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SURAYA MARCONDES CABRAL VILLAR

**THE DETERMINANTS OF FOREIGN DIRECT INVESTMENT DISTRIBUTION
AMONG THE BRAZILIAN STATES**

SÃO PAULO
2014

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Dissertação apresentada à Escola de Administração de Empresas de São Paulo, da Fundação Getúlio Vargas, como requisito para obtenção do título de Mestre em Administração Empresas.

Linha de Pesquisa: Finanças

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I dedicate this study to my father, who always encouraged me to academic life and never measured efforts to his children could have the best possible education.

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"We can easily forgive a child who is afraid
of the dark; the real tragedy of life is when men are afraid of the light."

Plato

ABSTRACT

FDI has played an important role in Brazil's push towards a market oriented economy. From 1995 to 2012, Brazil has received $ 511.5 billion dollars in FDI. In 2012 Brazil was the second largest developing country recipient of FDI and the fourth worldwide (UNCTAD).Due to geographical concentration, Brazilian states which are considerably less developed and poorer, and as a result, in greater need of capital investment, have not played host to FDI in a significant way. In 2010, states with the largest stocks of FDI were São Paulo with 42.3 percent of the total ($ 99.9 billion dollars), Rio de Janeiro with 13,3 percent ($ 31.4 billion dollars) and Minas Gerais with 10,6 percent of the total ($ 25.1 billion dollars). As can be observed, only three of the twenty-seven Brazilian states received around 66 percent of the total FDI intended to Brazil.Given such differentiation in the distribution of FDI among Brazilian states, this study seeks to explain if tax benefit is also a determintant of FDI inflow, besides the other variables already considered as determinant. Given the limitation of data, we performed two econometric analysis with panel data: 1. using six key variables: size of the consumer market, quality of workforce, transportation infrastructure, cost of labor, tax burden and tax benefit (by macro regions), in the years 1995, 2000, 2005 and 2010; 2. using five key variables: the same as the first model, excluding the cost of labor (for lack of data) and using the tax benefit data by state, in the years 2010, 2011 and 2012.

Keywords: Foreign direct investment. Brazilian states. Panel data. Tax benefit.

RESUMO

O Investimento Estrangeiro Direto (IED) tem desempenhado um papel importante no esforço do Brasil para tornar-se uma economia orientada para o mercado. De 1995 a 2012 o Brasil recebeu $ 511.5 bilhões de dólares em IED. Em 2012, o Brasil foi o segundo país em desenvolvimento que mais recebeu IED e o quarto no mundo (UNCTAD).Devido à concentração geográfica, os estados brasileiros que são consideravelmente menos desenvolvidos e mais pobres, são aqueles que mais precisam de investimentos e que no entanto, não têm sido receptores relevantes de IED. Em 2010, os estados com os maiores estoques de IED foram São Paulo, com 42,3 por cento do total ($ 99,9 bilhões de dólares), Rio de Janeiro com 13,3 por cento ($ 31,4 bilhões de dólares) e Minas Gerais com 10,6 por cento do total ($ 25,1 bilhões de dólares). Como pode ser observado, apenas três dos vinte e sete estados brasileiros receberam cerca de 66 por cento do total de IED destinado ao Brasil.Dada tal diferenciação na distribuição de IED entre os estados brasileiros, o presente estudo busca explicar se o benefício tributário também é determinante para o fluxo de IED, além das demais variáveis já consideradas como determinantes em outros estudos. Dada a limitação de dados, realizamos duas análises econométricas com dados em painel: 1. Usando seis variáveis chaves: tamanho do mercado consumidor, a qualidade da mão de obra, infraestrutura, custo da mão de obra, carga tributária e benefício tributário (por macro regiões), nos anos de 1995, 2000, 2005 and 2010; 2. Usando cinco variáveis: as mesmas do primeiro modelo, excluindo o custo da mão de obra (por falta de dados) e utilizando os dados de benefício tributário por estado, nos anos de 2010, 2011 e 2012.

Palavras-chaves: Investimento estrangeiro direto. Estados brasileiros. Dados em Painel. Benefício tributário.

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1 INTRODUCTION

During last decades, foreign direct investments (FDI) played an important role in the globalization process and have been crucial in the development of local businesses and economies in the host countries. According to the International Monetary Fund (IMF), FDI is defined as an investment involving a long-term relationship and reflecting a lasting interest in and control by a resident entity in one economy (foreign direct investor or parent enterprise) of an enterprise resident in a different economy (FDI enterprise or affiliate enterprise or foreign affiliate). Such investment involves both the initial transaction between the two entities and all subsequent transactions between them and among foreign affiliates.

In Brazil, the FDI inflow started to be more significant after the creation of Plano Real, which aimed important economic reforms. Thus, due to greater economic stability, FDI inflow more than doubled from 1994 to 1995 reaching $ 4.4 billion dollars (UNCTAD). In the following years, until 2000, the country saw the FDI inflow eightfold, reaching $ 32.8 billion, mainly driven by privatization that occurred in different sectors. Despite the decline of this flow in the following years, from 2007, the investments resumed their previous levels and according to the Brazilian Central Bank (BC), from 2008 to 2012, while the balance of current transactions showed a $ 206.5 billion dollars accumulated deficit, FDI exhibited a $ 251.4 billion dollars surplus, helping to alleviate the need to finance the Brazilian balance of payments. Therefore, it is clear the importance of this type of investment in the Brazilian economy.

To reinforce this importance, Carminati and Fernandes (2012) analyzed the relation between the GDP and the FDI for the Brazilian economy in the period of 1986 and 2009. This study used the Structural VAR model and also anylized others variables as exchange reate, electric energy consumption, tax for imported product, inflation and economic stability. The conclusion showed that FDI has a positive effect on the GDP.

Another paper also examines the effects of FDI on economic growth, but in this case by state: Fraga, Parré and Silva (2013) objective was to show empirically that the attraction of FDI has contributed to the economic growth of states. Thus, they used the theory of the New Economic Geography (Nova Geografica Econômica – NGE), which is the study of the location economic activity in space. Therefore, the starting point of NGE is that space matters

in shaping economic activity. The result suggested that there is a positive relationship between the ration of FDI stock / GDP in the states and growth in GDP per capita.

According to De Angelo, Eunni and Fouto (2010) who studied the determinants of FDI in emerging markets with a focus on Brazil during the period of 2000 until 2007, concluded that the evolution of the consumer market and strength of consumer sales are more important in explaining capital movements into Brazil than other factors as interest rates, exchange rates and country risk.

Baer and Rangel (2001) also gave their contribution by analyzing the FDI inflow to Brazil from 1929 until 1998. The study is divided in three mainly categories: 1. the era of the export economy, which comprises the period of 1929 until the 40s; 2. the era of import substitution, from the 50s until the 80s, when multinationals were attracted to build import substitution facilities in many sectors as they had the capital and the technology that domestic private and public firms did not have. Finally, 3. the era of neo-liberalisn in the 90s, where we had the opening of the economy mainly driven by the privatizations that occurred in this period.

Another analysis related to Brazil and FDI came from Aguiar, Conraria, Gulamhussen and Magalhães (2012) who related the FDI with the home country political risk. Their findings revealed that higher levels of home-country political risk lead to lower levels of FDI into Brazil and also that the negative relationship between risk and FDI into Brazil is associated with poor quality of policies we have.

Though there are many studies on the effects of FDI on the country level, relatively few have focused on the state level. Important contribution in this area was given by Bortoluzzo, Sakurai and Bortoluzzo (2013), who have analyzed the determining factors for the location of FDI across Brazilian states. Based on panel data analysis for the years 1995, 2000 and 2005, the results showed a positive response to market size, quality of labor and transport infrastructure, but a negative response to cost of labor and tax burden. What intrigued us in this work, was the measure on the tax burden. In this study, they used the ICMS (Tax on Circulation of Goods and Supply of Services) divided by the GDP. Thus, this tax rate indicates the tax collected by each state. However, we know about the existence of tax benefits and in this analysis, this information was not clear. A low amount of ICMS, for example, does not give us the clarity if that state did not have a good productivity and because of that the amount collected was lower, or if it was given some tax benefits and therefore the collection of ICMS was reduced. In an attempt to make this complementary analysis, our

inquiry is whether the tax benefit, as well as the tax burden is also significant for the determination of FDI in a particularly state. To improve previous analyses we segregated the tax issue in two variables: one specific to measure the tax burden, which is ICMS/GDP and another to measure tax incentives, represented by tax expenditure/GDP. Thus, we got a clear way to assess the impact of each of this variables on the FDI inflow to the states.

As noticed, we do not have a vast literature about FDI in Brazil and little has been reported reported on the destination of FDI among the Brazilian states. Also, until the conclusion of this study we found no literature that relates FDI with tax incetives at the level of Brazilian states. Therefore, we believe that this is the greatest contribution of this paper.

This study is organized as follows: in section 2 we analized the history of FDI in Brazil, the important concepts related to tax and the fiscal war among the Brazilian states. In section 3 we explained the model and the variables. The result is showed in section 4 and the conclusion in section 5.

2 LITERATURE REVIEW

2.1 Foreign direct investment in Brazil

The period from the end of World War II until the late 1970s foreign multinational companies started to integrate to some of the Brazilian public and private firms. (Hiratuka and Sarti, 2010). However, with the economic crisis of the 1980s, the entries of FDI in Brazil were strongly reduced compared to 1970 from USD 2.3 billion in the period 1971-81 to only USD 357 million between 1982 and 1991. Agudelo and Tebaldi (2004) explain that this reduction was due to ineffective and recessive economic adjustments that caused a reduction on profit rates in the productive sectors, discouraging new investment and increasing profit remittances to countries of origin of the transnational companies, who maintained their ability to accumulate capital . Thus, the transnational and multinational companies already operating in Brazil, were in search of reducing its indebtedness and preserving profitability, which somehow ended up hindering the process of modernization.

