (0.0559)	-0.00510 (0.0101)	-0.0422 (0.112)	-0.00177 (0.00293)	0.108 (0.0721)	-0.0111 (0.0123)	-0.0578 (0.105)	-0.00149 (0.00137)
Effect in 2002	0.0710 (0.0510)	-0.0106 (0.00908)	0.0728 (0.103)	-5.14e-05 (0.00304)	0.109 (0.0681)	-0.0159 (0.0116)	0.0471 (0.117)	0.000458 (0.00166)
Effect in 2003	0.0608 (0.0516)	-0.000425 (0.0121)	0.121 (0.103)	-0.000950 (0.00273)	0.102 (0.0668)	-0.00522 (0.0144)	0.142 (0.118)	-0.000398 (0.00135)
Effect in 2004	0.0246 (0.0589)	-0.0204 (0.0127)	0.168 (0.117)	5.31e-05 (0.00289)	0.0702 (0.0713)	-0.0244 (0.0157)	0.0938 (0.125)	-0.000715 (0.00148)
Effect in 2005	0.0122 (0.0498)	-0.0272* (0.0153)	0.117 (0.112)	0.001000 (0.00301)	0.0626 (0.0652)	-0.0305* (0.0180)	0.0483 (0.107)	-0.00234 (0.00201)
Effect in 2006	-0.0647 (0.0567)	-0.0535*** (0.0165)	0.0128 (0.117)	-0.00271 (0.00291)	-0.0138 (0.0709)	-0.0567*** (0.0187)	0.0195 (0.115)	-0.000935 (0.00151)
Domestic Capital	0.0196*** (0.00450)		-0.0182 (0.0300)		0.0196*** (0.00450)		0.0855* (0.0491)	
Imported Capital	0.0186** (0.00907)		0.000187 (0.0319)		0.0187** (0.00907)		0.0627 (0.0451)	
Observations	203.128	175.677	1.203	1.189	203.150	175.696	1.674	1.661
R-squared	0.693	0.11	0.870	0.191	0.693	0.481	0.761	0.391

Robust standard errors in parentheses

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

The existence of unobserved time-variant characteristics, which are not considered in the previous estimations, might be interfering in the overall results. As a robustness check, we estimate the effect of these schemes using the two control groups described in Section 4 (Groups B and C). As these control groups include only surviving firms, we consider only granted firms that have also survived during the investigated period: treatment Groups 1, 3 and 5. Table 8 shows the results. Columns present a similar structure as in previous tables.

Table 8: Results of Difference-in-Differences (Robustness Check - unobservable time-variant characteristics)

Treated Group Control Group Dependent Variable	Group 1				Group 3				Group 5			
	Group B		Group C		Group B		Group C		Group B		Group C	
	Labour	TFP	Labour	TFP	Labour	TFP	Labour	TFP	Labour	TFP	Labour	TFP
Effect in 1998	0.0943*	0.0162	0.180	0.0211	0.129	0.0173	0.230	0.0197	0.105	0.0217	0.189	0.0239
	(0.0565)	(0.0451)	(0.156)	(0.0649)	(0.0865)	(0.0648)	(0.168)	(0.0791)	(0.0647)	(0.0497)	(0.158)	(0.0684)
Effect in 1999	0.109**	-0.0210	0.0303	-0.0227	0.133*	-0.0159	0.0578	-0.0279	0.121**	-0.0196	0.0444	-0.0215
	(0.0533)	(0.0431)	(0.123)	(0.0609)	(0.0802)	(0.0608)	(0.137)	(0.0735)	(0.0594)	(0.0456)	(0.126)	(0.0626)
Effect in 2000	0.130**	-0.0185	0.0742	-0.0383	0.106	-0.0333	0.0461	-0.0676	0.146**	-0.0266	0.0845	-0.0457
	(0.0550)	(0.0442)	(0.158)	(0.0613)	(0.0854)	(0.0621)	(0.172)	(0.0746)	(0.0595)	(0.0472)	(0.160)	(0.0631)
Effect in 2001	0.128**	-0.0276	0.281	0.00854	0.0971	-0.0568	0.258	-0.0335	0.127**	-0.0375	0.281	0.000887
	(0.0574)	(0.0415)	(0.199)	(0.0587)	(0.0891)	(0.0603)	(0.210)	(0.0730)	(0.0614)	(0.0461)	(0.201)	(0.0617)
Effect in 2002	0.153***	0.0224	0.182	0.0121	0.135	0.0168	0.175	-0.00557	0.141**	0.00287	0.167	-0.0108
	(0.0550)	(0.0442)	(0.130)	(0.0624)	(0.0845)	(0.0650)	(0.146)	(0.0774)	(0.0612)	(0.0492)	(0.132)	(0.0656)
Effect in 2003	0.123**	-0.0284	-0.0456	-0.0402	0.141*	-0.0391	-0.0240	-0.0647	0.102*	-0.0347	-0.0727	-0.0507
	(0.0511)	(0.0450)	(0.106)	(0.0606)	(0.0779)	(0.0630)	(0.122)	(0.0741)	(0.0590)	(0.0500)	(0.110)	(0.0641)
Effect in 2004	0.113**	-0.0184	-0.0556	-0.0598	0.132*	-0.0256	-0.0231	-0.0854	0.0968	-0.00373	-0.0746	-0.0529
	(0.0561)	(0.0429)	(0.108)	(0.0620)	(0.0801)	(0.0611)	(0.122)	(0.0752)	(0.0655)	(0.0475)	(0.112)	(0.0653)
Effect in 2005	0.0875	-0.0462	-0.0822	-0.0574	0.117	-0.0547	-0.0376	-0.0796	0.0763	-0.0321	-0.101	-0.0494
	(0.0563)	(0.0417)	(0.108)	(0.0612)	(0.0796)	(0.0595)	(0.121)	(0.0735)	(0.0658)	(0.0467)	(0.113)	(0.0642)
Effect in 2006	0.0600	-0.0636	-0.104	-0.115*	0.0608	-0.0815	-0.0978	-0.144*	0.0707	-0.0534	-0.102	-0.111*
	(0.0563)	(0.0439)	(0.107)	(0.0642)	(0.0868)	(0.0629)	(0.125)	(0.0783)	(0.0649)	(0.0486)	(0.111)	(0.0671)
Multiple Treatments	0.00657	-0.0138*	0.0136	-0.00822					0.0144	-0.00783	0.0176	-0.0124
	(0.00782)	(0.00712)	(0.00915)	(0.00752)					(0.0104)	(0.00890)	(0.0112)	(0.00881)
Domestic Capital	-0.0147***		-0.144***		-0.0138**		-0.119**		-0.0148***		-0.154***	
	(0.00568)		(0.0394)		(0.00570)		(0.0478)		(0.00569)		(0.0416)	
Imported Capital	0.0143		0.0770**		0.0142		0.0949**		0.0144		0.0811**	
	(0.00900)		(0.0319)		(0.00902)		(0.0415)		(0.00900)		(0.0359)	
Observations	78,137	76,878	2,698	2,674	77,479	76,220	2,040	2,016	77,847	76,592	2,408	2,388
R-squared	0.707	0.445	0.694	0.446	0.705	0.445	0.653	0.457	0.705	0.445	0.664	0.439

Robust standard errors in parentheses

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

While different control groups are used, the outcomes remain basically the same. A positive impact on labour productivity occurs in all three treated groups when we use the less sophisticated control group (Group B). This means that even trimming our control group to the most efficient firms (which in our case are those able to survive and to make investments), granted firms may perform better in terms of labour productivity. However, results using TFP show a completely different picture as there is no evidence of any effect. A possible explanation of these results is that most of the effect on labour productivity may come from the fact that granted firms use the financial support to increase their capital stock while without any differential change in efficiency (TFP) with respect to non-granted firms.

Results for Group C are very similar to those for the Paired groups. Regardless which measure is considered, BNDES schemes do not impact firms' productivity. Actually, a negative effect on TFP is evidenced in the last year. These results are in line with what we observed in Tables 6 and 7.

Overall, our findings suggest that granted firms might perform similarly to non-granted firms after receiving BNDES financial support, as evidenced by those granted only once. However, when firms apply for financial support more than once, its effect becomes negative.

Our findings are not an isolated case in the literature. For example, Criscuolo et al (2012) investigate the effect of industrial policy in the UK. Their results show no significant impact on firms' productivity, even though there are effects on employment and investment. Arraiz et al (2014) evaluate the effects of government-backed partial credit guarantees on firms' performance in Colombia. Although they find some impact on output and employment, no effect is found on productivity. Similar outcomes are also reported by other papers listed in Coelho and Lage de Sousa (2010), including Ottaviano and Lage de Sousa (2008) and Lage de Sousa (2013). These last two papers investigate the same BNDES schemes as we do here but use different empirical strategies and a different granted year (1997), suggesting that our results may hold regardless of the year investigated. Given that Lage de Sousa (2013) used Kernel matching strategy, our results also seem robust across different matching strategies.

