

RESEARCH ON MONEY AND FINANCE

Discussion Paper no 42

BNDES' Contribution to Brazilian Industrialization, from 1952 to present-day

Victor Isidro Luna

July 2013

Research on Money and Finance Discussion Papers

RMF invites discussion papers that may be in political economy, heterodox economics, and economic sociology. We welcome theoretical and empirical analysis without preference for particular topics. Our aim is to accumulate a body of work that provides insight into the development of contemporary capitalism. We also welcome literature reviews and critical analyses of mainstream economics provided they have a bearing on economic and social development.

Submissions are refereed by a panel of three. Publication in the RMF series does not preclude submission to journals. However, authors are encouraged independently to check journal policy.

Victor Isidro Luna is a Graduate Teaching Asst., Economic Department, University of Utah

Research on Money and Finance is a network of political economists that have a track record in researching money and finance. It aims to generate analytical work on the development of the monetary and the financial system in recent years. A further aim is to produce synthetic work on the transformation of the capitalist economy, the rise of financialisation and the resulting intensification of crises. RMF carries research on both developed and developing countries and welcomes contributions that draw on all currents of political economy.

BNDES' contribution to Brazilian Industrialization, from 1952 to present-day.

Summary

This article aims to show that development banks make a positive effect to economic growth and to generate employment, mostly. It is specifically shown the Brazilian case, with its development bank BNDES founded in 1952. In doing this, we use statistical as well as historical tools. Our findings indicate that: 1) BNDES' disbursements had an important contribution to industrialization from 1952 until 1970s, and 3) statistical evidence showed that BNDES' disbursements are related to investment in machinery and equipment.

Key words.

Development banks, Neoliberalism, Import-Substitution Model, Financing, BNDES.

JEL Classification: N16, O23, E50

BNDES' contribution to Brazilian Industrialization, from 1952 to present-day.

1. Introduction.

While there are stylized facts about the economic performance in Latin America throughout the 20th century, national policies are still a key to increase the living standards of population in each country. Among these national policies, we believe that the creation of development banks make a positive effect to economic growth and to generate employment. However, currently during the neoliberal era public institutions and government intervention are considered pernicious to economic activity and several institutions and State-Owned Companies have been dismantled.

The relevant question for us is whether or not these public institutions have a positive effect to the economic performance of each country. We hypothesize that there is enough evidence indicating that developments banks are good at supporting investments and economic growth.¹ We are taking as a study case Brazil, with its development bank BNDES (Banco Nacional de Desenvolvimento Econômico e Social). Until now, evidence about BNDES' contribution to the Brazilian industrialization has been based on the support that the state granted to the industrial sector during the Import-Substitution model when occurred high rates of economic growth; in contrast to this, low rates of economic growth have been associated with the scarce involvement of the state at commanding the economy during the neoliberal era.

This article is organized as follows. After this introduction, we address a historical account of the performance of Brazilian growth rate; in section 3, we briefly review the BNDES' contribution in Brazilian industrialization showing which sectors were supported the most throughout its entire history; in section 4, we offer to show some statistical evidence between investment and BNDES' disbursements, in section 5 we summarize conclusions.

2. Historical facts in economic growth.

It is well-known that Brazil has followed three models of growth leading its economy in the 20th century: 1) export-oriented model, 2) import-substitution model, and 3) neoliberalism model.² There are no strict dates when these models starts or ends, there can only be addressed suggestions according to some framework (see Bakir and

¹ However, we are not stating that development banks make possible development (which involves above all human well-being).