One of the major barriers to FDI in Brazil was the high rates of inflation. In 1994 Brazil had a major evolution in its economy in the deployment of the Real Plan. Part of this plan was the creation of a new currency which brought a greater stability of the inflation, the annual rate of inflation was 5.150 percent and was brought down to about 10 percent at the end of the program (De Angelo, Eunni and Fouto, 2010). The new plan also brought the possibility of the renegotiation of the country foreign debt. Combined with this factors, the reduction of economic restrictions also boosted the trade openness of the country.

In order to assess the presence of FDI in the country, the Central Bank of Brazil (BC) held its first Census of Foreign Capital in 1995. The census was conducted through a questionnaire answered by the companies that had its operations registered in the Department of Foreign Capitals at BC. The result showed a stock of FDI at December 31st, 1995 amounting to USD 41.7 billion, which about a quarter came from the United States. The main target of this type of investment in Brazil was the Industry sector, which had received 67 percent of the total inflow of FDI. Three industries accounted for almost half of investment, in order of relevance: the chemicals sector, automotive sector and finally the metallurgy.

At the beginning of the 90s, began in Brazil an important privatization process. The structural modifications in the economy brought higher incentives for ease of access to credit

due to the deregulation of the financial sector. Nonetheless, it was after the implementation of Real Plan that the flow of the privatizations were intensified. According to Lacerda (2004), the privatizations carried out in federal and state levels generated a cumulative total revenue of USD 87.2 billion in the period of 1991 to 2002. Of this total, the share of foreign capital reached 48.3 percent, representing an annual average of about 24.76 percent of the total collected in the period of 1996 to 2000. This was the most significant period regarding the inflow of FDI related to privatization, because after 2001 there has been a drop, reaching 1.5 percent in 2002.

In this period, we also had in Brazil a number of large private companies of national capital being acquired by foreign owned companies. Some examples are: Metal Leve, Lacta, Renner Group, Cofap, Agroceres and some banks as Nacional-Excel, Bamerindus and Real (Ribeiro and Sambatti, 2002). According to Carneiro (2002), M&A happens when a company can quickly win market share by absorbing competitors or even have access to new markets by acquiring brands with local tradition. Also, in accordance with the Research Institute for Industrial Development (IED), Brazil showed a participation in M&As above the average for developing countries, almost reaching developed contries numbers in this period.

Until 1998, Brazil kept the regime of bands for the exchange rate in order to maintain the inflation under control, which favored the increase of FDI inflow in the Brazilian economy in general and in particular on privatization and M&As (Ribeiro and Sambatti, 2002). However, from 1999, the exchange rate regime became floating, which was one of the reasons that had contributed to a decline in FDI inflows directed to privatization. (Lacerda, 2004).

In the second Census of Foreign Capital, for the year 2000, the Service sector accounted for almost 64 percent of the total FDI inflow, followed by the Industry with 33.71 percent. This results were still regarded to the previtatizations in the infrastructure and telecommunication sectors (Lacerda and Oliveira, 2009). The stock of FDI at December 31st, 2000 more than double compared with 1995, reaching USD 103 billion. The main contributor was still the United States, with nearly 24 percent participation on the inflows of FDI to Brazil (BC).

The 2000 – 2010 period was positive in terms of FDI inflows into the Brazilian economy. This inflows were driven by the attractiveness of sectors liked to commodities listed in international markets, where prices have stabilized at thigh levels (Lacerda and Oliveira, 2009). In this period, it is necessary to take into account the relatively stable

macroeconomic conditions as inflation, public accounts and external accounts, besides the rate of growth of domestic demand, Brazil`s GDP grew at a rate exceeding 3 percent, with domestic demand accounting for 85 percent of GDP (BC).

Among Latin American countries, Brazil ranked first in 2008 in FDI inflows in the region, followed by Mexico and Chile. The high oil prices and commodity stimulated the growth of FDI in Latin America and Caribbean. In the region, inflows rose 36 percent reaching USD 126 billion. Also, considering all developing countries, Brazil has positioned itself in fourth in FDI inflows, with USD 34.6 billion in 2007, surpassed only by China (USD 83.5 billion), Hong Kong (USD 59.9 billion) and Russia (USD 52.5 billion) (UNCTAD).

Table 1 shows that in the period of this study, 2010 - 2012, foreign capital flows mainly from Netherlands and United States with around 50 percent of the total foreign capital and then they were followed by Spain, Luxembourg, France and Japan. All being the main countries responsible for 74 percent of FDI inflow in Brazil (BC).

Table 1 - FDI inflow by investor country
Source: Adapted from Central Bank of Brazil

	2010	2011	2012
Netherlands	28%	27%	30%
United States	18%	17%	16%
Spain	12%	14%	12%
Luxembourg	5%	4%	6%
France	5%	5%	5%
Japan	5%	6%	5%
Total	73%	73%	74%
Others	27%	27%	26%

According to UNCTAD, in 2012, FDI flows to developing economies proved to be much more resilient than flows to developed countries, recording their second highest level – even though they declined slightly (by 4%) to $703 billion in 2012. They accounted for a record 52% of global FDI inflows, exceeding flows to developed economies for the first time ever, by $142 billion. The global rankings, as illustrated in figure 1, of the largest recipients of FDI also reflect changing patterns of investment flows: 9 of the 20 largest recipients were developing countries and Brazil held the third position among the developing economies, behind only China and Hong Kong.

Top 20 host economies – 2012

(billion of dollars)

Rank	Economy	Value
1	United States (1)	168
2	China (2)	121
3	Hong Kong, China (4)	75
4	Brazil (5)	65
5	British Virgin Islands (7)	65
6	United Kingdom (10)	62
7	Australia (6)	57
8	Singapore (8)	57
9	Russian Federation (9)	51
10	Canada (12)	45
11	Chile (17)	30
12	Ireland (32)	29
13	Luxembourg (18)	28
14	Spain (16)	28
15	India (14)	26
16	France (13)	25
17	Indonesia (21)	20
18	Colombia (28)	16
19	Kazakhstan (27)	14
20	Sweden (38)	14

Developing economies
Developed economies
Transition economies

Figure 1 - Top 20 host economies, 2012 (billions of dollars)
Source: UNCTAD, World Investment Report 2013

Many countries consider the attraction of FDI as a crucial element in their strategy for economic development. FDI is widely regarded as a combination of capital, marketing, technology and management (Cheng and Kwan, 2000). Figure 2 shows that in 2012, just the state of São Paulo received around 42 percent of the total FDI inflow destinated to Brazil. Other 3 states, Rio de Janeiro, Minas Gerais and Rio Grande do Sul, combined with São Paulo have 74.82 percent of the total FDI. This means that we have other 23 states fighting for the reamining 25.18 percent FDI inflows (BC). Thus this creates a virtuous cycle for the more developed states, as they receive more capital, make more investment, then will be better prepared to receive more capital and so on. Hence, this has been one of the reasons that have led to the fast development of this parituclarly states and the widening gap in terms of economic development between them and all the other states.

FDI distribution among Brazilian states - 2012
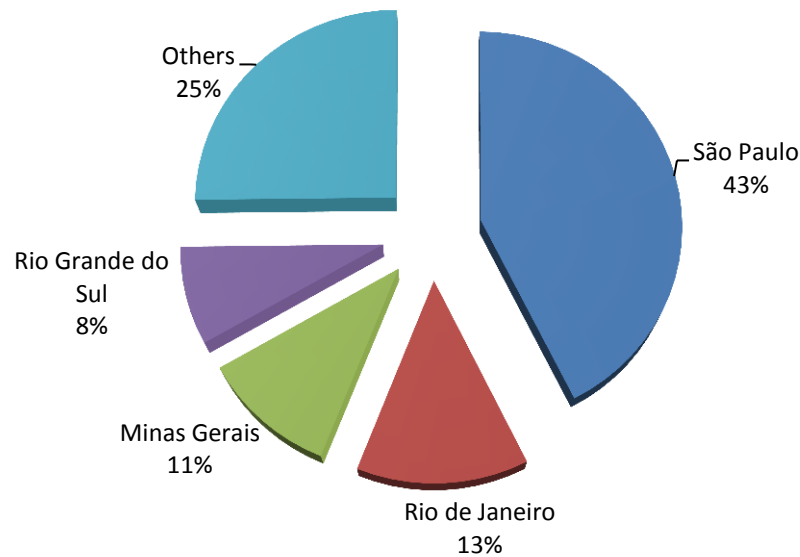
Graphic 1 - FDI distribution among Brazilian states - 2012
Source: Adapted from Central Bank of Brazil

Hymer (1960) explained that multinational companies were the result of imperfect market and monopoly advantages. Hence, FDI tends to flow into differentiated markets where the multinationals will have a competitive advantage. However, still according to Hymer (1960) it is crucial that the company that inteds to invest overseas already present advantages related to economies of scale, special skills, low-cost production or differentiated products.

According to Dunning (1997), multinationals corporations will invest in a foreign country if it offers certain location advantanges in terms of resources and facilities that will aggregate value for the multinational. Brazil is the largest Latin America country and it provides access to a wide diversity of markets not only in Latin America, but also in Central and North America. On the economic side, Brazil presented a GDP of approximately USD 2.2 trillions in 2012 (BC) which is a convicing record of development as an emerging economy and a financial centre for the region. Moreover, Brazil's growing domestic market comprises almost 200 million people (IBGE), which is equivalent the population of France, Italy and Germany combined. Thus, this show the great potential of the internal market that represents growth for many companies.