Recent contributions provide some explanations of these results. For instance, according to Carvalho (2014), firms eligible for BNDES financial support tend to expand their activities in politically attractive regions. Therefore, BNDES funds seem to support projects where there is political interest regardless of any productivity effect they might have. Banerjee and Duflo (2014) investigate what happens to Indian firms when credit constraints are removed. They show that credit is used to expand production in the short run as production declines two years after getting credit. In the same vein, BNDES financial support might be expanding solely production and neglecting long-term effects such as productivity growth.

6. Concluding remarks

Do FINEM and Automatic BNDES loans help relax credit constraints that hamper the competitiveness of Brazilian manufacturing firms? We have addressed this question by comparing granted and non-granted firms. In so doing, it has been crucial to identify a 'valid' counterfactual highlighting what would have happened to the granted firms had they not been supported by BNDES. We have then checked whether firms

granted BNDES loans were indeed credit constrained, and whether their performance actually changed after receiving BNDES loans.

Our results are consistent with the limited literature on whether government interventions are able to improve firms' productivity. Trimming our treated group, we have observed two specific patterns. On the one hand, when granted firms request government support *more than once*, they appear to be more credit constrained than comparable non-granted firms before receiving financial support. However, while financial support has allowed granted firms to achieve the same level of performance as similar non-credit-constrained firms in the short run, in some case it has not allowed them to perform as non-credit-constrained firms after a period of time. On the other hand, firms that have requested financial support *only once* do not seem to be credit constrained before being granted, and perform similarly to those non-granted after receiving government support.

Overall, our findings suggest that: (a) credit constraints facing Brazilian manufacturing firms are real, at least for firms that apply to BNDES repeatedly; (b) BNDES funding has been successful in relaxing those credit constraints; and (c) it has allowed BNDES supported firms to match the performance of similar unconstrained firms at least in the short run, but not to outperform them.

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References

- Aldrichi, D. M. and Bisinha, R. (2010) “Restrição financeira em empresas com ações negociadas na Bovespa” *Revista Brasileira de Economia*, Vol. 64 (no. 1): pages 25-47.
- Almeida, H., Campello, M. and Weisbach, M.S. (2004) “The cash flow sensitivity of cash” *The Journal of Finance*, 59(4), 1777-1804.
- Ambrozio, A. H. P., Faleiros, J. P., Lage de Sousa, F. L. and Sant’Anna, A. (2013) “Credit Scarcity in Developing Countries: An Empirical Investigation Using Brazilian Firm-Level Data” mimeo, presented at LACEA 2013.
- Araújo, B., Esteves, L.A. and De Negri J.A. (2010) “BNDES, Inovação Tecnológica e Desempenho das Empresas Industriais Brasileiras” mimeo.
- Arnold, J. M., and Javorcik, B.S. (2009). “Gifted kids or pushy parents? Foreign direct investment and plant productivity in Indonesia.” *Journal of International Economics*, 79(1), 42-53.
- Arráiz, I., Meléndez, M. and Stucchi, R. (2014) “Partial credit guarantees and firm performance: evidence from Colombia” *Small Business Economics*, 43(3), 711-724.

- Bandeira-de-Mello, R., Lazzarini, S. G., Musacchio, A. and Marcon, R. (2015). “What Do State-Owned Development Banks Do? Evidence from BNDES, 2002–09.” *World Development*, 66, 237-253.
- Banerjee, A. V. and Duflo, E. (2005) “Growth Theory Through the Lens of Development Economics” *Economics Handbook of Economic Growth*, Vol. 1, Part A: pages 473-552.
- Banerjee, A. V. and Duflo, E. (2014) “Do firms want to borrow more? Testing credit constraints using a directed lending program” *The Review of Economic Studies*, 81(2), 572-607.
- Bronzini, R. and de Blasio, G. (2006) “Evaluating the impact of investments incentives: The case of the Italian Law 488/1992” *Journal of Urban Economics*, Vol. 60 (no. 2): pages 327-349.
- Carpenter, R. and Guariglia, A. (2008) “Cash flow, investment, and investment opportunities: new tests using UK panel data” *Journal of Banking and Finance*, Vol. 32 (no. 9): pages 1894-1906.
- Carvalho, D. (2014) “The Real Effects of Government-Owned Banks: Evidence from an Emerging Market” *The Journal of Finance*, 69(2), 577-609.
- Castillo, V., Maffioli, A., Rojo, S. and Stucchi, R. (2014) “The effect of innovation policy on SMEs’ employment and wages in Argentina” *Small Business Economics*, 42(2), 387-406.
- Coelho, D. and De Negri, J. (2010) “Impacto do Financiamento do BNDES sobre a Produtividade das Empresas: Uma Aplicação do Efeito Quantílico de Tratamento” mimeo.
- Coelho, D. and Lage de Sousa, F.L. (2010) “Os Efeitos dos Financiamentos do BNDES sobre o Desempenho das Empresas Industriais Brasileiras” in Estrutura Produtiva Avançada e Regionalmente Integrada: Desafios do Desenvolvimento Produtivo Brasileiro, Livro 5, Vol. 1, edited by De Negri, F. and Almeida, M., IPEA, Brasília.
- De Bolle, M. (2015). “Do Public Development Banks Hurt Growth? Evidence from Brazil.” Peterson Institute for International Economics Policy Brief, Number PB15-16.
- Gao, D., Guo, Y. and Jiang (2016) “Government-subsidized R&D and firm innovation: Evidence from China” *Research Policy*, 45, 1129–1144.
- Crespi, G., Maffioli A. and Rastelletti, R. (2014) “Investing in Ideas: Policies to Foster Innovation” in Rethinking Productive Development: Sound Policies and Institutions for Economic Transformation. Ed. Eduardo Fernandez Arias, Gustavo Crespi, Ernesto Stein. Washington, DC: Palgrave Macmillan.
- Criscuolo, C., Martin, R., Overman, H. G. and Van Reenen, J. (2012) “The causal effects of an industrial policy” SERC Discussion Papers, SERCDP0098. Spatial Economics Research Centre (SERC), London School of Economics and Political Science, London, UK.
- De Negri, J. , De Negri, F. e Alves, P. (2008) “Os Financiamentos do BNDES têm Impacto Positivo sobre a Tecnologia, o Emprego e o Faturamento das firmas?” mimeo.
- Fazzari, S., Hubbard, R. and Petersen, B. (1988) “Financing constraints and corporate investments” *Brookings Papers on Economic Activity* (no. 1): pages 141–206.

Guariglia, A. (2008) “Internal financial constraints, external financial constraints, and investment choice: evidence from a panel of UK firms” *Journal of Banking and Finance*, Vol. 32: pages 1795-1809.

Guariglia, A., Liu, X. and Song, L. (2011) “Internal finance and growth: microeconomic evidence on Chinese firms” *Journal of Development Economics*, Vol. 96 (no. 1): pages 79-94.

Grilliches, Z., Klette, T. J. and Moen, J. (2000). “Do subsidies to commercial R&D reduce market failures? Microeconomic evaluation studies” *Research Policy*, Vol. 29 (no. 4&5): pages 471-495.

Heckman, J. J., LaLonde R. J. and J.A. Smith (1999) “The Economics and Econometrics of Active Labour Market Programs.” in Handbook of Labour Economics edited by O. Ashenfelter, D. E. Card and D. Card, Elsevier. Vol. 3: pages 1865-2097.

IADB (2013) “Annual Report 2013: The Year in Review” Washington, DC.

Kaplan, S. N. and Zingales, L. (1997) “Do investment-cash flow sensitivities provide useful measures of financing constraints?” *Quarterly Journal of Economics*, 169-215.

Lage de Sousa, F. (2013) “How Can Development Banks Boost Firms’ Productivity?” in Development Evaluation in Times of Turbulence: Dealing with Crises that Endanger our Future edited by Ray Rist, Marie-Hélène Boily and Frederic Martin, World Bank, Washington DC.

Levinsohn, J., and Petrin, A. (2003) “Estimating production functions using inputs to control for unobservables” *The Review of Economic Studies*, Vol. 70(no. 2): pages 317-341.

Luna-Martinez, D. and Vicente, C. L. (2012) “Global survey of development banks” World Bank Policy Research Working Paper n.5969.

McKenzie, D. (2010) “Impact Assessments in Finance and Private Sector Development: What have we learned and what should we learn?” *The World Bank Research Observer*, 25 (2): 209-233.

Ottaviano, G. and Lage de Sousa, F. (2008) “O efeito do BNDES na Produtividade das Empresas” in Políticas de Incentivo à Inovação Tecnológica edited by De Negri, J. and Kubota, L., IPEA, Brasília.

Reikard, G. (2011) “Total factor productivity and R&D in the production function” *International Journal of Innovation and Technology Management*, 8(04), 601-613.

Ribeiro, E. P. and De Negri, J. (2009) “Public Credit Use and Manufacturing Productivity in Brazil” mimeo.

Solow, R. M. (1957) “Technical change and the aggregate production function” *Review of Economics and Statistics*, 312-320.

Terra, M. C. (2003) “Credit constraints in Brazilian firms: evidence from panel data” *Revista Brasileira de Economia*, Vol. 57 (02), 443-464.

World Bank (2013) “The World Bank Annual Report 2013” Washington, DC.