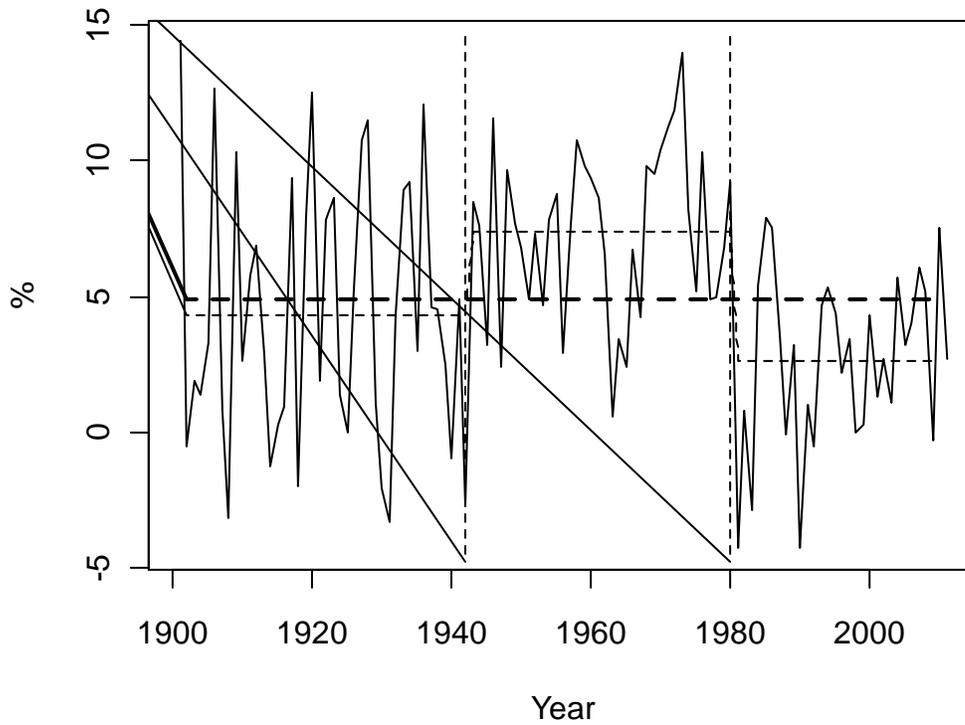
² These models of economic growth are common to almost all Latin American countries (see Guimarães 2010).

Campbell, 2009). We describe each period based on the statistical structural change³ occurring to the annual rate of economic growth and by the economic policies implemented during each period. Then, from 1901 through 1942, growth rate is 4.3 percent and comprehends the export-oriented model; from 1943 through 1980, growth rate is 7.4 percent and encompasses the import-substitution model, and from 1981 through 2011 growth rate is 2.6 percent and those have been the neoliberal years. Figure 1 plots the Brazilian rate of growth (solid line), the average rate of growth throughout the 20th century (thick dotted lines), and lines that mark the structural change (slight dotted lines). From now on, it is described the most important economic features of each period.

The export-oriented model was characterized by prosperous activities of coffee and rubber at the beginning of the period; even though, there came an overproduction of coffee right afterward, coffee prices were not decreasing throughout the period because a public sector set out programs to buy surpluses (Furtado, 1962). According to Triner (1996), common view about Brazilian economic growth during this period was that agricultural exports were the most dynamic sector; in contrast, he held that other activities were buoyant such as infrastructure and food and textile industries which were supported by private banks. It was true that the industrial sector had periods of high growth as this of before the WWI, but a notorious change in sectoral composition of GDP only occurred at the end of the 1930s and at the beginnings of the 1940s (Baer, 1978).

Table 1 shows the sectoral composition of GDP, 1900-2000. Even if primary activities declined fast from 1900 to 1940, secondary sector grew slowly from 1900 1920, declined in the following decade, and finally boomed in 1940.

³ Structural change in the Brazilian rate of economic growth means that our time series is not stable over time, there can be a sharp changes which can shift the mean to a lower or higher position.



Source: My own elaboration with data from IPEADA 2010. R Package, 2.11.1.

Figure 1. Brazilian rate of economic growth and structural change.