After reviewing the historical flow of FDI in Brazil, we will treat the next sessions on tax benefits, since the main interest of this study is to assess whether ot not those incentives

impact the flow of FDI among the Brazilian states. Therefore in the next session we will address key concepts of taxes and then evaluate the reaserch methodology.

2.2 Tax concepts in Brazil

Before discussing the tax benefits in Brazil, it is important to clarify some concepts in this area. For this, we rely on Almeida (2000), Nascimento (2008), Paranaiba and Marques (2013).

Analysing the different forms of existing collection in Brazil, we have: taxes, fees and contributions for improvement. The tax triggering event is an independent situation of any particular state activity that is related to the taxpayer. The fee refers to a specific public service that is provided to the taxpayer or that is at his disposal. Finally, the contribution of improvement refers to the public works that generate real estate valuation. Thus, the value of this contribution shall be limited to the total amount of expenditure on such works that are divided with every property that will benefit from this public work. These are the items that comprise the forms of tax collection.

As it can be seen in the table below, the tax revenue in Brazil represented, on average, 34.70 percent of GDP in the period 2000-2010.

Table 2 - Gross Tax Burden (BRL millions)
Source: Adapted from Treasury Department

	2000	2005	2010
Gross Domestic Product	1.089,68	1.937,70	3.674,96
Gross Tax Collection	361,47	724,11	1.233,49
Gross Tax Burden	33,18%	37,37%	33,56%

The tax revenue of the Union consists of three categories of taxes: a) taxes of Federal Government, which mainly include the Income tax, tax on imported products (Imposto Sobre Produtos Industrializados - IPI), contribution to the Social Security and contribution to the financing of Social Security (Cotribuição para o Financiamento da Seguridade Social – COFINS); b) taxes from the State Government – in which the Tax on Circulation of Goods and Supply of Services (Imposto sobre a Circulação de Mercadorias e sobre Prestações de Serviços de Transporte Interestadual, Intermunicipal e de Comunicação - ICMS), has almost all participation; c) taxes of Municipal Government, mainly composed by tax on any service

of any nature (Imposto Sobre Serviço de Qualquer Natureza - ISS) and the property tax (Imposto Predial e Territorial Urbano - IPTU).

In table 3, we can see that the main source of collection of the Union comes from ICMS, which is a tax of the State Government level. We can also verify that the six main taxes correspond, on average, about 75.68 percent of total collection and 25.82 percent of the country GDP.

Table 3 - Breakdown tax collection
Source: Adapted fromTreasury Department

	2000		2005		2010	
	% Total tax collection	% GDP	% Total tax collection	% GDP	% Total tax collection	% GDP
ICMS	22,76%	7,55%	21,38%	8%	21,09%	6,99%
Income tax	16,51%	5,48%	18,27%	6%	17,53%	5,81%
Social Security Contribution	15,41%	5,11%	14,97%	5,60%	17,41%	5,77%
COFINS	10,65%	3,53%	11,99%	4,50%	11,43%	3,79%
FGTS	5,17%	1,72%	4,45%	1,70%	5,07%	1,68%
IPI	5,17%	1,72%	4,03%	1,50%	3,74%	1,02%
Total	75,67%	25,11%	75,09%	27,30%	76,27%	25,06%

On the other side, we also have the concepts related to tax benefits and collection losses. The Federal Constitution of 1988, article 165 § 6 establish three types of benefits: financial, tax and credit. Together they constitute the set of fiscal benefits.

It is considered tax benefit any form of exemption, remission or reduction of assessment basis or of tax rate that should be collected. These benefits are special disposals to the general tax rule given to a select group of taxpayers, economic sectors or geographical regions to achieve goals of economic, social or administrative order, thus, encouraging the development of a particular region.

Still within the group of tax benefit, we have two subgroups: fiscal incentives and tax reliefs. For a fiscal incentive to be considered a tax benefit, it is necessary that this benefit induces the behavior of taxpayers, in other words, that stimulates these taxpayers to act in a certain way. An example of fiscal incentive is the absence of income tax on earnings from savings accounts. In this case, the incentive was given to attract individual taxpayers to carry out this type of investment, encouraging savings rather than consumption. The tax relief, as

the name implies, is used to relieve situations of involuntarily taxpayers difficulties. An example, in this case, is the tax exemption given on earnings from retirement and pension plans that are paid by the public social security for people over 65 years. The purpose here is to alleviate the contribution, so that the retired can enjoy a more favored social condition.

Figure 3 illustrates the types of fiscal benefits:
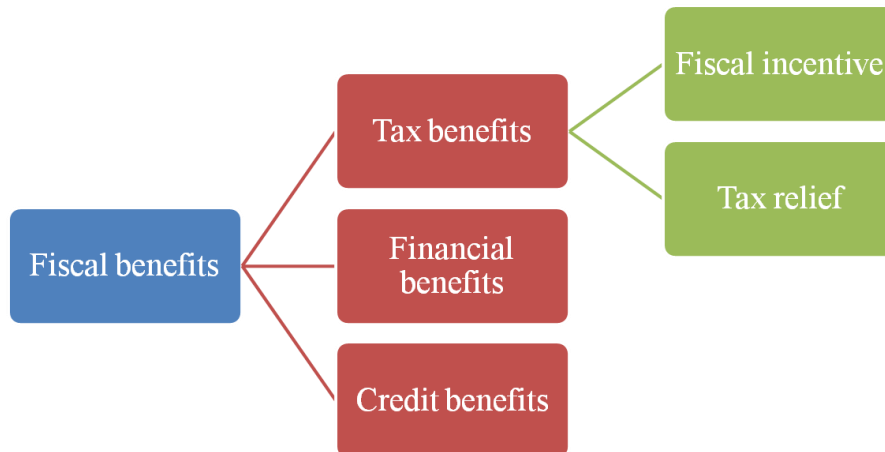
Figure 3 - Fiscal benefits
Source: Figure adapted from Almeida, 2000

The first experience of quantification of tax benefits occurred in Germany in 1959, and since 1967 they created a legal requirement to insert the given budget. Other countries have followed this practice, as the United States, starting in 1968, Spain, the UK, Austria and Canada, from the 1970s (Bordin 2003). Brazil did its first publication in 1989, the report is provided by the IRS, and continued to do so on a yearly basis. From 1991 until 2003 the report was named Statement of Tax Benefit (Demonstrativo dos Benefícios Tributários – DBT), then from 2003 until 2008 was Statement of Governement Spending of Indirect Tax – Tax Expenditure (Demonstrativo dos Gastos Governamentais Indiretos de Natureza Tributária – Gastos Tributários) and from 2009 until 2013 it was again renamed for Statement of Tax Expenditure (Demonstrativo dos Gastos Tributários – DGT).

It wasn't only the name of the report that changed, but also its methodology as this subject has envolved over time. Stanley S. Surrey, as Assistant Secretary of the US Treasury for Tax Policy from 1961 to 1969, stablished the defition of the term *tax expenditure* instead of the utilization of tax incentives or tax benefits:

> […] The second element consists of the special preferences found in every income tax. These provisions, often called tax incentives or tax subsidies, are departures from the normal tax structure and are designed to favor a particular industry, activity, or class or persons. They take many forms, such as permanent exclusions from income, deductions, deferrals of tax liabilities, credits against tax, or special rates. Whatever their form, these departures from the normative tax structure represent government spending for favored activities or groups, effected through the tax system rather than through direct grants, loans, or other forms of government assistance.

International organizations like the OECD, the World Bank and the IMF also quickly moved on to study tax expenditures. The OECD has repeatedly addressed the topic and his latest publication on the subject (OECD, 2010) provides a comprehensive study of tax expenditures in ten member countries. Already the IMF has adopted different authority providing general guidelines for the application of tax expenditures with the publication of several editions of the Manual on Fiscal Transparency, the latest in 2008. In a complementary way, the World Bank's approach to present the experiences of the countries most developed to assist developing countries in the structure of the legislation and estimation of tax expenditures.

In Brazil, the budget organization begins with the Multi-Year Plan (Plano Plurianual – PPA) where the macro guidelines for the following four years are specified. For this Plan to work as planned, we have the Budget Guidelines Law (Lei de Diretrizes Orçamentárias – LDO) that brings a series of rules of how to design, organize and implement the budget. In addition, is in the LDO where we have the definitions of which investments will be prioritized, including the investment policy of the development agencies. For all this planning to be put into practice, considering a short therm view, we have the Annual Budget Law (Lei Orçamentária Annual – LOA). Is in the LOA where we have the forecast of all the revenues and expenses for a specific year. On the expenses side, is where we have the tax expenditure disclosure, with all the benefits that are expected to be provided. Each Brazilian state has its own PPA, as well as their respective LDO and LOA. However, all these guidelines follow the main guideline of the Federal Government.

For a better management on tax issues, the government approved the Complementary Law of the Fiscal Responsibility Law (Lei de Responsabilidade Fiscal – LRF) No. 101 of May, 2000. It brought important contributions, not only relating to tax expenditure, but also on tax control as a whole. The main goals of LFR are: prevention of deficits, limit public debt,

preservation of public property, limit public spending, management of fiscal risks, broad access to information on public accounts.