Appendix I: List of Variables

Table A.1: Description of Variables

Variables	Variable Description	Source
Multinationals	Number of Multinationals	BACEN
% Multinationals	Share of Multinationals	BACEN
Labour Productivity	Value Added / Number of Employees	PIA
Value Added	Value Added	PIA
Number of Employees	Number of Employees	PIA
Average Wage	Total Wages / Number of Employees	PIA
Investment	Total Investment	PIA
Capital Stock	Capital Stock calculated by Perpetual Inventory (using Energy Consumption)	PIA
Total Revenue	Total Revenue (including Financial Revenue, for example)	PIA
Selling Revenue	Net Selling Revenues (only Goods)	PIA
Market Share	Market Share by Net Selling Revenues	PIA
Total Production Value	Value of Total Production (before taxes)	PIA
Energy Consumption	Expenditure in Electricity and Fuel Expenditure	PIA
Profitability	Net Profits / Total Revenue	PIA
Net Profit	Net Profits	PIA
Cash Flow	Net Profits plus Depreciation & Amortizations	PIA
Financial Status	Financial Expenditure / Total Costs	PIA
Solvency	Financial Expenditure / Net Selling Revenue	PIA
Financial Expenditures	Financial Expenditure	PIA
Total Cost	Total Cost	PIA
Efficiency	Production Cost / Total Production Value	PIA
Tax 1	Production Taxes / Selling Gross Revenue	PIA
Tax 2	All Taxes (Production + Land) / Selling Gross Revenue	PIA
Employees Growth	Annual Growth of Total Number of Employees	PIA
Revenue Growth	Annual Growth of Net Selling Revenue	PIA
Productivity Growth	Annual Growth of Productivity	PIA
Profit Growth	Annual Growth of Profits	PIA
Number Firms Profitable	Number of Firms which have earn Profits	PIA
Share of Profitable	Share of Profitable Firms	PIA
Rich Region	Number of Firms in Rich Regions	PIA
% Rich Region	Share of Firms in Rich Regions	PIA
Small Size	Number of Firms which Number of Employees is less than 100	PIA
Medium Size	Number of Firms which Number of Employees is greater than 100 and less than 500	PIA
Large Size	Number of Firms which Number of Employees is greater than 500	PIA
Share of Small	Share of Small Firms (< 100)	PIA
Share of Medium	Share of Medium Firms (> 100 e < 500)	PIA
Share of Large	Share of Large Firms (> 500)	PIA
OCDE Classification	High, Medium-High, Medium-Low and Low Technology	PIA & OCDE
Export Coefficient	Total Exports / Total Production Value	PIA & SECEX
Import Coefficient	Total Imports / Total Production Value	PIA & SECEX
Input Imports Coef	Intermediates Goods Imports / Manufacturing Operation Cost	PIA & SECEX
Capital Imports Coef	Capital Goods Imports / Investments	PIA & SECEX
Age	Number of Years of Firm's existence	RAIS
Workers' Schooling	Number of Years Spent on Education	RAIS
Skill Worker %	Share of Workers with at least Undergraduated Level Completed	RAIS
Capital Imports	Capital Goods Imports	SECEX
Input Imports	Intermediates Goods Imports	SECEX
Total Exports	Total Volume of Exports FOB	SECEX
Export Status	Percentage of Firms wich have exported during 1996 and 2006	SECEX
Total Imports	Total Volume of Imports FOB	SECEX

Appendix II: Descriptive Statistics

Table A.2: Average of Some Variables from Financed Firms in 1998 and Non Financed Firms One Year Before Treatment (in 1997)

Firms' Type	Non Treated Firms			Treated Firms			Unit
	All Firms over 30 employees	Survived and Invested from 1996 to 2006	First Treated in 2007	All First Time in 1998	Automatic BNDES First Time in 1998	All only in 1998	
Variables							
Number of Firms	21,380	6,344	128	141	112	75	
Age	20.1	22.6	22.1	26.6	25.0	24.4	Years
Labour Productivity	26.6	26.8	27.0	35.5	29.7	31.8	R\$ thousand / worker
Labour Productivity Growth	30.3%	26.0%	14.3%	31.7%	27.6%	34.6%	%
TFP Levinhson-Petrin	100	101	93	115	107	106	TFP All Firms = 100
TFP Growth	-3.2%	-1.1%	-2.9%	0.5%	-1.6%	0.0%	%
Investment / Capital	3.7%	4.0%	4.2%	6.6%	6.9%	5.5%	%
Cash Flow / Capital	12.3%	16.7%	19.0%	10.5%	10.4%	11.2%	%
Export Status	32.2%	40.0%	38.3%	58.9%	54.5%	49.3%	%
Value Added	6.84	7.40	12.07	28.90	9.99	24.95	R\$ millions
Number of Employees	175	196	255	620	332	468	Number
Average Wage	22.0	23.3	21.4	31.5	26.9	24.8	R\$ thousand / worker
Workers' Schooling	6.7	6.7	6.5	7.1	7.0	6.9	Years
Skilled Worker %	5.8%	6.8%	5.7%	9.2%	8.1%	9.2%	%
Investment	1.17	0.86	1.24	5.45	1.58	4.79	R\$ millions
Capital Stock 1	31.58	19.61	34.86	84.45	29.02	53.87	R\$ millions
Capital Stock 2	32.35	18.15	32.19	113.44	33.22	81.44	R\$ millions
Total Revenue	17.01	16.56	25.21	80.71	22.66	82.02	R\$ millions
Selling Revenue	15.71	15.41	21.65	72.91	21.22	73.50	R\$ millions
Market Share	0.09%	0.11%	0.12%	0.33%	0.11%	0.31%	%
Total Production Value	14.96	14.90	21.60	68.49	20.86	64.88	R\$ millions
Capital Imports	0.32	0.30	0.30	3.49	0.28	5.64	R\$ billions
Input Imports	1.18	1.20	1.54	3.97	0.63	4.20	R\$ billions
Energy Consumption	1.00	0.99	1.23	5.99	0.93	2.54	R\$ millions
Profitability	5.85%	6.69%	7.92%	5.68%	5.89%	6.38%	%
Net Profit	1.00	1.11	2.00	4.58	1.34	5.23	R\$ millions
Financial Status	3.9%	3.6%	3.2%	4.7%	4.5%	5.0%	%
Solvency 1	3.9%	3.0%	2.2%	2.8%	2.8%	3.1%	%
Solvency 2	3.6%	2.8%	1.9%	2.5%	2.6%	2.8%	%
Financial Expenditures	0.62	0.46	0.47	2.05	0.59	2.28	R\$ millions
Total Cost	18.2	16.6	24.4	79.3	22.1	80.2	R\$ millions
Efficiency	52%	50%	53%	52%	52%	51%	%
Tax 1	17%	16%	16%	15%	15%	15%	%
Tax 2	17%	16%	17%	15%	15%	15%	%
Total Exports	1.87	1.75	4.47	9.27	1.13	6.45	R\$ millions
Total Imports	1.75	1.78	2.14	8.67	1.20	11.68	R\$ millions
Export Coefficient	4.9%	6.1%	7.7%	6.5%	5.6%	5.1%	%
Import Coefficient	4.2%	4.6%	5.3%	5.6%	4.6%	4.5%	%
Input Imports Coefficient	4%	5%	7%	6%	5%	5%	%
Capital Imports Coefficient	5%	6%	8%	9%	9%	5%	%
Employees Growth	0.1%	4.3%	1.8%	8.8%	10.3%	6.2%	%
Revenue Growth	22.1%	20.6%	16.9%	17.5%	13.7%	13.8%	%
Profit Growth	45.8%	50.1%	15.3%	44.4%	50.3%	65.1%	%
Number Firms Profitable	4,344	1,740	36	40	34	24	Number
Share of Profitable	20.3%	27.4%	28.1%	28.4%	30.4%	32.0%	%
Multinationals	1,089	509	7	21	13	8	Number
% Multinationals	5.09%	8.02%	5.47%	14.89%	11.61%	10.67%	%
Rich Region	18,165	5,505	119	124	97	61	Number
% Rich Region	85%	87%	93%	88%	87%	81%	%
Small Size	14,416	3,584	69	43	42	31	Number
Medium Size	5,686	2,304	45	57	48	27	Number
Large Size	1,278	456	14	41	22	17	Number
Share of Small	67%	56%	54%	30%	38%	41%	%
Share of Medium	27%	36%	35%	40%	43%	36%	%
Share of Large	6%	7%	11%	29%	20%	23%	%

Table A.2: Average of Some Variables from Financed Firms in 1998 and Non Financed Firms One Year Before Treatment (in 1997)

OCDE Classification							
High & Medium-High Tech	4,732	1,648	23	45	36	26	Number
Medium-Low Tech	5,360	1,789	36	30	18	13	Number
Low Tech	11,288	2,907	69	66	58	36	Number
Share High & Medium-High Tech	22%	26%	18%	32%	32%	35%	%
Share Medium-Low Tech	25%	28%	28%	21%	16%	17%	%
Share Low Tech	53%	46%	54%	47%	52%	48%	%