The import-substitution model was characterized by a fast industrialization mostly in nondurable and durable goods as well as in intermediate goods. During this period, industrial activities led the economy and were not just the result of the primary sector's needs. Although, this kind of industrialization may have started during the 1930s (Guimarães, 2010; Baer, 1978; Bulmer-Thomas, 1994; Tavares, 1977) because of great crisis' impact at reducing external demand and national policies implemented by the government, high and sustained rates of economic growth just occurred to the mid-WWII onwards. For example, the average rate of economic growth from 1941 through 1950 was 6 percent, and from 1951 through 1980 was 7.4 percent; in contrast, it was only 4.5

percent from 1931 through 1940.⁴ Additionally, the Brazilian government created several institutions to foster industrial development, big public enterprises like Volta Redonda (steel), and Petrobras (oil) were carried out at the beginnings of the 1940s, the *Superintendência de Moeda e do Crédito* which coordinated the monetary issuing was created in 1945, and a development bank to provide long-term financing (Banco Nacional de Desenvolvimento Econômico e Social, BNDES) was established in 1952. By the end of the 1970s, Brazil was the most industrialized country of all Latin America (Guth, 2006; Baddini, 1998).

Table 1. Sectoral composition of GDP, 1900-2000, constant 1949 prices.

Year	Primary	Secondary	Tertiary
1900	44.57	11.59	43.84
1910	39.73	13.08	47.19
1920	38.09	15.72	46.19
1930	35.77	14.81	49.41
1940	29.42	18.74	51.84
1950	22.42	25.64	51.94
1960	16.91	29.85	53.25
1970	14.27	32.52	53.22
1980	9.81	34.29	55.90
1990	10.54	29.97	59.49
2000	11.04	27.74	61.22

Source: Boneli 2003.

⁴ In addition to this, it was through the 1950s and the 1960s when Brazil became an industrial country. In the 1940s, primary activities still led the Brazilian sectoral composition of GDP.

The neoliberalism era started in 1981 and has not yet ended,⁵ market-oriented policies were established even before right after the dictatorship mostly in the financial sector (Hermann, 2010; Guth, 2006), in the tax system, and in the labor markets (Marquetti et al); yet for this article, the key turning point was the performance of the rate of growth that was just 2.6 percent and the set policies implemented under the IMF's guideline such as the fiscal balance, control to inflation and the the rise of exports afterward debt crisis.⁶ Although some redistributive measures were carried out during the Lula's administrations (2003-2011), some other neoliberal tenets remained as was the commitment to maintain the "...inflation targeting, central bank independence, large fiscal surpluses, free capital mobility, flexible exchange rates...support for export-oriented agribusinesses [and] no privatizations were reversed..." (Morais and Filho, 2011, 32).⁷

As was stated above, poor growth rates have been occurred afterward and since the industrialization's peak in 1980, industrial activities were less important in the GDP's composition during the subsequent decades (see Table 1, also see Midialdea, 2011 and Marquetti et al 2010)

3. Development bank's contribution. BNDES' experience.

From the mid-WWII till present day, growth rates' performance can be broken into two periods, high rates from 1943 to 1980, and low rates from 1981 onwards. It is a

⁵ For many scholars, a full neoliberal era just started during the 1990s, with the Plano Real's implementation. We took into a consideration as the key feature, the transition period that started in 1982, mostly.

⁶ Furthermore, for Marquetti et al.,(2010, 488) market-oriented reforms introduced during the mid-60s did not reshaped Brazilian development strategy.

⁷ Though, Morais and Filho (2001) were strongly critical to Lula's first presidential period (2003-2007), they were sympathetic to the second period when according to them a neo-developmental strategy was implemented which increase the level of consumption, investment, and credit.

stylized fact that during the first period, which is called the import-substitution model:⁸ “...economic growth was led by the industrial sector...” (Marquetti et al 2010, 488; see also Guth, 2006, 84); in contrast, in the second period the country has been dis-industrialized (Medialdea, 2011).