It is up to the Federal Government promote an optimal allocation of scarce resources, alleviate the unequal distribution of wealth, minimizing regional imbalances in income and create conditions for monetary and fiscal stabilization. Since the Second World War, many countries have used fiscal instruments to accelerate the pace of economic development and in Brazil this has been no different. The Federal Government has several incentive programs, with the main being:

- Free Zone of Manaus (Zona Franca de Manaus): was established in 1967 to boost economic development in Amazonia state. This project is manager by the Superintendency of the Manaus Free Zone (Superintedência da Zona Franca de Manaus – SUFRAMA) and has around 720 industries that comprises three economic sectors: commercial, industrial and agricultural. Since its creation, the companies that are installed there count on huge tax incentives that was given for a period of 30 years and has been renewed over the years. In this case, we have a period of 47 years with concession, without any hint of termination or revision of the coditions.

- SUDENE: was created in 2002 under the name ADENE – National agency for development of the Northeast (Agência Nacional de Desenvolvimento do Nordeste). Than it was renamed to Sudene – Superintendency for development of Northeast (Superintendência do Desevolvimento do Nordeste). Its mission is to promote inclusion and sustainability of their area of operation and the competitive integration of regional production base in the national and international economy.

- REPORTO: this program is a tax incentive for odernizatio and expansion of the port structure and was established on December 1st, 2004. This tax regime suspend the collection of: tax on industrialized products (IPI), the contribution to the financing of Social Security (COFINS) and when applicable, the import tax on the sales of machinery, equipment ad other goods in the port terminals.

The tax expenditure subject brings divided opinions: those who defend it say that social and economic benefits of exemptions outweigh its disadvantages, because the incentives induce investments from the private sector that would otherwise not take place and these investments have been generating income and, as a consequence, future revenue. On the

other hand, the most common criticism is that exemptions are a form of waste government resources, as the incentive may be given to the taxpayer that would invest regardless of the existence of the benefit. In addition, the tax expenditure could distort the choice of market alternatives, removing the neutrality that should exist in the allocation of private resources process. Thus, the benefit should interfere as little as possible in decisions about investment and business organization.

Although the Complementary Law is relatively recent, the next step for the improvement of the Fiscal Responsibility Law would be the evaluation of the results of the tax expenditure. This would require setting paramenters of the population welfare to control these assessments. Therefore, while Brasil still does not have these evaluation mechanisms, we incurred in what we call *fiscal war*, the subject of our next session. We will see that the tax benefits are often granted without the proper analysis of returns of that benefit. Most importantly, the states end up competing investments and grating benefits only seeking their own interests.

2.2 Fiscal War

Brazil lived for 21 years a regime of dictatorship, which began in 1964 with a military coup that overthrew the government of President João Goulart. Only in 1985, this regime ended, and we had the New Republic. This was a period of great changes for the country, which had its Constitution promulgated in 1988. As explained by Dulci (2002), one of the major changes brought by the new Constitution was a greater power to each of the 26 units of the Brazilian Federation plus the Federal District, in several aspects, including the tax issue. One of the most important points was that each state began to have autonomy to set the aliquot of ICMS, the main source of tax collection, as we saw earlier.

In a country with continental dimensions like Brazil, we know that homogeneity in the development of each state is the major challenge. We can observe that, beyond the differences among states, we have differences on the degree of development within each state (Chein, Lemos and Assunção, 2007). No doubts that the poor management of the collected public funds has a big impact on the permanence of this inequality, besides, of course, the financial limitation of each state to generate all the necessary resources for social and economic recovery. These points are important to understand the root of fiscal problems in Brazil.

There has been a record of fiscal disputes in Brazil since the 20s, though it was in the 90s, with the opening of the economy, that this dispute has been intensified (Nascimento, 2008). Brazilian states saw on entry of foreign capital in the country an opportunity to attract these investments to generate jobs, increase income, promote the economy to increase GDP and consequently increase tax collection.

According to Nascimento (2009), the so-called *fiscal war* occurs both between the Federation Units and the Union, and among the Federation Units. In the first case, since the Constitution of 1988 was promulgated, there has been an increase in the collection of taxes by the states, as a result of tax changes. Therefore, the Union had its tax collection reduced, and the way found to expand this collection was to create or increase the aliquot of social contributions that are not subject to have a share transfer to the states. In the second case, the competition between the Federation Units happens in two ways: among the states, by charging a different aliquot of ICMS for the same services, and among municipalities, through the differences of the charge of ISS and IPTU. Thus, each region ends up creating "artificial" advantages for enterprises to choose regions that, perhaps, by the logic of the market, would not be chosen to be installed.

In this fiscal dispute, it is clear the advantage of powerful multinationals versus local companies. While, in the first case, the multinationals are highly benefited with various tax benefits, the others end being charged for full payment of due taxes. So the government starts to deal with a scenario of default and tax evasion by companies that do not agree with the distribution of tax collection. As a consequence, we have the "informal economy", representing an important part of the Brazilian economy (Prado, 1999).

Firstly, evaluating the fiscal war between states through the ICMS, according to Ribeiro (2010), this fiscal dispute has two objectives: a) to attract investments that generate a revenue from the collection of ICMS that, in the future, will cover the tax renunciation granted at the time of the establishment of the company and; b) transfer the cash flow without necessarily transferring economic activity, thus, switching the ICMS revenue for the state that gave the benefit. The difference between these two goals is that, in the first case, the government is considering a long-term vision for the development of the region, while, in the second, the focus is to have only the gain in the short term, without considering the imbalance that this act can generate, not only economic but also political.

There are several examples of fiscal war in Brazil and different industries that are affected. Lagemann (2014) made a specific study on the fiscal war in Brazilian ports. The supplementary Law No. 87 (LC 87/96) of September 13, 1996, which defines the ICMS, in Article 12, defines that the triggering event of payment of the tax should happen in customs clearance, and the chargement of the tax should be made at the place in which the goods are delivered. Thus, the tax responsibility, in this case, is of the place that receives the delivery, and not of the place where, in fact, the product or service will be consumed and / or used. As the delivery and consumption might not occur at the same location, a state ends up with the tax revenues that should belong to another state. In addition, the consumer will use the public services of the state he is, but, on the other hand, there is no payment of taxes due to this state. Additionally, it is evident that the port states are encouraged to stimulate the installation of companies in which the delivery occurs. So they can appropriate of the tax revenues that should belong to the states where end consumers are.

In the automotive industry, one of the most emblematic cases was that of Ford Company. In 1999, the new government in Rio Grande do Sul decided to review the benefits given to the company by considering that it was too costly to the state. Ford tried to convince the government to keep the agreement, and, if that did not happen, the company would install its new plant in another state. Observing this impasse, the government of Bahia quickly asked the Federal Government to reopen the program of incentives for the automotive industry in the Northeast, which had ended in the previous year. Due to the federal political alliances with the state of Bahia, the Federal Government gave in to this request, which caused a political discomfort, not only with the state of Rio Grande do Sul, but with other states that considered inappropriate the intervention of the Federal Government on this issue. Besides the renunciation of federal taxes, Ford had a loan from BNDES, and other benefits offered by the Bahian government (Incentivo à Montadora, 1999).

As the government of Rio Grande do Sul suffered competition from other states, the government of Minas Gerais had also had a similar experience with Itambé Company, the largest company of dairy products. The company announced in 2000 that it was evaluating shift production from Minas to Goias. This decision was based on the fact that Minas charged 7% of ICMS on long-life milk, while the government of Goias offered an exemption of 80% of this value. In this case, even with the transfer being impractical, the company forced the state of Minas Gerais to have the same tax of the companies that were located in Goiás (Dulci, 2002).

When evaluating the fiscal war in meat and leather industry, the state of Minas Gerais was even more harmed. Their competitors in this sector, the states of Ceará, São Paulo, Mato Grosso do Sul, Bahia and Espírito Santo, completely eliminated the ICMS tax aliquot. As a result, in four years, in the period 96-00, Minas lost 17 refrigerators to the states of Goiás and São Paulo. (Frigoríficos Insatisfeitos, 2000).

In accordance with Diniz (2000), fiscal war is harmful to the public treasury, endanger future collections besides causing changes in prices. The war ends up benefiting more developed states, which have greater financial and political conditions to afford larger fiscal renunciation. These factors exacerbate the inequalities among the regions, as we talked earlier in this session.

According to Ozaki and Biderman (2004), this dispute also reached the municipal spheres. As it was mentioned earlier, the tax used in municipalities dispute is the ISS. The Complementary Law 116/03 updated and regulated the ISS legislation, expanding the list of taxable services for 193 items. The triggering event for the collection of this tax is where "the service will be provided". This term is considered to be subject to different interpretations because one might consider that the service will be provided in the central office or in the parent company, that is, in the specific address where the company is located. However, it may be that the service is performed elsewhere.

The fiscal war on ISS can be considered more serious than the one with ICMS. Even with the enactment of Constitutional Amendment 37 of 2002, which set the floor of the aliquot at 2%, we have municipalities that charges lower rates, hurting the Constitution with illegal act. This is not the only problem. We also have a fraud scenario: companies that "fictitiously" install themselves in a municipality, keeping only an address, without having any activity in that place just to take advantage of the tax benefit in that municipality (Martins and Cintra, 2006).

Almeida (2000) brought an important contribution by analyzing all the problems related to fiscal renunciation:

> [...] it is a public policy enshrined internationally, with widespread application in countries of all continents, without distinction of level of economic development social and governance regime, whose purpose is to promote the financial support necessary to carry out programs, projects and activities of interest to society and for the promotion of balanced socio-economic development in different geo-economic regions of the country.

Another important goal is the development of strategic economic sectors that favors certain groups of taxpayers, among other relevant public goals.

Because of these disputes between the states that we just described, we believe that the tax benefit has influence in the decision of which state will receive the FDI. However, still according to Almeida (2000), the difference between Brazil and developed countries is that they have instruments to control the results achieved with the given benefits. Thus, these countries can know whether the adopted fiscal policy is being effective.