Appendix III: Propensity score matching

Probit Model	Employees	Revenues
Dependent Variable: BNDES Dummy	(i)	(ii)
Capital Stock	0.08 (0.04)**	0.06 (0.04)
Number Employees	0.17 (0.06)***	
Revenue		0.15 (0.05)***
Solvency	-0.96 (0.85)	-0.86 (0.84)
Profit	-0.58 (0.54)	-0.71 (0.55)
Profit Growth	0.07 (0.04)*	0.08 (0.04)*
Employees Growth	0.28 (0.16)*	0.38 (0.16)**
Revenue Growth	-0.10 (0.14)	-0.17 (0.14)
Market Share	190.87 (87.14)**	182.76 (87.58)*
Multinational Status	-0.10 (0.14)	-0.17 (0.14)
Rich Region	0.14 (0.13)	0.12 (0.13)
Sector Dummies	Yes	Yes
Observations	5.550	5.550
Percent Concordant	76%	76.2%
Hosmer and Lemeshow Statistic	0.86	0.74

Table A.3.a: Comparing Group 5 after Matching with Non Granted

	Non-Treated		Treated		Testing Matched Firms	
	Not Matched	Matched	Matched	Not Matched	t Value	P-value
Capital Stock	18	26	30	20	-0.49	62.8%
Number of Employees	192	312	337	297	-0.36	72.1%
Solvency	3.0%	2.4%	2.6%	4.3%	-0.39	69.8%
Profit	6.7%	6.1%	6.5%	1.0%	-0.40	68.6%
Profit Growth	49%	87%	51%	-23%	1.22	22.5%
Employment Growth	4%	4%	9%	19%	-1.21	22.9%
Revenue Growth	21%	18%	16%	0%	0.51	61.0%
Market Share	0.10%	0.10%	0.10%	0.00%	-1.43	15.3%
Multinational Status	8%	6%	13%	0%	-1.69	9.2%
Rich	87%	85%	88%	77%	-0.62	53.7%
Labour Productivity	26.7	25.2	31.7	14.1	-1.72	8.7%
TFP Productivity	99.6	100	102.7	93.5	-1.55	12.3%
Investment	0.8	1.4	1.6	1.6	-0.25	80.5%
Cash Flow / Capital	16.8%	10.8%	10.1%	12.4%	0.41	68.2%
Investment / Capital	4.0%	4.4%	7.0%	6.4%	-2.94	0.3%
Number of Firms	6235	99	99	13		

Table A.3.b: Comparing Group 3 after Matching with Non Granted

	Non-Treated		Treated		Testing Matched Firms	
	Not Matched	Matched	Matched	Not Matched	t Value	P-value
Capital Stock	20	27	35	177	-0.65	51.8%
Number of Employees	195	298	302	1,553	-0.05	95.8%
Solvency	3.0%	2.5%	3.1%	2.8%	-0.62	53.7%
Profit	6.7%	6.8%	7.0%	2.4%	-0.10	92.2%
Profit Growth	50%	54%	63%	117%	-0.27	79.1%
Employment Growth	4%	3%	5%	18%	-0.33	74.4%
Revenue Growth	21%	19%	15%	9%	0.81	41.9%
Market Share	0.1%	0.1%	0.1%	1.6%	-0.65	51.4%
Multinational Status	8%	6%	9%	20%	-0.65	51.4%
Rich	87%	85%	83%	70%	0.24	81.3%
Labour Productivity	26.9	25.7	31.5	33.7	-1.12	26.7%
TFP Productivity	99.6	100.2	102.2	99.1	-1.36	17.5%
Investment	0.9	0.6	2.5	18.0	-1.78	7.8%
Cash Flow / Capital	16.7%	10.5%	10.3%	17%	0.08	93.6%
Investment / Capital	4.0%	5.9%	4.1%	14.4%	1.59	11.2%
Number of Firms	6279	65	65	10		

Table A.3.c: Comparing Group 2 after Matching with Non Granted

	Non-Treated		Treated		Testing Matched Firms	
	Not Matched	Matched	Matched	Not Matched	t Value	P-value
Capital Stock	12	48	74	43	-0.98	33.0%
Number of Employees	131	384	561	464	-1.61	10.8%
Solvency	3.9%	2.5%	2.6%	3.2%	-0.27	78.6%
Profit	6.0%	5.4%	6.2%	4.4%	-0.91	36.3%
Profit Growth	55%	4%	1%	32%	1.45	15.1%
Employment Growth	-1%	12%	9%	10%	0.55	58.0%
Revenue Growth	20%	102%	18%	14%	1.13	26.1%
Market Share	0.1%	0.2%	0.3%	0.4%	-1.19	23.6%
Multinational Status	5%	10%	14%	10%	-1.01	31.4%
Rich	84%	89%	90%	79%	-0.18	85.9%
Labour Productivity	67.2	136.7	101.6	97.9	1.09	27.6%
TFP Productivity	100.2	83.4	80.5	88.7	0.87	38.6%
Investment	1.7	17.2	14.4	10.4	0.21	83.2%
Number of Firms	18,240	169	169	58		

Table A.3.d: Comparing Group 4 after Matching with Non Granted

	Non-Treated		Treated		Testing Matched Firms	
	Not Matched	Matched	Matched	Not Matched	t Value	P-value
Capital Stock	12	18	51	31	-2.07	4.1%
Number of Employees	133	263	438	380	-1.48	14.1%
Solvency	3.9%	2.6%	2.9%	3.4%	-0.57	56.9%
Profit	6.0%	5.0%	6.8%	4.4%	-1.63	10.4%
Profit Growth	55%	5%	1%	-1%	1.32	19.3%
Employment Growth	-1%	7%	7%	17%	0.04	96.8%
Revenue Growth	21%	32%	16%	16%	1.53	12.8%
Market Share	0.1%	0.1%	0.2%	0.4%	-1.40	16.5%
Multinational Status	5%	10%	14%	10%	0.23	81.9%
Rich	84%	90%	87%	77%	0.64	52.6%
Labour Productivity	67.7	91.5	83.5	86.3	0.51	60.8%
TFP Productivity	100.1	86.9	83.6	99.1	0.85	39.4%
Investment	1.9	2.6	12.8	6.7	-1.85	6.7%
Number of Firms	18.301	108	108	35		

Table A.3.e: Comparing Group 6 after Matching with Non Granted

	Non-Treated		Treated		Testing Matched Firms	
	Not Matched	Matched	Matched	Not Matched	t Value	P-value
Capital Stock	12	22	30	16	-1.21	22.6%
Number of Employees	131	286	333	251	-0.84	40.1%
Solvency	3.9%	2.4%	2.5%	3.6%	-0.19	85.0%
Profit	6.0%	5.2%	6.4%	4.8%	-1.36	17.4%
Profit Growth	55%	5%	1%	45%	1.56	12.4%
Employment Growth	-1%	11%	9%	15%	0.21	83.4%
Revenue Growth	20%	112%	16%	13%	1.11	27.0%
Market Share	0.1%	0.1%	0.1%	0.1%	-0.67	50.3%
Multinational Status	5%	8%	10%	9%	-0.60	54.6%
Rich	84%	91%	90%	80%	0.40	69.2%
Labour Productivity	67.5	88.1	88.0	70.6	0.01	98.9%
TFP Productivity	100.1	86.4	86.2	97.7	0.06	95.0%
Investment	1.8	3.8	4.1	3.9	-0.24	81.0%
Number of Firms	18.237	144	144	46		

Appendix IV: Credit constraints for alternative treated groups

Table A.4.a: Credit Restriction for Group 3

Dependent Variable: Invest / K	Group A (1)	Group B (2)	Group C (3)	Paired Firms (4)
Cash Flow / K	0.000827*** (0.00041)	0.000519 (0.00109)	0.0141 (0.0159)	0.0871 (0.0656)
BNDES * Cash Flow / K	0.0599 (0.0373)	0.0549 (0.0370)	0.0544 (0.0452)	0.0836 (0.0686)
Sales / K	-0.00029*** (3.45e-05)	-0.000423*** (0.000158)	-0.00131** (0.00558)	-0.0417*** (0.00978)
Sales / K lagged in time	0.000352*** (1.95e-05)	0.000290*** (2.43e-05)	0.000952*** (0.000258)	0.0344*** (0.00673)
OCDE Tech. Dummy	Yes	Yes	Yes	Yes
Region Dummy	Yes	Yes	Yes	Yes
Multinational Dummy	Yes	Yes	Yes	Yes
Size Dummy	Yes	Yes	Yes	Yes
Observations	18.038	6.419	203	128
R-squared	0.110	0.129	0.246	0.324

Standard errors in parentheses

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

Table A.4.b: Credit Restriction for Group 5

Dependent Variable: Invest / K	Group A (1)	Group B (2)	Group C (3)	Paired Firms (4)
Cash Flow / K	0.000814*** (0.000411)	0.000430 (0.00110)	-0.00642 (0.0167)	0.0664 (0.0426)
BNDES * Cash Flow / K	0.135*** (0.0349)	0.126*** (0.0346)	0.114** (0.0485)	0.0728 (0.0646)
Sales / K	-0.00029*** (3.46e-05)	-0.000414*** (0.000159)	-0.00106 (0.00404)	-0.0524*** (0.0113)
Sales / K lagged in time	0.000352*** (1.96e-05)	0.000290*** (2.44e-05)	0.000501*** (0.000208)	0.0299*** (0.00587)
OCDE Tech. Dummy	Yes	Yes	Yes	Yes
Region Dummy	Yes	Yes	Yes	Yes
Multinational Dummy	Yes	Yes	Yes	Yes
Size Dummy	Yes	Yes	Yes	Yes
Observations	18.075	6.456	240	180
R-squared	0.111	0.131	0.207	0.222