According to Guth (2006), Brazilian industrialization, which could have started right after the great crisis, needed investment in both infrastructure and in basic industries such as steel; however, financing those areas were so restrictive by the private sector; then, the state had to carry out these activities by its own. With this idea was founded the Banco Nacional de Desenvolvimento Econômico e Social (BNDES)⁹ which had as its main target to provide long-term funding to branches that Brazilian industrialization made necessary. Hence, Brazilian’s needs owing to industrialization were: 1) throughout the 1950s, investments in infrastructure such as energy and transports and basic industries like steel, 2) throughout the 1960s, investments in basic industries such as steel during the first five years and afterward investments in durables goods, 3) throughout the 1970s, investments in basis industries and in capital goods (specially machinery and equipment), 4) throughout the 1980s, investments in agriculture and energy (to prevent an energy crisis after the oil shock in the 1970s), 5) throughout 1990s, investments in services, exports, and privatizations of former State Own Companies, and 6) throughout 2000s, investments in agriculture, manufacturing (food, fuels, and machinery and equipment), basic industries (electricity), and transportation.

Baddini (1998), Guth (2006), and Diniz (2004) have singled out that BNDES contributed to the high growth rates that Brazil featured during the import-substitution

⁸ Intellectually not all Latin American policy-makers were guided by structuralist ideas, some orthodox policies were set out in countries such as Mexico and Brazil in the mid of the import-substitution model.

⁹ In 1952, it was just the Banco Nacional de Desenvolvimento Econômico (BNDE).

model. For them, this bank was so helpful in building infrastructure as well as in creating the biggest industrial complex in Latin America. In contrast, opinions differ about the BNDES' performance during the neoliberal era, Além (1998) claimed that BNDES would have a very positive role during the 1990s along with the market-oriented reforms introduced at that span of time (Plano Real), whereas Baddini (1998), Guth (2006) held that BNDES was not a development bank any more because of its scarce long-term financing involvement and its second-tier financial intermediary function. With this background, what statistical evidence could be obtained regarding BNDES's contribution in Brazilian industrialization, whether or not BNDES worked

4. Statistical evidence.

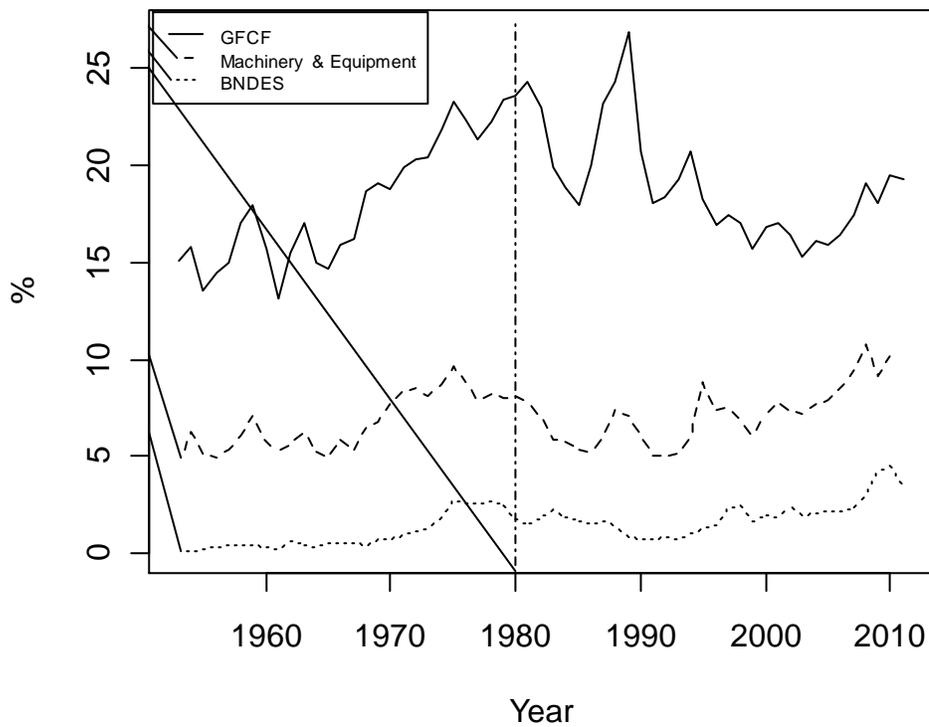
It has said above that Brazilian industrialization in the 1940s made necessary long-term financing, with this purpose BNDES was founded in 1952. Then, investment's requirements should have led BNDES' disbursements throughout its entire history. Figure 3 plots Gross Fixed Capital Formation (GFCF) as a percent of GDP, the proportion of GFCF that is dedicated to Machinery and Equipment as percent of GDP, and BNDES disbursements as a percent a GDP, (dotted vertical line represented structural change in 1980). In short, the variables presented below depict the followings trends:

- 1) The GFCF grew steadily from 1952 to 1980, decrease from 1980 to 2000, and increase from 2001 onwards.

- 2) The accumulation on machinery and equipment did not grow so vigorously as the GFCF from 1952 through 1980. It was almost stagnated until mid-60s, and then it grew continuously for a decade. From the end of the 1970s throughout the 1980s, it

decreased steadily, and from the beginnings of the 1990s to present-day started to rise again.

3) The BNDES disbursements remained stagnated from 1952 until the end of the 1970s and started to grow significantly throughout the 1970s (years of the Brazilian miracle and the IIPND). Afterward, disbursements diminished until the mid-1990s (the years to the structural adjustment and part of the neoliberal era), and it started to rise from mid-1990s to present-day.



Source: my own elaboration with data from Guth, 2006, BNDES, 2013, and Presidência 2013. R Package, 2.11.1

Figure 2, Investment in the Brazilian economy, 1952 to 2011

From what we have said before, along with Figure 2, there seems striking evidence that GFCF in machinery and equipment is highly correlated with BNDES disbursements (this correlation grows strongly after 1970s onwards). This assertion is corroborated in Table 2, where we shows the correlation among variables just mentioned above. Despite outliers presence in years 2010 and 2011, a linear positive relationship can be established between the two variables (see Figure 3), i.e., higher values in GFCF in machinery and equipment as a percent of GDP implies higher BNDES's disbursements values.

Table 2. Correlation among variables.

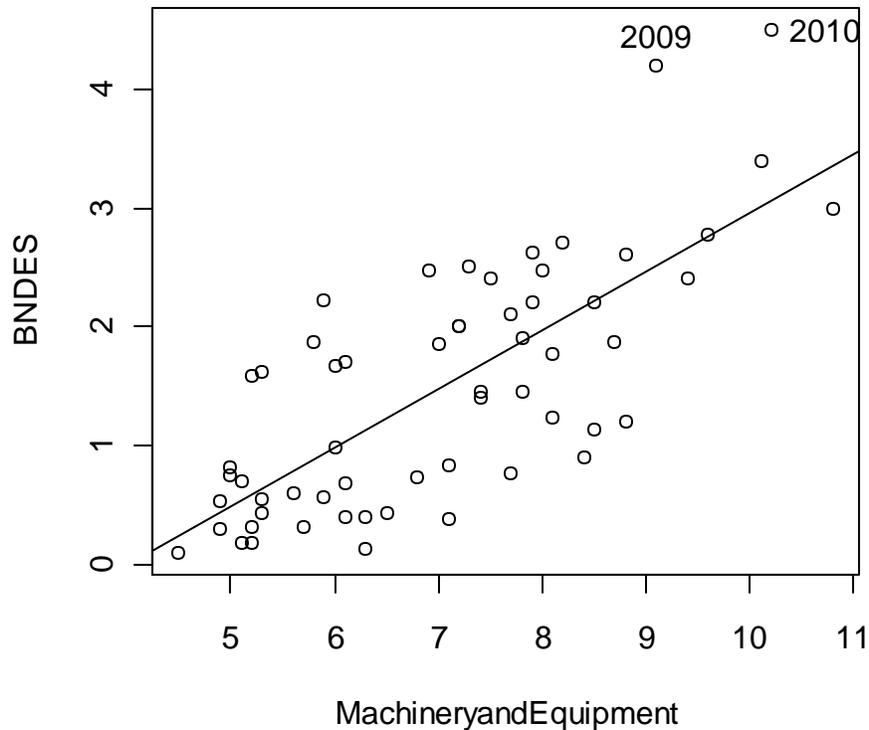
	GFCF/M & E	GFCF/BNDES	M & E/BNDES
Correlation	0.4192	0.3320	0.7431

Source: My own elaboration with data from Presidência 2013.