In the Brazilian scenario, the Federal Government has poor monitoring mechanisms to know the exactly amount of fiscal renunciation and no mechanisms to evaluate if the policy is being effective or not. Even though the Fiscal Responsibility Law requires states to disclose all information regarding the fiscal renunciation, are few who do it. Moreover, the value requested by the LFR is estimated, it is not what was actually renunciated. Given these adversities we had to work with two models to try to capture the influence of the tax benefit on the FDI inflow to the Brazilian states. These models will be tested and explained in the following sections.

3 RESEARCH METHODOLOGY

3.1 Tax incentive variable

As previously mentioned, this study aims to make an unprecedent assessment of the impact of the tax incentive in FDI of Brazilian states. To achieve this result, we performed an econometric panel regression using two models: A – for the years 1995, 2000, 2005 and 2010, with the tax expenditure by macro regions; B – the period of 2010, 2011 and 2012, with the tax expenditure variable by state.

The tax expenditure is a variable used in many studies to analyze how this fiscal policy impacts the FDI inflows in a certain country or region. Liu, Daly and Varua (2012) chose the following determinants to analyze the inflow of FDI among the four regions of China: market size, labor cost, labor quality, physical infrastructure development, telecommunication, degree of economic openness and government incentives. By using a multiple regression model for each region and then comparing the results across them, the authors found that the coefficients for the government incentives variables were positive and significant for coastal and northeast region in China.

Sethi, Judge and Sun (2009) went deeper in analyzing the impact of tax expenditure in the intra-country FDI variations in China, testing several hypotheses, using government incentives and the industry location advantages. The results showed that those two variables explain better the inter-province variations in FDI inflows when they are analyzed together then independently.

A study from Morisset and Pirnia (1999) presented an interesting review of others analysis on how tax policy and tax incentives impact the FDI. By analyzing some econometric studies they concluded that the importance of others factors such as infrastructure, cost of labor and political stability suggests that tax policy is a poor instrument to compensate the investors for the negative factors of a particularly location, or country.

In line with this study, we have Devereux and Freeman (1995) that presented the FDI inflow between seven countries for the period of 1984 to 1989. The result showed that incentives are generally insignificant when we consider the decision of companies to where allocate their investment.

As we can see, we have multiple views on the impact of incentives on FDI.. The ICMS/GDP, used as the independent variable *tax burden* in Bortoluzzo, Sakurai and Bortoluzzo (2013) papers', represents the amount of tax that was actually paid, disbursed by the taxpayers. The amount that was not charged by the government, i.e., the value given as benefit will not be represented in any form of collection. Thus, the idea of including the tax expenditure as an independent variable is a way to measure and understand better if the incentives given by the Brazilian government have or not an influence on the multinationals' decision about in which state they should invest.

In order to make this distinction referring the tax variables, the data were obtained in two different ways:

Tax burden: This variable is composed by the collected ICMS for each state divided by the state GDP. Then, the ratio obtained for each census year was the arithmetic average of the previous five years, including the base year. The ICMS data were obtained by the Institute of Applied Economic Research (IPEA).

Tax expenditure: This variable was extracted from the table provided by the Treasury Department (Ministério da Fazenda, Secretaria da Receita Federal) from their Annual Statement of Tax Expenditure (Demonstrativo dos Gastos Tributários). For the first model, the data were displayed by macro regions - North, Northeast, South, Southeast and Midwest. We divided the tax expenditure variable by the macro regions GDP. As this was the only data that we couldn't get by state, we replicated the macro region information to each state that it was part of (i.e. the information of the South state was replicated to Rio Grando do Sul, Paraná and Santa Catarina that are the states that comprises the South region). For the second model, we had the data by state from the Prediction and Analysis of Tax Expenditure Division (Divisão de Previsão e Análise dos Gastos Tributários) of the IRS. To get the tax expenditure ratio, we divided the tax expenditure of the state by the GDP of the state. In the following sections we present a description of the others variables and the used model.

3.2 Description of variables

    Model A: period of 1995, 2000, 2005 and 2010.

    Foreign Direct Investment per capita (FDI): The stock of FDI at December, 31st of each year was used as the dependent variable. The used source was the Census of Foreign Capitals in the Country (Censo de Capitais Estrangeiros no País), conducted by the Brazilian Central Bank (BC). For the years 1995, 2000 and 2005, the BC didn't follow the same criteria for FDI, as the International Monetary Fund (IMF) in a way that did not consider the intercompany loans as FDI. However, the information gathering and the production results for the stock of FDI relied methodologically, on BC Census 2011, base year 2010, on the recommendations of the sixth edition of the Balance of Payments and International Investment Position Manual (BPM6) from the IMF, and on the fourth edition of Reference Definitions of FDI (BD4) from the Organization for Economic Cooperation and Development (OECD). In both documents, the credit relations between the direct investor and the investee company are in the stock of the direct investment intercompany lending modality. The credit transactions between companies under one controller, called "sisters", also make up the stock of intercompany loan. Thus, to equate the information, the IMF methodology was applied for the Cesus of 1995, 2000 and 2005. The data for 2010 was provided in US dollars so we made the conversion using the BC PTAX rate as of December 31st. The data were also updated by the GDP deflator in the year of 2010. Then, the FDI of the state was divided by the population of the state of each year to reach de FDI per capita.

    Market size: For this variable, it was used the population and the relative GDP. For the population, the data were obtained from Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística - IBGE). The GDP data were also obtained by IBGE in partnership with State Statistics (Órgãos Estaduais de Estatística), State Government Departments (Secretarias Estaduais de Governo) and Superintendence of the Manaus Free Zone (Superintendência da Zona Franca de Manaus- SUFRAMA). To reach the relative GDP, we divided the GDP of each state by the country GDP and then, for each Census year, we did an arithmetic average of the five previous years (i.e. for 1995, we used the data from 1991 until 1995 to calculate the arithmetic average). FDI's mainly motivation is the expansion to new markets, and market size directly affects the expected revenue of investment (Shapiro, 1998). The expectations were that the market size should continue to have a positive answer

as it defines the size of a potential consumer market, and the larger it is, the more FDI the region should attract (Bevan and Estrin, 2004)

Quality of workforce: To measure the quality of workforce, we used the illiteracy rate for individuals aged 15 years, which was obtained from IBGE. Due to missing information on the year 2000, the arithmetic average of the years 1999 and 2000 was used to represent the data of this year. This is an important variable associated with productivity, which should impact somehow the FDI as FDI are often cited as having linkages with education, because a more educated people will intend to perpetuate the development, leading to innovation and further investment (Porter and Stern, 2001).

Infrastructure: The data used were the extension of paved road, which was generated by the National Land Transport Agency (Agência Nacional de Transporte Terrestre - ANTT). We divided the paved road network by the extension of each state to achieve the number per thousand km². Brazil has continental dimensions, which can be a negative effect if a company invests in a state that does not have the necessary infrastructure to make the production reach the existing consumer market in that state or in any other. Thus, the lack of infrastructure would highly impact the production costs (Coughlin, Terza and Arromdee, 1991).

Cost of labor: This variable was composed by all the wages, income and social security contributions, compensations and benefits summed up and divided by the net income of the company. The source was the Institute of Applied Economic Research (Instituto de Pesquisa Econômica Aplicada - IPEA). The data from 1996 were used instead of 1995 as they were not segregated by state.

The descriptive statistics of the data are displayed in Table 4. We can notice that for the natural logarithm of FDI stock per capita, we have differents *n* mainly because for the first year, the BC didn't provide the values for the states of Roraima and Rondônia. Despite the number for FDI in Sergipe in 1995 was zero, we considered it as missing mainly because the state presented a significant increase in the following years. In 2010, the FDI for Roraima wasn't provided too.

For the variable tax expenditure, as we had the data only for macro regions, we repeated the information, and that is why we considered 27 observations in each year instead of just 5 observations.

Table 4 - Descriptive statistics of the variables (Model A)
Source: the author

Variable	Average	Standard Deviation	Minimum	Maximum	N
FDI per capita					
1995	R$ 562,16	R$ 940,40	R$ 4,91	R$ 3.535,93	24
2000	R$ 1.513,93	R$ 2.497,81	R$ 6,90	R$ 11.257,51	27
2005	R$ 1.951,12	R$ 2.756,28	R$ 162,48	R$ 12.721,58	27
2010	R$ 2.437,12	R$ 2.236,19	R$ 4,50	R$ 7.990,37	26
Population					
1995	5.771.201	7.005.811	262.201	33.699.614	27
2000	6.288.858	7.630.323	324.397	37.032.403	27
2005	6.804.521	8.265.798	392.255	40.490.757	27
2010	7.065.030	8.410.049	450.479	41.262.199	27
Relative GDP					
1995	3,7%	7,1%	0,1%	36,2%	27
2000	3,7%	6,7%	0,2%	34,3%	27
2005	3,7%	6,7%	0,2%	34,3%	27
2010	3,7%	6,6%	0,2%	33,5%	27
Illiteracy (%)					
1995	18,1%	10,1%	6,5%	35,1%	27
2000	15,1%	8,7%	4,7%	31,7%	27
2005	13,8%	7,7%	4,7%	29,3%	27
2010	12,1%	6,5%	3,5%	24,3%	27
ICMS/GDP					
1995	9,8%	3,0%	3,0%	14,7%	27
2000	6,5%	1,6%	2,3%	9,0%	27
2005	7,4%	1,6%	3,5%	10,6%	27
2010	7,6%	1,7%	3,3%	12,1%	27
Cost of labor (%)					
1995	20,5%	8,8%	8,0%	43,1%	27
2000	14,6%	5,9%	6,1%	30,7%	27
2005	12,3%	5,4%	5,8%	27,6%	27
2010	13,8%	5,5%	6,3%	26,3%	27
Infra (km/km^2)					
1995	38,08	38,38	0,87	128,03	27
2000	41,05	39,17	1,09	128,03	27
2005	47,61	45,11	1,05	151,78	27
2010	48,80	44,77	1,39	158,02	27
Tax expenditure/GDP (%)					
1995	2,6%	3,3%	0,4%	8,0%	27
2000	2,5%	2,2%	0,8%	6,2%	27
2005	2,6%	2,1%	1,0%	6,0%	27
2010	4,7%	3,5%	1,0%	10,3%	27