Standard errors in parentheses

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

Appendix V: Post-treatment performance for alternative treated groups

Table A.5.a: Results of Difference-in-Differences (More than Once)

Treated Group Control Group Dependent Variable	Group 1				Group 2			
	Group A		Paired		Group A		Paired	
	Labour	TFP	Labour	TFP	Labour	TFP	Labour	TFP
Effect in 1998	0.130** (0.0577)	0.00176 (0.00870)	0.103 (0.102)	0.00371 (0.00319)	0.0562 (0.0625)	0.00904 (0.00845)	0.0531 (0.0951)	-0.000451 (0.00176)
Effect in 1999	0.150*** (0.0549)	-0.00273 (0.00916)	0.0940 (0.0983)	0.00188 (0.00291)	0.0922 (0.0573)	0.00208 (0.00993)	0.0838 (0.129)	-0.00264 (0.00181)
Effect in 2000	0.181*** (0.0562)	-0.0853 (0.0714)	0.194 (0.118)	0.00112 (0.00286)	0.124* (0.0665)	-0.0829 (0.0700)	0.0589 (0.122)	-0.00167 (0.00115)
Effect in 2001	0.163*** (0.0589)	-0.0115 (0.0109)	0.195* (0.119)	0.00101 (0.00278)	0.137*** (0.0513)	-0.00943 (0.0108)	-0.00842 (0.0757)	-0.00216* (0.00115)
Effect in 2002	0.169*** (0.0567)	-0.0165* (0.00976)	0.0724 (0.0736)	0.00245 (0.00285)	0.126** (0.0495)	-0.0136 (0.00982)	0.0906 (0.0848)	-0.00113 (0.00126)
Effect in 2003	0.126** (0.0529)	-0.0117 (0.0103)	0.104 (0.0743)	0.000838 (0.00276)	0.0703 (0.0500)	-0.00960 (0.0114)	0.0553 (0.0865)	-0.00198* (0.00113)
Effect in 2004	0.0993* (0.0583)	-0.0269** (0.0125)	0.0918 (0.0760)	-0.000126 (0.00309)	0.0424 (0.0537)	-0.0259** (0.0131)	0.0638 (0.0910)	-0.00217* (0.00120)
Effect in 2005	0.0573 (0.0587)	-0.0300* (0.0164)	0.0717 (0.0763)	-6.61e-05 (0.00307)	0.0176 (0.0515)	-0.0289* (0.0168)	0.0282 (0.0856)	-0.00317** (0.00151)
Effect in 2006	0.0122 (0.0581)	-0.0528*** (0.0174)	0.0789 (0.0744)	0.000593 (0.00276)	-0.0216 (0.0516)	-0.0516*** (0.0179)	-0.0242 (0.0800)	-0.00248** (0.00125)
Multiple Treatments	0.00255 (0.00802)	0.0129*** (0.00403)	0.0120 (0.0102)	0.000218 (0.000148)	0.0182** (0.00882)	0.0137*** (0.00431)	0.0315*** (0.00969)	0.000259** (0.000121)
Domestic Capital	0.0194*** (0.00450)		-0.0217 (0.0301)		0.0190*** (0.00450)		-0.0156 (0.0326)	
Imported Capital	0.0181** (0.00904)		0.0529** (0.0225)		0.0189** (0.00906)		0.0357 (0.0360)	
Imported Input	0.436*** (0.0966)	0.0777*** (0.0224)	0.710*** (0.199)	0.0224*** (0.00703)	0.439*** (0.0970)	0.0774*** (0.0223)	0.598** (0.279)	0.00476** (0.00191)
Export Coefficient	0.203*** (0.0384)	0.00188 (0.0133)	0.118* (0.0662)	0.00408*** (0.00122)	0.204*** (0.0386)	0.00186 (0.0133)	0.0904 (0.0691)	0.00215** (0.00104)
Import Coefficient	-1.211*** (0.163)	-0.115*** (0.0338)	-1.156*** (0.331)	-0.0341*** (0.00793)	-1.218*** (0.164)	-0.115*** (0.0335)	-1.426*** (0.520)	-0.00890*** (0.00204)
Net Sales Revenue	0.496*** (0.00490)	-0.0468*** (0.00879)	0.584*** (0.0275)	-0.00301*** (0.000410)	0.496*** (0.00489)	-0.0468*** (0.00878)	0.630*** (0.0289)	-0.00249*** (0.000279)
Number of Employees	-0.423*** (0.00666)		-0.582*** (0.0395)		-0.423*** (0.00665)		-0.560*** (0.0372)	
Cost / Revenue	-2.010*** (0.0750)	-0.163*** (0.0433)	-1.670*** (0.378)	-0.0158*** (0.00365)	-2.009*** (0.0748)	-0.163*** (0.0432)	-1.554*** (0.237)	-0.0158*** (0.00496)
Firms' Age	-0.0175*** (0.00380)	-0.0817*** (0.0283)	0.0997* (0.0516)	-0.000177 (0.000829)	-0.0174*** (0.00380)	-0.0815*** (0.0282)	-0.106** (0.0422)	-0.00194*** (0.000484)
Years of Schooling	-0.0162* (0.00971)	-0.0195 (0.0141)	0.266** (0.115)	0.00244 (0.00245)	-0.0165* (0.00970)	-0.0195 (0.0141)	-0.0499 (0.0594)	0.000118 (0.00112)
Skilled Labour	0.309*** (0.0350)	0.0198 (0.0436)	-0.0225 (0.195)	-0.0104*** (0.00341)	0.312*** (0.0349)	0.0202 (0.0437)	0.517*** (0.147)	0.00170 (0.00181)
Average Salary	0.567*** (0.00682)	0.0534*** (0.0118)	0.435*** (0.0351)	0.000782 (0.000930)	0.566*** (0.00681)	0.0534*** (0.0118)	0.400*** (0.0390)	0.000586 (0.000599)
Investment	0.0103*** (0.000421)	-0.00394*** (0.000930)	0.00989** (0.00389)	-0.000204*** (6.66e-05)	0.0104*** (0.000421)	-0.00393*** (0.000927)	0.0172*** (0.00329)	-0.000149*** (4.33e-05)
Solvency	1.272*** (0.0856)	0.0103 (0.0273)	1.323*** (0.265)	0.00349 (0.00347)	1.270*** (0.0854)	0.0103 (0.0273)	1.734*** (0.327)	0.00977 (0.00827)

Table A.5.a: Results of Difference-in-Differences (More than Once) - Continuation

Revenue Growth	-0.461*** (0.0126)	0.0176*** (0.00592)	-0.373** (0.145)	0.00294*** (0.000706)	-0.461*** (0.0126)	0.0176*** (0.00590)	-0.364*** (0.125)	0.00160* (0.000832)
Employment Growth	0.463*** (0.0117)	0.0186 (0.0223)	0.478*** (0.162)	-0.000764 (0.00142)	0.463*** (0.0117)	0.0186 (0.0222)	0.460*** (0.130)	-0.000303 (0.000666)
Productivity Growth	0.492*** (0.00995)	0.000691 (0.000564)	0.483*** (0.168)	9.54e-05 (0.000134)	0.492*** (0.00994)	0.000676 (0.000567)	0.483*** (0.132)	0.000305** (0.000134)
Profitable	0.170*** (0.00772)	-0.00544 (0.00948)	0.00363 (0.0251)	-0.000476 (0.000510)	0.170*** (0.00770)	-0.00544 (0.00945)	0.0772*** (0.0231)	-0.000454 (0.000422)
Multinational Status	0.0506*** (0.0109)	0.0120*** (0.00375)	-0.0659* (0.0371)	0.00181** (0.000873)	0.0492*** (0.0109)	0.0115*** (0.00355)	0.00730 (0.0359)	0.00130*** (0.000416)
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OCDE Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	203.418	175.963	2.336	2.317	203.943	176.488	2.703	2.689
R-squared	0.693	0.481	0.779	0.495	0.694	0.481	0.754	0.547

Robust standard errors in parentheses

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

Table A.5.b: Results of Difference-in-Differences (Just Once)