GFCF = Gross Fixed Capital Formation as percent of GDP.

M & E = Proportion of GFCF that is dedicated to machinery and equipment as percent of GDP.

BNDES= BNDES disbursements as a percent a GDP.



Source: My own elaboration with data from Guth 2006 and BNDES 2012 and Presidencia 2010. R

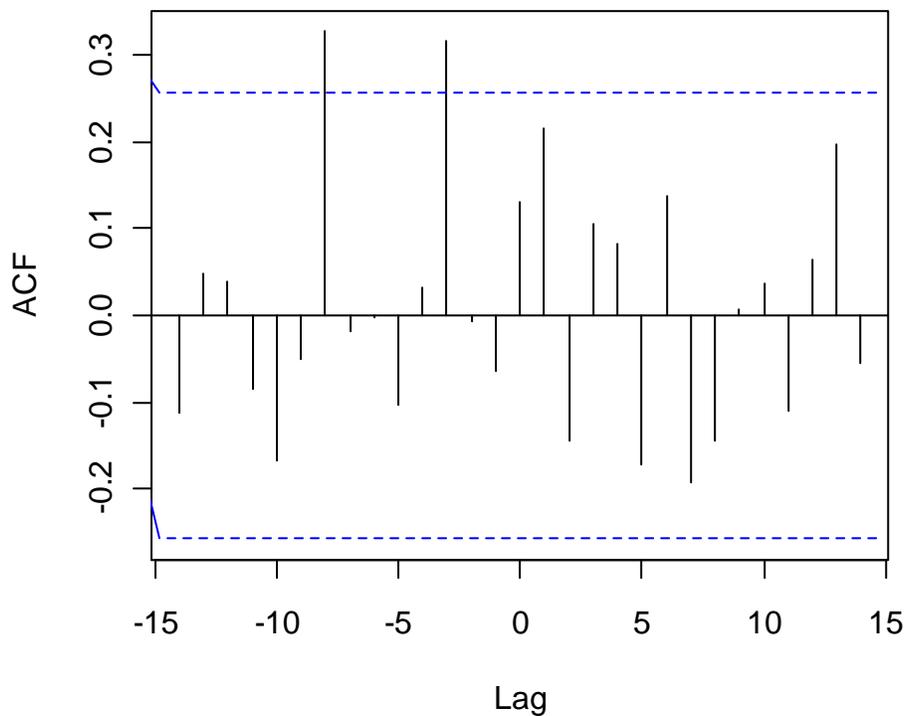
Package, 2.11.1

Figure 3. GFCF in Machinery and equipment and BNDES disbursements as a percent pf GDP in Brazil.

In addition to these facts just mentioned, it is more important for us to throw light whether or not, accumulation in machinery and equipment led BNDES' disbursements. Historically, BNDES was created to solve Brazilian industrialization's bottlenecks only,¹⁰ hence, BNDES' disbursements could be related to past lags of the machinery and equipments. Cross-correlation Function (CCF) could be a helpful tool for identifying lags of machinery and equipment that could be useful predictors of BNDES' disbursements.

¹⁰ This was a common task for the vast of the majority of development banks. (See Aubey 1961, Amsden 2001, Guth 2006)

In short, cross-correlations indicate lags in which two variables are correlated. Figure 4 shows these cross-correlations between machinery and equipment on BNDES's disbursements, in horizontal axis are plotted lags, while in vertical axis are plotted cross-correlations, spikes that over- pass the horizontal dashed lines mean to be correlated. It is plain to see that machinery and equipment leads BNDES' activity.



R Package, 2.11.1

Figure 4. Cross -correlations Machinery and Equipment on BNDES.