The inequality among the Brazilian states, mentioned before on this study, can be clearly noticed by analyzing Table 4. In all the variables, we have vast differences among the states. Starting by the FDI per capita, while the state of São Paulo presents the maximum

value for three years – R$ 3,535.93 in 1995, R$ 11,257.51 in 2000 and R$ 7,990.37 in 2010, we have in 1995 the state of Maranhão with the lowest value R$ 4.91, Tocantins with R$ 6.90 in 2000 and Acre with R$ 4.50 in 2010. On the population variable, while we have São Paulo with more than 41 million inhabitants in 2010, Roraima had around only 450,000. Based on that, the relative GDP will follow these discrepancies with São Paulo having the highest GDP ratio, being almost 20% higher than the second placed that is Rio de Janeiro. Analyzing the illiteracy, we have São Paulo and Rio de Janeiro with one of the lowest ratio in 2010, around 4,30%, while we have the states of the Northeast region, as Alagoas and Piauí, with more than 21% of the population over 15 years being illiterate. On the ICMS/GDP ratio, we have states like Mato Grosso do Sul and Espírito Santo with the highest ratios, on average 10% for the years 2005 and 2010, and two states of the North region with the lowest ratio, about 5%. When we analyze the Northeast region on the cost of labor variable, we have Bahia with one of the lowest ratio, 6.79% in 2005 and Rio Grande do Norte with 27.55%. Thus, it shows the discrepancy not only among the Brazilian states, but also among the states from the same region. Comparing the last two variables, we have all the states from the North region with the lowest infrastructure numbers and with the highest rates of tax expenditure. Therefore, this reinforces the fact that the poorest states are those that provide more incentives in order to compensate companies for the lack of infrastructure in a general way.

In order to verify the existence of multicollinearity among the independent variables, the Pearson correlation and the VIF (Variance Inflation Factor) were performed for all the four years, and the result are shown, respectively, in table 5 and 6 in the appendix section. Due to the absence evidence of high multicollinearity, all the variables were kept in the model.

It is important to mention that for the variables FDI per capita and the population we worked with the natural logarithm of both variables in order to reduce the strong positive asymmetry, which also reduces the variability. The transformation to natural logarithm brings linearity to the relationship of FDI with other variables.

Model B: period of 2010, 2011 and 2012

The main difference between model A and B is that in the second model we used the information of tax expenditure by state. In fact, we had this information since 2006, however, the BC started to do the Census annually since 2010 and as a result we couldn't match the information period and were left with 3 years to analyze.

For the variable *FDI per capita*, the difference between both models was that in the second, the FDI data was provided in USD dollars for all the years. In this case we made the conversion, using the BC PTAX rate of the last day of each year, as we are working with the stock of FDI. For the *Market size* variable, the only difference was in the relative GDP, as we did not calculated the arithmetic average. *Quality of workforce* and *Infrastructure*, we used the exactly same methodology as model A. We had to exclude the variable *Cost of labor* due to lack of information (we only had 2010 and 2011). In the *Tax burden* variable in model A we used the arithmetic average of the previous five year, and in the model B, because we had the information of a short period, the ICMS collected of each state was divided by the GDP of the state for each year, without calculating the average.

The descriptive statistics of the data are displayed in Table 7. We did not have many differences between the descriptive tables of models A and B, the inequalities between states found in the first model remain in this second one. However, some numbers should be highlighted: the illiteracy rate has dropped significantly over time, the maximum value in the year 1995 was 35.1 percent and for the year 2012 was 21.8 percent, showing that the country as whole has been reaching improvements in the education sector. Another relevant point is the tax expenditure variable which, being segregated by state, allows us a clearly analysis. We can see that the maximum value reached about 33 percent on average in all periods and the state with this maximum value was Amazonas. This was expected since the Manaus Free Zone is one of the biggest programs of incentives, and as previously discussed, the poorer regions needs to use incentives to compete with the wealthier states in order to attract FDI.

Table 7 - Descriptive statistics of the variables (Model B)
Source: the author

Variable	Average	Standard Deviation	Minimum	Maximum	N
FDI per capita					
2010	R$ 2.437,12	R$ 2.236,19	R$ 4,50	R$ 7.990,37	26
2011	R$ 3.684,81	R$ 3.515,92	R$ 4,77	R$ 12.538,19	27
2012	R$ 4.501,69	R$ 4.223,74	R$ 5,39	R$ 15.195,20	27
Population					
2010	7.065.030	8.410.049	450.479	41.262.199	27
2011	7.125.159	8.470.477	460.165	41.587.182	27
2012	7.183.218	8.528.904	469.524	41.901.219	27
Relative GDP (%)					
2010	3,7%	6,6%	0,2%	33,5%	27
2011	3,7%	6,4%	0,2%	32,6%	27
2012	3,7%	6,5%	0,2%	33,1%	27
Illiteracy (%)					
2010	12,1%	6,5%	3,5%	24,3%	27
2011	10,8%	5,7%	3,1%	21,8%	27
2012	10,7%	5,9%	3,2%	21,8%	27
ICMS/GDP (%)					
2010	7,6%	1,7%	3,3%	12,1%	27
2011	7,6%	1,6%	3,2%	11,8%	27
2012	8,0%	1,9%	3,3%	12,9%	27
Infra (km/km2)					
2010	48,80	44,77	1,39	158,02	27
2011	50,71	44,36	1,66	166,58	27
2012	47,34	41,45	1,48	150,86	27
Tax Expenditure (%)					
2010	3,8%	5,7%	1,5%	32,1%	27
2011	3,9%	5,8%	1,4%	32,8%	27
2012	4,3%	6,0%	1,4%	34,2%	27

Again, the Pearson correlation and the VIF were performed for all the three years, and the result are shown, respectively, in table 8 and 9 in the appendix section. No high multicollinearity was found. For this model we also worked with the natural logarithm of FDI per capita and population variables.

3.3 Model

According to Wooldridge (2002), the analysis of panel data is used to monitor the same data during a specific period of time. In that way, it is possible to have multiple observations on the same units, allowing us to control certain unobservable characteristics of individuals, firms and, in the case of this study, the states. A second advantage of panel data is related to the fact that it allow us to study the importance of time lags in behavior or in the result of taking decisions. This information can be important since one can expect the impact on many public policies only after some time. Thus, we first perfomed the OLS (Ordinary Least Square) method and the results are presented in table 10 for model A and table 11 for model B in the appendix section.

Considering this scenario, with the description of the variables previously mentioned, the analysis on the determinants of FDI across the Brazilian states can be described as follows:

Model A

$$\ln(\text{FDI per capita})_{it}$$
$$= \beta_0 + \beta_1 \ln(\text{Population})_{it} + \beta_2 \text{Illiteracy}_{it} + \beta_3(\text{relative GDP})_{it}$$
$$+ \beta_4(\text{Tax expenditure/GDP})_{it} + \beta_5(\text{ICMS/GDP})_{it} + \beta_6(\text{Cost of Labor})_{it}$$
$$+ \beta_7(\text{Infrastructure})_{it} + \beta_8 \text{Year2000}_i + \beta_9 \text{Year2005}_i + \beta_{10} \text{Year2010}_i + u_i$$
$$+ \varepsilon_{it}$$

As it can be observed, the dependent variable is the natural logarithm of FDI stock per capita of a given state *i* at year *t*. The independent variables: natural logarithm of population, illiteracy, relative GDP, tax expenditure/GDP, ICMS/GDP, cost of labor and infrastructure are the explanatory variables. Then, we have the dummies for the years 2000, 2005 and 2010 to evaluate the effect of the year in the regression. The year of 1995 was used as a reference, and because of that, was excluded from the model to avoid multicollinearity.

The Hausman test was used to examine the hypothesis of correlation between one or more explanatory variables and the error term. The result showed that the random effects estimator should be used; thus, this effect is represented as *u*. Finally, we have the ε representing the idiosyncratic error term.

Model B

$$\ln(\text{FDI per capita})_{it}$$
$$= \beta_0 + \beta_1 \ln(\text{Population})_{it} + \beta_2 \text{Illiteracy}_{it} + \beta_3 (\text{relative GDP})_{it}$$
$$+ \beta_4 (\text{Tax expenditure/GDP})_{it} + \beta_5 (\text{ICMS/GDP})_{it} + \beta_6 (\text{Infrastructure})_{it}$$
$$+ \beta_7 \text{Year2011}_i + \beta_8 \text{Yea2012}_i + u_i + \varepsilon_{it}$$

The equation of this model is very similar with the previous one. The difference is the exclusion of the variable cost of labor, as already explained and the use of the year 2010 as the reference year. Also, we had the same result for the Hausman test: random effect.

According to Sartoris (2003), evaluating basic hypotheses about the linear regression model, ours models should have:

I. Each independent variable X_i can not be a linear combination of the others: as shown in the tables 5 and 6 for model A nd 8 and 9 for model B, the independent variables are not highly correlated.