Treated Group Control Group Dependent Variable	Group 3				Group 4			
	Group A		Paired		Group A		Paired	
	Labour	TFP	Labour	TFP	Labour	TFP	Labour	TFP
Effect in 1998	0.0261 (0.0822)	0.0194** (0.00868)	0.00939 (0.104)	-0.0165 (0.0174)	0.0493 (0.0902)	0.0119 (0.0109)	0.113 (0.135)	-0.000821 (0.00237)
Effect in 1999	0.0508 (0.0722)	0.00920 (0.00931)	-0.0456 (0.103)	-0.00399 (0.00354)	0.0763 (0.0821)	0.00202 (0.0121)	0.0163 (0.158)	-0.00253 (0.00253)
Effect in 2000	0.0432 (0.0972)	-0.0759 (0.0724)	-0.0694 (0.109)	-0.000177 (0.00291)	0.0730 (0.1000)	-0.0825 (0.0706)	-0.0322 (0.163)	-0.00112 (0.00135)
Effect in 2001	0.0752 (0.0559)	-0.00510 (0.0101)	-0.0422 (0.112)	-0.00177 (0.00293)	0.108 (0.0721)	-0.0111 (0.0123)	-0.0578 (0.105)	-0.00149 (0.00137)
Effect in 2002	0.0710 (0.0510)	-0.0106 (0.00908)	0.0728 (0.103)	-5.14e-05 (0.00304)	0.109 (0.0681)	-0.0159 (0.0116)	0.0471 (0.117)	0.000458 (0.00166)
Effect in 2003	0.0608 (0.0516)	-0.000425 (0.0121)	0.121 (0.103)	-0.000950 (0.00273)	0.102 (0.0668)	-0.00522 (0.0144)	0.142 (0.118)	-0.000398 (0.00135)
Effect in 2004	0.0246 (0.0589)	-0.0204 (0.0127)	0.168 (0.117)	5.31e-05 (0.00289)	0.0702 (0.0713)	-0.0244 (0.0157)	0.0938 (0.125)	-0.000715 (0.00148)
Effect in 2005	0.0122 (0.0498)	-0.0272* (0.0153)	0.117 (0.112)	0.001000 (0.00301)	0.0626 (0.0652)	-0.0305* (0.0180)	0.0483 (0.107)	-0.00234 (0.00201)
Effect in 2006	-0.0647 (0.0567)	-0.0535*** (0.0165)	0.0128 (0.117)	-0.00271 (0.00291)	-0.0138 (0.0709)	-0.0567*** (0.0187)	0.0195 (0.115)	-0.000935 (0.00151)
Domestic Capital	0.0196*** (0.00450)		-0.0182 (0.0300)		0.0196*** (0.00450)		0.0855* (0.0491)	
Imported Capital	0.0186** (0.00907)		0.000187 (0.0319)		0.0187** (0.00907)		0.0627 (0.0451)	
Imported Input	0.440*** (0.0970)	0.0775*** (0.0224)	0.673*** (0.184)	0.00105 (0.00408)	0.439*** (0.0970)	0.0774*** (0.0224)	0.686** (0.337)	0.00234 (0.00177)
Export Coefficient	0.206*** (0.0387)	0.00220 (0.0135)	-0.373*** (0.0943)	-0.0126 (0.0179)	0.206*** (0.0387)	0.00221 (0.0135)	0.141 (0.0953)	0.00284* (0.00166)
Import Coefficient	-1.218*** (0.164)	-0.115*** (0.0335)	-0.671** (0.278)	-0.0119 (0.0103)	-1.218*** (0.164)	-0.115*** (0.0335)	-1.924*** (0.590)	-0.00763*** (0.00222)
Net Sales Revenue	0.495*** (0.00491)	-0.0470*** (0.00884)	0.625*** (0.0242)	0.00265*** (0.000551)	0.495*** (0.00491)	-0.0470*** (0.00884)	0.591*** (0.0352)	-0.00286*** (0.000368)
Number of Employees	-0.422*** (0.00668)		-0.643*** (0.0478)		-0.422*** (0.00668)		-0.568*** (0.0482)	
Cost / Revenue	-2.010*** (0.0750)	-0.163*** (0.0433)	-2.106*** (0.221)	-0.0329*** (0.0109)	-2.010*** (0.0750)	-0.163*** (0.0433)	-1.809*** (0.299)	-0.0193*** (0.00705)
Firms' Age	-0.0175*** (0.00380)	-0.0817*** (0.0282)	0.0840** (0.0334)	-0.00554 (0.00366)	-0.0175*** (0.00380)	-0.0817*** (0.0282)	-0.104** (0.0529)	-0.00216*** (0.000672)
Years of Schooling	-0.0171* (0.00971)	-0.0197 (0.0142)	-0.122 (0.0796)	0.00516 (0.00869)	-0.0172* (0.00971)	-0.0197 (0.0142)	-0.105 (0.0745)	-0.000634 (0.00163)
Skilled Labour	0.316*** (0.0351)	0.0203 (0.0441)	0.678*** (0.185)	-0.00718 (0.0102)	0.317*** (0.0351)	0.0205 (0.0441)	0.676*** (0.174)	0.00361 (0.00252)
Average Salary	0.567*** (0.00683)	0.0535*** (0.0118)	0.287*** (0.0401)	0.000431 (0.00105)	0.567*** (0.00683)	0.0535*** (0.0118)	0.426*** (0.0534)	0.000753 (0.000933)
Investment	0.0104*** (0.000422)	-0.00394*** (0.000927)	0.0150*** (0.00289)	5.20e-05 (0.000255)	0.0104*** (0.000422)	-0.00394*** (0.000927)	0.0174*** (0.00445)	-0.000111* (5.96e-05)
Solvency	1.272*** (0.0855)	0.0107 (0.0273)	1.212*** (0.170)	0.0231** (0.0114)	1.272*** (0.0855)	0.0107 (0.0273)	2.279*** (0.399)	0.0239* (0.0144)
Revenue Growth	-0.461*** (0.0126)	0.0176*** (0.00591)	-0.343*** (0.0729)	-0.000823 (0.00291)	-0.461*** (0.0126)	0.0176*** (0.00591)	-0.361** (0.146)	0.00149 (0.00123)

Table A.5.b: Results of Difference-in-Differences (Just Once) - Continuation

Employment Growth	0.463*** (0.0118)	0.0187 (0.0223)	0.273*** (0.0905)	0.000367 (0.00144)	0.463*** (0.0118)	0.0187 (0.0223)	0.415** (0.167)	-0.000180 (0.000933)
Productivity Growth	0.492*** (0.00994)	0.000671 (0.000568)	0.411*** (0.0678)	0.000273 (0.000645)	0.492*** (0.00994)	0.000670 (0.000568)	0.476*** (0.151)	0.000301* (0.000173)
Profitable	0.171*** (0.00773)	-0.00538 (0.00948)	0.0451* (0.0241)	-0.00158 (0.00164)	0.171*** (0.00773)	-0.00537 (0.00948)	0.101*** (0.0318)	-0.000238 (0.000615)
Multinational Status	0.0504*** (0.0110)	0.0116*** (0.00368)	0.0334 (0.0540)	0.00490 (0.00343)	0.0502*** (0.0110)	0.0116*** (0.00367)	0.0490 (0.0609)	0.00266*** (0.000839)
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OCDE Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	203.128	175.677	1.203	1.189	203.150	175.696	1.674	1.661
R-squared	0.693	0.11	0.870	0.191	0.693	0.481	0.761	0.391

Robust standard errors in parentheses

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

Table A.5.c: Results of Difference-in-Differences (Automatic BNDES)