Numerical values of cross-correlations are printed below. As it can be seen, the most dominant cross correlations occurred somewhere in lag -3 and -8 (see Table 3). These results are quite natural because long-term investments, such as in infrastructure, should take time to produce some positive effect in a economy.

Table 3. Cross-correlations of series, by lag

-14	-13	-12	-11	-10	-9
-0.113	0.049	-0.040	-0.084	-0.166	-0.050
-8	-7	-6	-5	-4	-3
0.327	-0.017	-0.002	-0.104	0.032	0.316
-2	-1	0	1	2	3
-0.008	-0.065	0.131	0.216	-0.144	0.105
4	5	6	7	8	9
0.082	-0.173	0.137	-0.192	-0.143	0.007
10	11	12	13	14	
0.037	-0.109	0.064	0.196	-0.055	

R Package, 2.11.1

With this positive cross-correlation evidence we ran a regression including the biggest spikes in the figure 3. In doing this regression, as well as when we calculated the cross-correlation relationship, we did not take each variable percentage to GDP, instead we took growth rates because cross-correlations could be sensible to trends (Cowpewart and Metcalfe, 2011; Penn State, 2012¹¹). The model was as follows:

$$\Delta BNDE_t = \alpha + \beta_1 \Delta M\&E_{t-1} + \beta_2 \Delta M\&E_{t-2} + \beta_3 \Delta M\&E_{t-3} + \beta_4 \Delta M\&E_{t-4} + \beta_5 \Delta M\&E_{t-5} + \beta_6 \Delta M\&E_{t-6} + \beta_7 \Delta M\&E_{t-7} + \beta_8 \Delta M\&E_{t-8} + \beta_9 \Delta M\&E_{t-9} + \beta_{10} \Delta M\&E_{t-10} + \beta_{11} \Delta M\&E_{t-11} + \beta_{12} \Delta M\&E_{t-12} + \beta_{13} \Delta M\&E_{t-13} + \beta_{14} \Delta M\&E_{t-14} + \epsilon_t$$

Where α is the intercept, $\Delta BNDE_t$ is the growth rate of Brazilian's disbursements as a percent of GDP and $\Delta M\&E_{t-i}$ are different lags of the growth rates of GFCF in machinery and equipment as a percent of GDP (see the results in Table 3).

¹¹ See the appendix where it is shown that the two time series exhibit unit roots

This regression does not fit very well because R square is 26 %, median residual are close to 0 which is good but maximum and minimum values differ quite a bit, 0.78684 and -0.64952 respectively, as it is expected $\Delta M \& E_{t-3}$ and $\Delta M \& E_{t-8}$ are significant but it has a little explanatory power on dependent variable, joint significant probability is 0.0007456.

Afterward, we carried out a regression we only lag 3 and 8 and without the intercept but it did not improve the model's results too much. In our way of thinking, we found fair results because it seemed plausible that investment's needs led BNDES disbursements and not the other way, but there should have been more other variables that affected BNDES' disbursements behavior apart from investments in machinery and equipment.

Table 4. Regression's results.

Coefficients	Estimate	Std. Error	t-value	P-value
α	0.04175	0.03685	1.133	0.26291
$\Delta M \& E_{t-3}$	0.78426	0.29632	2.647	0.01103
$\Delta M \& E_{t-8}$	0.74211	0.74211	2.734	0.00879

R Package, 2.11.1

5. Conclusions.

This article addressed threefold aspects: 1) Brazilian growth models throughout the entire 20th century, 2) BNDES' contribution to industrialization from 1952 onwards,

and 3) statistical evidence in the relationship between GFCF in machinery and equipment, and BNDES' activities.