II. $E(\varepsilon_i \varepsilon_j) = 0, i \neq j \ (errors \ are \ not \ autocorrelated)$: The omission of a relevant variable may cause autocorrelation in the erros becuase the omission of this variable puts its systematic influence in the error term, which is, supposedly, a set of non-systematic influences on the depedent variable. Thus, the autocorrelation test sugested by Wooldridge was performed for model A and the Durbin-Watson test was performed for model B, as this is applicable for shorter periods. Both did not present autocorrelation in the erros.

III. $var(\varepsilon_i) = \sigma^2$ (constant): Heteroscedasticity was verified using Modified Wald test. For the *FDI per capita* and *population* variables we used the natural logarithm of these variables in both models and also worked with standard robust errors.

IV. Stationary time series: the estimation of a regression model with non-stationary time series can lead to spurious regression problem: high coefficient of determination (R^2) without any significant relationship between the variables. Thus, before proceeding with the adjustment of the models, the unit root test (Harris-Tzavalis) was applied and both models are stationary (Model A: p-value 0.0000 and Model B: p-value 0.0025).

Before we present the results, based on the literature presented in all the sections of this study, below we have a table which summarizes the expected signal in the regression model and also the literature that supports it.

Table 12 – Expected effect
Source: the author

Variable	Expected effect	Source
Population	+	Fraga, Parré and Silva (2013); Carminati and Fernandes (2012); Angelo, Eunni and Fouto (2010); Bevan Esterin (2004); Shapiro (1998)
Relative GDP	+	
Illiteracy	-	Porter and Stern (2001)
Cost of labor	-	Liu, Daly and Varua (2012)
Infrastructure	+	Coughlin, Terza and Arromdee (1991)
Tax burden	-	Bortoluzzo, Sakurai, Bortoluzzo (2013)
Tax expenditure	+	Liu, Daly and Varua (2012); Sethi Judge and Sun (2009)

4 RESULTS

In this section we present the results of our panel regression. Table 13 reports the results of equations (A) and (B). The adjusted R^2 value of 0,624 and 0,506 respectively, further suggests that the models fit the data well. Hausman tests indicated the adequacy of random effects for the two models.

Table 7 – Results of the regression for models A and B
Source: the author

Dependent Variable: ln FDI per capita		
Explanatory Variable **(P Value)**	**(A)**	**(B)**
Population (Natural logarithm)	0,590*	1,322***
	(0,019)	(0,000)
Illiteracy (%)	-0,095***	-0,0878**
	(0,001)	(-0,007)
Relative GDP	0,224	-6,371
	(0,930)	(0,290)
Tax Expenditure (%)	-0,075*	0,018
	(0,048)	(0,695)
ICMS/GDP	-0,026	-0,024
	(0,794)	(0,636)
Cost of labor (%)	0,021	
	(0,395)	
Infrastructure (km/km2)	0,002	-0,0003
	(0,788)	(0,933)
2000 dummy	1,198	
	(0,100)	
2005 dummy	1,648***	
	(0,000)	
2010 dummy	1,631*	
	(0,021)	

2011 dummy		0,039
		(0,607)
2012 dummy		0,296***
		(0,000)
Constant	-2,333	-11,56
	(0,454)	(0,028)
Observations	104	80
R^2	0,624	0,506
Hausman Test (p-value)	0,533	0,586

* p<0,05, ** p<0,01, *** p<0,001 . Robust standard errors.

This study has found that both population and illiteracy variables have a statistically significant relationship with FDI in models A and B for the 27 different states of Brazil. The relationship between market size was a significant and positive factor in attracting FDI in all the period studied. For each 1 percent increase in the population, we will have a 0.59 percent increase in model A and 1.32 percent increase in the FDI in model B. Based on the literature previously discussed, this seems to suggest that foreign firms may be motivated to invest in Brazil under an assumption that by doing so will allow them to gain access to the Brazilian market. The state of São Paulo, which is the most populated one, is also the one with the biggest FDI inflow.

The higher the quality of labor the more attractive a region is to FDI. The results suggest a negative relation between FDI and the quality of labor: the models showed a similar number as a 1 point percent increase in the illiteracy is estimated to lead to 9.5 (model A) and 8.78 (model B) percent decrease in FDI. Again, we have São Paulo and Rio de Janeiro, the leaders of FDI inflow with the lowest illiteracy rates, around 3.67 percent.

Then we have the tax expenditure variable being statistically significant (p=0,048) for model A but not for model B. However, compared with the other variables, was the least significant. According to Morisset and Pirnia (1999), on the analysis of the survey to FDI investors, one explained: "tax exemption is like a desert; it is good to have, but it does not help very much if the meal is not there". It might be the case that we are facing in Brazil: while we still have the discrepancy level between the states, which generates all these economic inequalities, tax incentive will continue to be the "cake icing", meaning it will be just a detail but not strongly determinant for the FDI inflow.

The years were also significant in ours models. For the first model, we used the year of 1995 as a reference and the years 2005 and 2010 were positively significant. Despite the reduction of the FDI inflow in 2005, the stock more than fourfold compared to the year of reference. The reduction in 2005 was mainly driven by the exit of FDI in form of equity participation. In the year 2010, Brazil achieved a record of FDI inflow since 1995, on the amount of $ 48.4 billion dollars. One of the mais reasons for this increase was the sale of the shares of Rapsol, an oil company, to the chinese company Sinopec for $ 7.1 billion dollars. In 2012, Brazil was the country that received the third largest amount of FDI among emerging economies, with $ 65 billion dollars, only behind China ($ 120 billion) and Hong Kong ($72 billion). Although the volume was slightly below the record $ 67 billion dollars in 2011, the sare destinated to the Brazilian economy represented 4.96 percent of the world total, compared to 4.18 percent in 2011 and only 2.34 percent in 2000 (Valor Econômico). Thus, we believe that the regression captured this increase of FDI for this years.

The other variables did not meet the test of statistical significance. Actually this wasn`t expected as there is a vast literature that considers the same variables that we used as determinants for FDI. However, we believe that the specific characteristics of Brazil and the inequalities among the states explaines why other variables are not determinant. Considering the size of the country, it might not be logical to invest in the state of Acre, for example, if the region doesn't provide you enough cosumer market and if the investors won't find skilled labor. In this case, investing in a state like this, will only increase their costs of production, because they will have to transport the product, using an inappropriate infrastructure and they will have to scroll thorugh almost 3.500 km to reach the consumer market.

Assessing the Pearson correlation table for both models, although we have not an indication of high multicollinearity, the relative GDP and the population variables showed the highest correlation. Therefore, we decided to make a third check, alternating these variables in the models. Thus, we tested the model A with the population variable and without the relative GDP and then reversed, tested without population and with the relative GDP. The same analysis was done woth model B. The result is in the appendix section, table 14 (model A) and 15 (model B). As noticed, we had the same results as previously presentend, so we kept the models with both variables.

Is important to note that the fact we did not have the data by state was a great limiter for model A. We can observe on the descriptive tables the the tax expenditure variable differs

greatly, the maximum value in the table 4, where we have the data aggregated by macro regions was 10.3 percent, while table 7, with the data by state, the maximum value was 34.2 percent. We conclude that the tax benefit information end up diluted among the states of the same region. As the objective of this study is to evaluate FDI determinants ath the state level, the analysis is impaired with the information in this format. Thus, despite the period analyzed in model B is shorter, we believe that the results are better represented in these model.

5 CONCLUSION

The above findings suggest that firms investing in Brazil are highly motivated by the economic performance and the potential consumer market size of the state. Thus, another important contribution of this study is related to the tax policy. Clearly, the incentives did not compensate for a weak unattractive FDI envornment. Tax is just one element among many anothers and despite all this fiscal war that we had described, it seems to not compensate for weak non-tax conditions, as the tax incentive was not determinant for the FDI inflow in the Brazilian states.

This study had similar results with Morisset and Pirnia (1999) and Devereux and Freeman (1995) that also found that incentives were not significant to determine the FDI inflow. It is also aligned with Angelo, Eunni & Fouto (2010) which the result was that the potential growth of consumer market are the most significant determinant that explains the FDI flow to Brazil.

In order to achieve our goal, we worked with a panel data regression model for two different periods, mainly due to lack of data: one for the years 1995, 2000, 2005 and 2010 and another one for the period of 2010, 2011 and 2012. We believe that the second model has a higher statistical consistency, because we could test it with values of incentives for each state. However, we had the same result for both models being the population and illiteracy variables statistically significant. The years 2005, 2010 and 2012 also performed significant, but this does not give us much clarity of which factors influenced the distribution of FDI.

LIMITATIONS

Our study has some limitations that deserve further investigation. First, the importance of determining factors may change over time. Similarly, the location determinants of FDI may differ by industry and that was not a factor that we explored in this study. Furthermore, due to data limitation, we were not able to consider a more broader period. Despite having the information about tax incentives since 2006, we did not have the FDI information for the same period as the BC only did the Census of Foreign Capital in each 5 years and just started to do it annually since 2010. The information about 2013 had not been disclosed by the time of this study. We had the same situation with the *cost of labor* variable that we intended to use, but the last data provided by IBGE was 2011.