Treated Group Control Group Dependent Variable	Group 5				Group 6			
	Group A		Paired		Group A		Paired	
	Labour	TFP	Labour	TFP	Labour	TFP	Labour	TFP
Effect in 1998	0.137** (0.0665)	0.00210 (0.00930)	0.0555 (0.0960)	0.00610 (0.00524)	0.0966* (0.0579)	0.0127 (0.00941)	0.0527 (0.108)	-0.000609 (0.00199)
Effect in 1999	0.160*** (0.0618)	-0.00361 (0.00954)	0.0425 (0.0917)	0.00423 (0.00466)	0.0935 (0.0658)	0.00447 (0.0113)	0.0831 (0.148)	-0.00343* (0.00204)
Effect in 2000	0.195*** (0.0610)	-0.0851 (0.0711)	-0.0159 (0.102)	0.00265 (0.00445)	0.125 (0.0763)	-0.0800 (0.0684)	0.0633 (0.141)	-0.00204 (0.00124)
Effect in 2001	0.161** (0.0631)	-0.0140 (0.0111)	-0.00923 (0.102)	0.00222 (0.00444)	0.137** (0.0556)	-0.00905 (0.0113)	-0.0236 (0.0843)	-0.00252** (0.00126)
Effect in 2002	0.158** (0.0634)	-0.0176* (0.0103)	0.000578 (0.0974)	0.00471 (0.00475)	0.108** (0.0548)	-0.0118 (0.0109)	0.0599 (0.0952)	-0.00133 (0.00141)
Effect in 2003	0.105* (0.0610)	-0.0138 (0.0107)	0.0414 (0.0959)	0.00301 (0.00432)	0.0491 (0.0571)	-0.00850 (0.0125)	0.0241 (0.0974)	-0.00230* (0.00125)
Effect in 2004	0.0834 (0.0680)	-0.0297** (0.0126)	0.00902 (0.0961)	0.00198 (0.00484)	0.0282 (0.0622)	-0.0261* (0.0135)	0.00137 (0.0972)	-0.00259* (0.00135)
Effect in 2005	0.0429 (0.0687)	-0.0326* (0.0167)	0.0174 (0.0943)	0.000529 (0.00498)	0.0122 (0.0594)	-0.0289 (0.0176)	-0.0245 (0.0887)	-0.00359** (0.00168)
Effect in 2006	0.0196 (0.0667)	-0.0537*** (0.0176)	-0.0211 (0.108)	0.00241 (0.00427)	-0.0120 (0.0587)	-0.0499*** (0.0186)	-0.0513 (0.0881)	-0.00301** (0.00139)
Multiple Treatments	0.0160 (0.0106)	0.00620** (0.00298)	0.0378*** (0.0111)	0.00000867 (0.000140)	0.0294*** (0.0110)	0.00889*** (0.00345)	0.0378*** (0.0111)	8.67e-05 (0.000140)
Domestic Capital	0.0193*** (0.00451)		0.0364 (0.0266)		0.0189*** (0.00450)		0.000122 (0.0368)	
Imported Capital	0.0183** (0.00904)		0.0478 (0.0342)		0.0188** (0.00906)		0.0664 (0.0426)	
Imported Input	0.435*** (0.0964)	0.0779*** (0.0224)	0.828*** (0.279)	0.00184 (0.00388)	0.437*** (0.0967)	0.0775*** (0.0224)	0.652** (0.322)	0.00825*** (0.00260)
Export Coefficient	0.205*** (0.0384)	0.00199 (0.0133)	0.263*** (0.0725)	0.00253 (0.00189)	0.205*** (0.0386)	0.00197 (0.0133)	0.131* (0.0738)	0.00200 (0.00124)
Import Coefficient	-1.211*** (0.163)	-0.115*** (0.0337)	-0.759* (0.452)	-0.00377 (0.00704)	-1.216*** (0.164)	-0.115*** (0.0334)	-1.287** (0.649)	-0.0122*** (0.00260)
Net Sales Revenue	0.496*** (0.00490)	-0.0470*** (0.00883)	0.593*** (0.0203)	-0.00434*** (0.000560)	0.496*** (0.00490)	-0.0469*** (0.00882)	0.628*** (0.0289)	-0.00311*** (0.000348)
Number of Employees	-0.422*** (0.00668)		-0.563*** (0.0331)		-0.422*** (0.00667)		-0.526*** (0.0434)	
Cost / Revenue	-2.011*** (0.0751)	-0.163*** (0.0433)	-1.822*** (0.187)	-0.0204*** (0.00634)	-2.009*** (0.0749)	-0.163*** (0.0432)	-1.563*** (0.264)	-0.0181*** (0.00576)
Firms' Age	-0.0175*** (0.00380)	-0.0817*** (0.0283)	-0.0217 (0.0246)	-0.00348** (0.00145)	-0.0176*** (0.00380)	-0.0816*** (0.0282)	-0.112** (0.0455)	-0.00185*** (0.000504)
Years of Schooling	-0.0164* (0.00972)	-0.0196 (0.0142)	0.187*** (0.0696)	0.00430 (0.00352)	-0.0165* (0.00972)	-0.0196 (0.0142)	-0.103 (0.0716)	0.000700 (0.00121)
Skilled Labour	0.311*** (0.0351)	0.0195 (0.0436)	0.365** (0.182)	0.00303 (0.00369)	0.314*** (0.0351)	0.0197 (0.0437)	0.733*** (0.172)	-0.000866 (0.00203)
Average Salary	0.567*** (0.00683)	0.0535*** (0.0118)	0.373*** (0.0285)	0.000367 (0.00161)	0.566*** (0.00682)	0.0535*** (0.0118)	0.390*** (0.0412)	0.000833 (0.000693)
Investment	0.0103*** (0.000421)	-0.00394*** (0.000930)	0.00329 (0.00238)	-0.000254** (0.000106)	0.0104*** (0.000421)	-0.00393*** (0.000927)	0.0177*** (0.00343)	-0.000129*** (4.87e-05)
Solvency	1.271*** (0.0857)	0.0105 (0.0274)	1.505*** (0.282)	0.00277 (0.00501)	1.269*** (0.0855)	0.0105 (0.0273)	1.655*** (0.388)	0.0126 (0.00985)
Revenue Growth	-0.462*** (0.0126)	0.0176*** (0.00593)	-0.373*** (0.0911)	0.00246** (0.00101)	-0.461*** (0.0126)	0.0176*** (0.00591)	-0.370*** (0.130)	0.00189** (0.000956)

Table A.5.c: Results of Difference-in-Differences (Automatic BNDES) - Continuation

Employment Growth	0.463*** (0.0118)	0.0187 (0.0223)	0.397*** (0.0931)	-0.00419 (0.00307)	0.463*** (0.0117)	0.0187 (0.0222)	0.436*** (0.136)	-0.000392 (0.000775)
Productivity Growth	0.492*** (0.00995)	0.000688 (0.000565)	0.428*** (0.0677)	0.000131 (0.000494)	0.492*** (0.00994)	0.000689 (0.000563)	0.486*** (0.137)	0.000302** (0.000142)
Profitable	0.171*** (0.00773)	-0.00537 (0.00948)	0.00879 (0.0241)	0.00147* (0.000848)	0.171*** (0.00771)	-0.00536 (0.00944)	0.0756*** (0.0251)	-0.000296 (0.000481)
Multinational Status	0.0516*** (0.0110)	0.0120*** (0.00373)	-0.124** (0.0526)	0.00412** (0.00165)	0.0510*** (0.0110)	0.0117*** (0.00360)	0.0213 (0.0443)	0.00136*** (0.000471)
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OCDE Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	203.150	175.696	1.273	1.254	203.596	176.145	2.291	2.281
R-squared	0.693	0.111	0.890	0.466	0.693	0.481	0.734	0.560

Robust standard errors in parentheses

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

Table A.5.d: Results of Difference-in-Differences (Robustness Check - unobservable time-variant characteristics)

Treated Group Control Group Dependent Variable	Group 1				Group 3				Group 5			
	Group B		Group C		Group B		Group C		Group B		Group C	
	Labour	TFP	Labour	TFP	Labour	TFP	Labour	TFP	Labour	TFP	Labour	TFP
Effect in 1998	0.0943*	0.0162	0.180	0.0211	0.129	0.0173	0.230	0.0197	0.105	0.0217	0.189	0.0239
	(0.0565)	(0.0451)	(0.156)	(0.0649)	(0.0865)	(0.0648)	(0.168)	(0.0791)	(0.0647)	(0.0497)	(0.158)	(0.0684)
Effect in 1999	0.109**	-0.0210	0.0303	-0.0227	0.133*	-0.0159	0.0578	-0.0279	0.121**	-0.0196	0.0444	-0.0215
	(0.0533)	(0.0431)	(0.123)	(0.0609)	(0.0802)	(0.0608)	(0.137)	(0.0735)	(0.0594)	(0.0456)	(0.126)	(0.0626)
Effect in 2000	0.130**	-0.0185	0.0742	-0.0383	0.106	-0.0333	0.0461	-0.0676	0.146**	-0.0266	0.0845	-0.0457
	(0.0550)	(0.0442)	(0.158)	(0.0613)	(0.0854)	(0.0621)	(0.172)	(0.0746)	(0.0595)	(0.0472)	(0.160)	(0.0631)
Effect in 2001	0.128**	-0.0276	0.281	0.00854	0.0971	-0.0568	0.258	-0.0335	0.127**	-0.0375	0.281	0.000887
	(0.0574)	(0.0415)	(0.199)	(0.0587)	(0.0891)	(0.0603)	(0.210)	(0.0730)	(0.0614)	(0.0461)	(0.201)	(0.0617)
Effect in 2002	0.153***	0.0224	0.182	0.0121	0.135	0.0168	0.175	-0.00557	0.141**	0.00287	0.167	-0.0108
	(0.0550)	(0.0442)	(0.130)	(0.0624)	(0.0845)	(0.0650)	(0.146)	(0.0774)	(0.0612)	(0.0492)	(0.132)	(0.0656)
Effect in 2003	0.123**	-0.0284	-0.0456	-0.0402	0.141*	-0.0391	-0.0240	-0.0647	0.102*	-0.0347	-0.0727	-0.0507
	(0.0511)	(0.0450)	(0.106)	(0.0606)	(0.0779)	(0.0630)	(0.122)	(0.0741)	(0.0590)	(0.0500)	(0.110)	(0.0641)
Effect in 2004	0.113**	-0.0184	-0.0556	-0.0598	0.132*	-0.0256	-0.0231	-0.0854	0.0968	-0.00373	-0.0746	-0.0529
	(0.0561)	(0.0429)	(0.108)	(0.0620)	(0.0801)	(0.0611)	(0.122)	(0.0752)	(0.0655)	(0.0475)	(0.112)	(0.0653)
Effect in 2005	0.0875	-0.0462	-0.0822	-0.0574	0.117	-0.0547	-0.0376	-0.0796	0.0763	-0.0321	-0.101	-0.0494
	(0.0563)	(0.0417)	(0.108)	(0.0612)	(0.0796)	(0.0595)	(0.121)	(0.0735)	(0.0658)	(0.0467)	(0.113)	(0.0642)
Effect in 2006	0.0600	-0.0636	-0.104	-0.115*	0.0608	-0.0815	-0.0978	-0.144*	0.0707	-0.0534	-0.102	-0.111*
	(0.0563)	(0.0439)	(0.107)	(0.0642)	(0.0868)	(0.0629)	(0.125)	(0.0783)	(0.0649)	(0.0486)	(0.111)	(0.0671)
Multiple Treatments	0.00657	-0.0138*	0.0136	-0.00822					0.0144	-0.00783	0.0176	-0.0124
	(0.00782)	(0.00712)	(0.00915)	(0.00752)					(0.0104)	(0.00890)	(0.0112)	(0.00881)
Domestic Capital	-0.0147***		-0.144***		-0.0138**		-0.119**		-0.0148***		-0.154***	
	(0.00568)		(0.0394)		(0.00570)		(0.0478)		(0.00569)		(0.0416)	
Imported Capital	0.0143		0.0770**		0.0142		0.0949**		0.0144		0.0811**	
	(0.00900)		(0.0319)		(0.00902)		(0.0415)		(0.00900)		(0.0359)	
Imported Input	0.383***	0.445***	0.931***	0.0131***	0.381***	0.445***	0.962***	0.676***	0.381***	0.445***	0.890***	0.659***
	(0.136)	(0.0598)	(0.220)	(0.00505)	(0.136)	(0.0600)	(0.257)	(0.108)	(0.136)	(0.0598)	(0.238)	(0.104)
Export Coefficient	0.106***	-0.115***	-0.00709	-0.00361**	0.110***	-0.111***	0.107	-0.240***	0.109***	-0.114***	0.0494	-0.323***
	(0.0363)	(0.0130)	(0.0788)	(0.00153)	(0.0367)	(0.0131)	(0.0940)	(0.0622)	(0.0365)	(0.0130)	(0.0894)	(0.0572)