The evidence presented in this article showed that BNDES responded to the Brazilian industrialization needs, this totally made sense because in its origins in the 20th century, development banks were created to deal with bottlenecks. We found out positive cross-correlation between investments and BNDES' disbursements. Then, there can be evidence that investment in machinery and equipments led BNDES activity. A further implication of this finding is that BNDES' activities have been pro-cyclical and no anti-cyclical. This fact could make totally sense, because BNDES has not been an entrepreneur throughout its entire history nor involded important resources in acquisition of machinery and equipment. Considering this latter point, BNDES had only featured periods as a great investor in machinery and equipment during 1974-1979 and 2003-2011 only. Then, BNDES has been a complement and not a substitute to other investment activities (this clearly rejects the conservative argument of public investment's crowding out effects). However, whether or not BNDES can be a solid entrepreneur who can lead and foster accumulation of capital and the growth is a matter of the future.

Appendix.

Table A. 1 Test for unit roots.

Variable	ADFTest*	PPTest*
----------	----------	---------

Machinery & Equipment	0.5981	0.3241
BNDES	0.5605	0.503

Null Hypothesis: Non stationary.

* P-values. It includes constant and trend.

ADF = Augmented Dickey-Fuller test.

Phillips-Perron Unit Root Test.

References.

Além, Ana Claudia. “O desempenho do BNDES no período recente e as metas da política econômica.” *Revista do BNDES* 9 (1998): 51 – 76.

Amsden, A. H. *The Rise of the Rest: Challenges to the West from Late-Industrialized Economies*. NY: Oxford University Press, 2001.

Aubey, Robert. *Nacional Financiera and Mexican Industry*. California: UCLA, 1966.

Baddini Currello, Cláudia. *A atuação do sistema BNDES como instituição financeira de fomento no período 1952/1996*. Master diss., Universidade Estadual de Campinas, 1998.

Baer, Werner. “Evaluating the impact of Brazilian Industrialization.” *Luso – Brazilian Review* 2 (1978): 178 – 190.

Bakir, Erdogan y Campbell, Al. “The Bush Business Cycle Profit Rate: Support in a Theoretical Debate and Implications for the Future.” *Review of Radical Political Economics* 41 (2009) : 335-342.

BNDES. *Estatísticas operacionais*. Accessed January 18, 2012. www.bndes.gov.br

Boneli, Regis. “Nível de actividade e mudança estrutural,” In *Estatísticas do século*, edited by IBGE, 228-278. Brasil: IBGE, 2003.

Bulmer-Thomas, Victor. *The Economic History of Latin America since Independence*. Cambridge: Cambridge University Press, 1994.

Cowpertwait, Paul and Metcalfe, Andrew. *Introductory Times Series with R*. New York: Springer, 2011.

Da Conceição Tavares, Maria. *De la sustitución de importaciones al capitalismo financiero*. México: FCE, 1977.

- Diniz, Adriana. *BNDES: De agente desenvolvimentista a gestor da privatização – 1952 – 2002*. Master diss., Universidade Estadual de Campinas, 2004.
- Furtado, Celso. *Formación económica de Brasil*. México: Brasil, 1962.
- Guimarães, Alexandre. “State Capacity and Economic Development. The advances and Limits of Import Substitution Industrialization in Brazil.” *Luso-Brazilian Review* 2, (2010): 49-74.
- Medialdea, Bibiana. “Límites estructurales al desarrollo económico: Brasil (1950-2005).” *Problemas del desarrollo* 43, (2011): 55 – 81.
- Hermann, Jennifer. “Financial Structure and Financing Models: The Brazilian experience over the 1964 – 1997 period.” *Journal of Latin American Studies* 1, (2002): 71 – 114.
- Marquetti, Adalmir, Maldonado, Eduardo and Lautert, Vladimir. “The Profit Rate in Brazil, 2003.” *Review of Radical Political Economics* 42, (2010): 485: 504.
- Penn State. *Applied Time series Analysis*. Accessed 2012, January 23, 2013. <https://onlinecourses.science.psu.edu/stat510/?q=node/74>.
- Presidência da República Federativa do Brasil. IPEADATA, *Contas Nacionais*, Accessed July 12, 2012. www.ipeadata.gov.br.
- Triner, Gail. “Banks, Regions, and Nation in Brazil, 1889 – 1930.” *Latin American Perspectives* 1, (1996): 49-74.