

# The Influence of Political Cycles on Public Investments in Infrastructure: A Study of Brazilian States from 2003 to 2014

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This study aims to evaluate whether political cycles together with the government's ideological bias have a significant impact on decision making regarding the allocation of public investments in infrastructure in the states of Brazil. This study uses information for Brazilian states for the period from 2003 and 2014 in order to cover three political cycles. It utilizes a fixed effects panel data regression which makes it possible to identify state characteristics that are unobserved and constant over time. The results show that the electoral cycle does exert an influence, if we consider that ideological differences are linked to electoral cycles. Left-wing and centrist parties tend to invest more in infrastructure in pre-election periods in comparison with right-wing parties. This result also contributes to the literature because it shows that cycles can be more influential depending on the party that is governing. A counter-intuitive result worth mentioning is the negative impact on infrastructure investment that occurs when the governor belongs to the same political party as the president. A positive impact had been expected.

**Keywords:** political cycles; public investments; Brazilian states.

## A influência dos ciclos políticos nos investimentos públicos em infraestrutura: um estudo nos estados brasileiros no período de 2003 a 2014

Este artigo tem como objetivo avaliar se os ciclos políticos em conjunto com viés ideológico impactam significativamente as decisões de alocação de recursos públicos em investimentos de infraestrutura nos estados brasileiros. Para atingir tal objetivo, utilizamos informações em nível estadual de 2003 a 2014 para capturar três ciclos eleitorais. Como abordagem metodológica utilizamos regressão em painel com efeitos fixos, com o objetivo de detectar características estaduais não observáveis e invariantes no tempo. Os resultados encontrados mostram a existência de influência do ciclo eleitoral se considerarmos as diferenças ideológicas interagindo com os ciclos eleitorais. Os resultados apontam que partidos de esquerda e de centro tendem a investir mais em infraestrutura em períodos pré-eleitorais se comparados com partidos de direita. Esse resultado contribui para a literatura evidenciando que ciclos podem ser mais influenciados dependendo do partido que está governando. Foi identificado adicionalmente um resultado contraintuitivo relativo ao impacto negativo nos gastos em infraestrutura quando o governador é do mesmo partido do presidente. Para essa variável, esperava-se um impacto positivo.

**Palavras-chave:** ciclos políticos; investimentos públicos; estados brasileiros.

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## La influencia de los ciclos políticos en la inversión pública en infraestructura: un estudio en los estados brasileños de 2003 a 2014

Este estudio tiene como objetivo evaluar si los ciclos políticos, teniendo en cuenta el sesgo ideológico de los gobiernos, tienen un impacto significativo en la toma de decisiones sobre la asignación de inversiones públicas en infraestructura en los estados de Brasil. El estudio utilizó información de los estados brasileños del período comprendido entre 2003 y 2014 para cubrir tres ciclos políticos. El método utilizado fue la regresión de efectos fijos de panel que permite identificar las características de los estados que no son claras y constantes en el tiempo. Los resultados muestran que hay influencia del ciclo electoral, si se considera que las diferencias ideológicas están vinculadas a los ciclos electorales. Los partidos de izquierda y de centro tienden a invertir más en infraestructura en los períodos preelectorales en comparación con los partidos de derecha. Este resultado también contribuye a la literatura porque muestra que los ciclos pueden ser más influenciados dependiendo del partido que gobierna. Un resultado contraintuitivo digno de mención es el impacto negativo de los gastos en infraestructura cuando el gobernador pertenece al mismo partido político que el presidente. Para esta variable, se esperaba un impacto positivo.

**Palabras clave:** ciclos políticos; las inversiones públicas; estados brasileños.

### 1. INTRODUCTION

The Brazilian election of 2014 was one of the closest in history. There were real clashes. Topics such as government plans, party ideology, spending priorities, GDP growth and the role of government investments in driving economic growth were almost always in the news over the course of this electoral dispute (Folha de S.Paulo, 2014).

Along these lines, studies such as Bertussi and Ellery Júnior (2012) point to investments in infrastructure as one of the ways that the government can stimulate sustained economic growth. Thus, this study seeks to contribute to the literature by investigating the influence of political cycles on economic growth through the government's budgetary allocation of financial resources in infrastructure investments. According to Sakurai and Gremaud (2007), political cycles can be defined in general terms as the influence of facts of political origin on economic behavior. They further argue that political cycles can generate "electoral cycles," which consist of the ways in which the economy is affected by the electoral period and "party cycles," which consist of the ways in which the economy is affected by the ideological posture of political parties.

In relation to government investments, the economic literature points to public investments in infrastructure as one of the main reasons for sustained economic growth. As a consequence, according to Bertussi and Ellery Júnior (2012:103), "the energy, telecommunications and transport sectors have the capacity to generate positive externalities which make it possible to increase the productivity of other investments and provide other activities with economies of scope and scale".