Table A.5.d: Results of Difference-in-Differences (Robustness Check - unobservable time-variant characteristics) - Continuation

Import Coefficient	-1.238*** (0.182)	-0.582*** (0.0704)	-1.568*** (0.510)	-0.0129** (0.00608)	-1.239*** (0.182)	-0.578*** (0.0706)	-1.661*** (0.633)	-0.802*** (0.160)	-1.237*** (0.181)	-0.579*** (0.0705)	-1.514*** (0.580)	-0.826*** (0.155)
Net Sales Revenue	0.554*** (0.00726)	0.100*** (0.00238)	0.543*** (0.0267)	-0.00292*** (0.000434)	0.552*** (0.00731)	0.100*** (0.00239)	0.525*** (0.0296)	0.110*** (0.0125)	0.554*** (0.00727)	0.101*** (0.00239)	0.542*** (0.0279)	0.117*** (0.0120)
Number of Employees	-0.349*** (0.0260)		-0.488*** (0.0319)		-0.336*** (0.0289)		-0.504*** (0.0414)		-0.334*** (0.0283)		-0.471*** (0.0399)	
Cost / Revenue	-2.250*** (0.0764)	-1.273*** (0.0276)	-2.217*** (0.268)	-0.00763** (0.00327)	-2.253*** (0.0767)	-1.275*** (0.0278)	-2.310*** (0.307)	-1.000*** (0.114)	-2.252*** (0.0766)	-1.274*** (0.0277)	-2.347*** (0.291)	-0.978*** (0.114)
Firms' Age	0.0312*** (0.00786)	-0.0535*** (0.00360)	-0.0496 (0.0464)	-0.000176 (0.000496)	0.0311*** (0.00791)	-0.0538*** (0.00362)	-0.0629 (0.0588)	0.0335 (0.0247)	0.0310*** (0.00787)	-0.0529*** (0.00360)	-0.0560 (0.0497)	0.0369* (0.0215)
Years of Schooling	-0.0122 (0.0144)	-0.309*** (0.00708)	0.0764 (0.0701)	0.00618*** (0.00152)	-0.0144 (0.0145)	-0.310*** (0.00710)	0.0600 (0.0852)	-0.306*** (0.0471)	-0.0127 (0.0145)	-0.308*** (0.00709)	0.0667 (0.0856)	-0.254*** (0.0494)
Skilled Labour	0.127*** (0.0469)	0.549*** (0.0282)	0.0693 (0.180)	-0.0234*** (0.00487)	0.135*** (0.0475)	0.552*** (0.0286)	0.0299 (0.269)	0.263* (0.156)	0.130*** (0.0474)	0.548*** (0.0285)	0.0946 (0.227)	0.317** (0.138)
Average Salary	0.520*** (0.00956)	0.211*** (0.00420)	0.426*** (0.0418)	0.00273*** (0.000950)	0.521*** (0.00963)	0.211*** (0.00422)	0.425*** (0.0542)	0.161*** (0.0242)	0.519*** (0.00957)	0.210*** (0.00420)	0.402*** (0.0443)	0.156*** (0.0212)
Investment	0.0112*** (0.000611)	-0.00203*** (0.000295)	0.00338 (0.00353)	-0.000255*** (6.40e-05)	0.0113*** (0.000613)	-0.00201*** (0.000296)	0.00431 (0.00393)	-0.000642 (0.00188)	0.0112*** (0.000612)	-0.00202*** (0.000295)	0.00319 (0.00376)	-0.00116 (0.00176)
Solvency	1.323*** (0.0976)	0.607*** (0.0379)	1.795*** (0.298)	-0.00388 (0.00389)	1.325*** (0.0980)	0.609*** (0.0380)	1.917*** (0.354)	0.543*** (0.192)	1.323*** (0.0980)	0.605*** (0.0380)	1.819*** (0.351)	0.379** (0.187)
Revenue Growth	-0.444*** (0.0241)	0.0304*** (0.00615)	-0.388*** (0.119)	0.00410*** (0.00106)	-0.444*** (0.0241)	0.0301*** (0.00617)	-0.394*** (0.130)	0.0545 (0.0332)	-0.445*** (0.0241)	0.0306*** (0.00616)	-0.412*** (0.126)	0.0791** (0.0310)
Employment Growth	0.451*** (0.0234)	0.00961 (0.00693)	0.286** (0.131)	-0.00218 (0.00147)	0.452*** (0.0236)	0.00881 (0.00699)	0.257 (0.169)	-0.0884* (0.0509)	0.450*** (0.0235)	0.00879 (0.00697)	0.246* (0.145)	-0.0737* (0.0438)
Productivity Growth	0.475*** (0.0206)	0.0325*** (0.00180)	0.469*** (0.116)	0.000164 (0.000102)	0.475*** (0.0207)	0.0324*** (0.00180)	0.471*** (0.120)	0.0139** (0.00695)	0.475*** (0.0207)	0.0325*** (0.00180)	0.470*** (0.118)	0.0164** (0.00711)
Profitable	0.0907*** (0.00697)	0.0405*** (0.00339)	0.0960*** (0.0292)	4.41e-05 (0.000618)	0.0918*** (0.00702)	0.0411*** (0.00341)	0.129*** (0.0362)	0.0408** (0.0184)	0.0909*** (0.00699)	0.0404*** (0.00340)	0.103*** (0.0318)	0.0216 (0.0167)
Multinational Status	0.0414*** (0.0114)	-0.0648*** (0.00627)	-0.0859** (0.0378)	0.000791 (0.000580)	0.0428*** (0.0116)	-0.0651*** (0.00638)	-0.109* (0.0632)	-0.141*** (0.0387)	0.0429*** (0.0114)	-0.0659*** (0.00632)	-0.0614 (0.0481)	-0.167*** (0.0310)

Table A.5.d: Results of Difference-in-Differences (Robustness Check - unobservable time-variant characteristics) - Continuation

Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OCDE Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	78,137	76,878	2,698	2,674	77,479	76,220	2,040	2,016	77,847	76,592	2,408	2,388
R-squared	0.707	0.445	0.694	0.446	0.705	0.445	0.653	0.457	0.705	0.445	0.664	0.439

Robust standard errors in parentheses

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

Appendix VI: Measuring TFP à la Levinsohn and Petrin (2003)

We have used the following variables:

- a) Labour – We use the total number of employees for each firm multiplied by their average number of years spent on schooling as measure of human capital.
- b) Capital – Sector investment from 1985 to 1995 is used to create a sector capital stock by perpetual inventory. Sector capital stock in 1995 is allocated across firms in 1996 based on their revenue in 1996. This gives each firm’s initial capital stock. The initial capital stock is then added to each firm’s investment in 1996. Further accounting for depreciation gives the capital stock of each firm in 1996. From this year on, each firm’s capital stock is generated using its initial capital stock, its investments and depreciation.
- c) Input – The PIA dataset reports firm input expenditure.
- d) Output – We use the total value of production as our measure of production
- e) Energy – The PIA dataset reports firm energy expenditure.

Although TFP was estimated at sector level, estimation results of the TFP estimation for the full sample are the following:

Dependent Variable: Total Value of Production	
Human Capital	0.30 (0.006)***
Input Consumption	0.43 (0.005)***
Capital Stock	0.34 (0.035)***
Wald Test for Constant Returns	4.54
P-value	3.3%

* significant at 10%, ** at 5% and *** at 1%

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