APPENDIX A – EXTRA TABLES

Table 5 - Pearson correlation (Model A)
Source: the author

	Y	X1	X2	X3	X4	X5	X6	X7
1995								
Y. ln(FDI per capita)	1,000							
X1. ln(Population)	0,365	1,000						
X2. Relative GDP	0,527**	0,630**	1,000					
X3. Illiteracy	-0,558**	0,036	-0,346	1,000				
X4. ICMS/GDP	-0,117	0,145	0,004	0,014	1,000			
X5. Cost of labor	0,023	-0,334	0,007	-0,002	-0,390*	1,000		
X6. Infrastructure	0,474*	0,441*	0,502**	-0,133	-0,254	0,152	1,000	
X7.Tax Expenditure/GDP	0,009	-0,636**	-0,266	-0,236	-0,194	0,098	-0,557**	1,000
2000								
Y. ln(FDI per capita)	1,000							
X1. ln(Population)	0,718**	1,000						
X2. Relative GDP	0,619**	0,653**	1,000					
X3. Illiteracy	-0,512**	-0,049	-0,361	1,000				
X4. ICMS/GDP	0,186	0,321	0,021	0,130	1,000			
X5. Cost of labor	-0,149	-0,402*	0,010	-0,025	-0,525**	1,000		
X6. Infrastructure	0,515**	0,449*	0,507**	-0,146	-0,206	0,205	1,000	
X7.Tax Expenditure/GDP	-0,497**	-0,609**	-0,269	-0,148	-0,270	0,135	-0,556**	1,000
2005								
Y. ln(FDI per capita)	1,000							
X1. ln(Population)	0,404*	1,000						
X2. Relative GDP	0,594**	0,663**	1,000					
X3. Illiteracy	-0,713**	-0,152	-0,398*	1,000				
X4. ICMS/GDP	-0,081	0,179	-0,098	0,127	1,000			
X5. Cost of labor	0,021	-0,231	-0,002	0,292	-0,226	1,000		
X6. Infrastructure	0,469*	0,464*	0,524**	-0,219	-0,354	0,217	1,000	
X7.Tax expenditure/GDP	-0,278	-0,659**	-0,320	-0,121	-0,171	-0,124	-0,581**	1,000
2010								
Y. ln(FDI per capita)	1,000							
X1. ln(Population)	0,647**	1,000						
X2. Relative GDP	0,406*	0,670**	1,000					
X3. Illiteracy	-0,367	-0,182	-,431*	1,000				
X4. ICMS/PIB	0,114	0,039	-0,152	0,196	1,000			
X5. Cost of labor	0,005	-0,248	0,021	0,176	-0,335	1,000		
X6. Infrastructure	0,308	0,441*	0,494**	-0,240	-0,424*	0,341	1,000	
X7.Tax Expenditure/GDP	-0,552**	-0,640**	-0,276	-0,103	-0,068	-0,163	-0,540**	1,000

*p<0,05. **p<0,01.***p<0,001.

Table 6 – VIF (Model A)
Source: the author

Explanatory Variable	VIF			
	1995	**2000**	**2005**	**2010**
Population (Natural logarithm)	3,05	4,15	4,15	4,13
Relative GDP	3,05	2,91	2,82	3,08
Illiteracy (%)	1,36	1,31	1,56	1,55
ICMS/GDP	2,58	1,69	1,60	1,52
Infrastructure (km/km2)	2,70	2,41	2,93	2,71
Cost of labor	1,94	1,95	1,62	2,04
Tax Expenditure (%)	3,04	1,11	1,11	2,96

Table 8 - Pearson correlation (Model B)
Source: the author

	Y	**X1**	**X2**	**X3**	**X4**	**X5**	**X6**
2010							
Y. ln(FDI per capita)	1,000						
X1. ln(Population)	0,638**	1,000					
X2. Relative GDP	0,396*	0,670**	1,000				
X3. Illiteracy	-0,357	-0,182	-0,431*	1,000			
X4. ICMS/GDP	0,058	0,028	-0,152	0,304	1,000		
X5. Infrastructure	0,303	0,441*	0,494**	-0,240	-0,433*	1,000	
X6. Tax Expenditure	0,173	0,049	-0,021	-0,073	0,246	-0,157	1,000
2011							
Y. ln(FDI per capita)	1,000						
X1. ln(Population)	0,678**	1,000					
X2. Relative GDP	0,412*	0,676**	1,000				
X3. Illiteracy	-0,375	-0,185	-0,443*	1,000			
X4. ICMS/GDP	0,103	0,121	-0,069	0,206	1,000		
X5. Infrastructure	0,280	0,368	0,453*	-0,207	-0,358	1,000	
X6. Tax Expenditure	0,186	0,052	-0,021	-0,095	0,242	-0,177	1,000
2012							
Y. ln(FDI per capita)	1,000						
X1. ln(Population)	0,603**	1,000					
X2. Relative GDP	0,399*	0,675**	1,000				
X3. Illiteracy	-0,347	-0,137	-0,419*	1,000			
X4. ICMS/GDP	0,116	0,053	-0,180	0,299	1,000		
X6. Infrastructure	0,267	0,394*	0,495**	-0,178	-0,315	1,000	
X7. Tax Expenditure	0,174	0,059	-0,019	-0,086	0,225	-0,167	1,000

*p<0,05. **p<0,01.***p<0,001.

Table 9 - VIF (Model B)
Source: the author

Explanatory Variable	VIF		
	2010	**2011**	**2012**
Population (Natural logarithm)	2,03	2,07	2,07
Relative GDP	2,47	2,46	2,57
Illiteracy (%)	1,38	1,36	1,38
ICMS/GDP	1,48	1,35	1,32
Infrastructure (km/km2)	1,72	1,54	1,50
Tax Expenditure (%)	1,10	1,11	1,11

Table 10 - OLS – Ordinary least square (Model A)
Source: the author

Dependent Variable: ln FDP per capita				
Explanatory Variable (Standard Error)	**1995**	**2000**	**2005**	**2010**
Population (Natural logarithm)	0,704	0,882**	0,056	1,021
	(0,515)	(0,289)	(0,257)	(0,538)
Illiteracy (%)	-0,070	-0,0935***	-0,106***	-0,118*
	(0,036)	(0,021)	(0,022)	(0,049)
ICMS/GDP	0,036	0,113	0,030	0,203
	(0,164)	(0,128)	(0,112)	(0,193)
Cost of labor (%)	0,006	0,040	0,046	0,057
	(0,064)	(0,038)	(0,032)	(0,071)
Relative GDP	-0,164	-1,955	3,301	-5,291
	(7,445)	(4,027)	(3,433)	(6,886)
Infrastructure (km/km2)	0,022	0,004	0,001	-0,003
	(0,014)	(0,006)	(0,005)	(0,010)
Tax Expenditure (%)	0,275	-0,094	-0,119	-0,151
	(0,184)	(0,113)	(0,120)	(0,132)
Constant	-6,381	-6,718	6,924	-8,476
	(8,935)	(4,756)	(4,271)	(9,323)
Observations	24	27	27	26
R^2	0,558	0,800	0,722	0,609

* p<0,05, ** p<0,01, *** p<0,001. Standard errors in parentheses.

Table 11 - OLS – Ordinary least square (Model B)
Source: the author

Dependent Variable: ln FDP per capita			
Explanatory Variable (Standard Error)	**2010**	**2011**	**2012**
Population (Natural logarithm)	1,283**	1,365**	1,101*
	(0,420)	(0,373)	(0,398)
Illiteracy (%)	-0,091	-0,117	-0,117
	(0,051)	(0,056)	(0,059)
ICMS/GDP	0,239	0,090	0,173
	(0,234)	(0,199)	(0,178)
Relative GDP	-7,659	-8,913	-6,118
	(6,858)	(6,763)	(7,235)
Infrastructure (km/km2)	0,008	0,005	0,006
	(0,009)	(0,008)	(0,009)
Tax Expenditure (%)	0,037	0,035	0,025
	(0,053)	(0,050)	(0,051)
Constant	-13,390*	-12,963*	-9,470
	(6,181)	(5,271)	(5,628)
Observations	26	27	27
R^2	0,532	0,582	0,495

* $p < 0,05$, ** $p < 0,01$, *** $p < 0,001$. Standard errors in parentheses.

Table 13 - Model A
Source: the author

Explanatory Variable (Standard Error)	Model 1	Model 2
Population (Natural logarithm)	0,601** (0,185)	
Illiteracy (%)	- 0,095*** (0,023)	-0,089** (0,029)
Relative GDP		5,894* (2,924)
Tax expenditure (%)	-0,072 (0,053)	-0,179** (0,059)
ICMS/GDP	-0,022 (0,102)	-0,053 (0,087)
Cost of labor (%)	0,022 (0,021)	-0,011 (0,013)
Infrastructure (km/km2)	0,002 (0,007)	0,001 (0,006)
2000 dummy	1,213 (0,746)	1,024 (0,816)
2005 dummy	1,657*** (0,434)	1,507** (0,573)
2010 dummy	1,631* (0,644)	1,803* (0,711)
Constant	-2,552 (2,800)	7,378*** (1,844)
Observations	104	104
R^2	0,624	0,587

* p<0.05, ** p<0.01, *** p<0.001.
Robust Standard Error in parentheses.

Table 14 - Model B
Source: the author

Explanatory Variable (Standard Error)	Model 1	Model 2
Population (Natural logarithm)	1,077*** (0,274)	
Illiteracy (%)	-0,0789* (0,031)	-0,0763* (0,035)
Relative GDP		8,116 (5,424)
Tax expenditure (%)	0,0205 (0,047)	0,026 (0,055)
ICMS/GDP	-0,022 (0,051)	-0,019 (0,053)
Infrastructure (km/km2)	-0,0008 (0,0033)	-0,0001 (0,0035)
2011 dummy	0,053 (0,074)	0,065 (0,078)
2012 dummy	0,309*** (0,083)	0,330*** (0,088)
Constant	-8,156 (4,210)	7,859*** (0,719)
Observations	80	80
R^2	0,481	0,222

* p<0.05, ** p<0.01, *** p<0.001.
Robust Standard Error in parentheses

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