Given this, we need to identify whether electoral and party cycles influence allocation decisions involving government resources for this type of expense. Even though there are Brazilian studies that address this topic, there is a certain gap in the literature in terms of studies that seek to evaluate the correlation between political cycles and the realization of economic growth through government investments in infrastructure. Thus, this study is focused on the following question:

do political cycles influence allocation decisions involving government resources in infrastructure<sup>1</sup> investments in Brazilian states?

The purpose of this study is to verify whether there are expansionary or contractionary trends in terms of infrastructure investments due to political cycles. This topic will allow us to determine whether these cycles influence indices of state economic growth through the management of financial resources allocated to public investments in infrastructure.

While Arvate, Avelino and Lucinda (2008, 2010) and Bittencourt and Hilbrecht (2011) demonstrate the relationship between party ideology and government spending in the former, and political cycles and spending in the latter, this study will investigate whether the political cycle is strengthened by party ideology, focusing on its effect on infrastructure expenditures.

Thus, this work also contributes to the literature by evaluating if political cycles may be accentuated by party ideology (left-wing, centrist, and right-wing), tending to prioritize, to a greater or lesser extent, infrastructure investments as well as identifying the variables that mostly influence the size of the financial resources devoted to infrastructure.

Our methodological approach adopts fixed effects panel data in order to capture unobserved and constant state characteristics over time. Our findings show the existence of the electoral cycle's influence if we consider the ideological differences that interact with the electoral cycles. The results indicate that left-wing and centrist parties tend to invest more in infrastructure in pre-election periods when compared with right-wing parties. This result contributes to the literature by showing that cycles may be more accentuated depending on which party is in power.

Besides this introduction, this article is structured as follows: the second section presents the theoretical support for the relationship with electoral cycles and their effect on public sector investment decisions; the third section describes the methodology and data used to answer our research question; the fourth section presents our results and their connection within the context of the literature; and the fifth section presents our conclusions.

## 2. THEORETICAL SUPPORT

### 2.1 ELECTORAL CYCLES

It is almost universally accepted that politics and the economy go hand in hand, with decisions and results in one sphere affecting the other, thus making the relationship of cause and effect between them almost indistinguishable (Sakurai and Gremaud, 2007). Knowing that political decisions affect the economy and, as a consequence, the perception of voters in regard to politicians' competence as governmental managers, those who govern can use this knowledge to guide their decision-making. Sometimes such knowledge may increase the opportunistic nature of their management, whether it be for their reelection, for example, or any other goal besides social well-being.

Videira and Mattos (2011) suggest, for example, that during election years there is an increase on spending on investments, education and health. This leads us to believe that its main goal is to

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<sup>1</sup> In line with other studies, including Bertussi and Ellery Júnior (2012) and Rodrigues and Teixeira (2010), this study considers infrastructure investments as government spending on energy, transport and telecommunications.

demonstrate the government's competence to the voters and thus increase its chances of winning more votes, corroborating with the theory of political and electoral cycles. According to Sakurai (2009), the influence of political factors on the economy has become known as political cycles, which can be divided into electoral and party cycles. This division basically impacts decision-making on economic indicators based on the election year and party ideology respectively.

In terms of electoral cycles in Brazil, they could be more accentuated due to the periodic nature of the current electoral calendar in which the government knows ahead of time when elections will be held, which enables them to "adjust" their public policy decisions to this calendar in order to obtain better evaluations from the voters at the precise moment that they vote (Klein, 2010; Klein and Sakurai, 2015).

In terms of party cycles, they would be characterized by political choices in managerial decisions that take into account the ideological position (or lack thereof) of the governing party. Thus, the ideology of the party (left-wing, centralist or right-wing) will influence the government's decisions and as a result the economy.

This way, with several studies having addressed political cycles and the factors that determine their existence, and the way they act within the political-economic environment, there has been agreement on several points that are regarded as essential aspects to explain their existence. Along these lines, Vicente and Nascimento (2012:108) state that:

[...] thus the figure of a "rational voter" has been created, who has rational expectations, is aware of all available information, and evaluates the government in a forward looking fashion according to expectations of future performance, as well as a "typical voter," who is the opposite of the rational voter and evaluates the government in a backward looking fashion according to the government's previous performance. Governments are called "opportunistic" when they choose policies that maximize their chances of being reelected without being influenced by past situations, loyalty to party ideals or the expected impacts on the economy, and "ideological" when they focus on given social and political objectives, are not swayed by efforts to remain in power, and are not solely concerned with their popularity in the eyes of the voters.

In this context, and considering the objectives of this study, "opportunistic" politicians tend to make fiscal decisions related to the areas that are most appealing to the electorate, or in other words, where voters, mainly the "typical voters" are mostly concerned with this aspect (previous performance) as being the most relevant factor in determining their votes.

In contrast, "ideological" politicians tend to make decisions aiming at achieving social demands, giving more importance to the ideas related to their ideology than the positive evaluation of society or even their possible reelection.

## **2.2 PARTY IDEOLOGY**

According to the Supreme Electoral Court (TSE), there were 32 parties registered in Brazil in 2015, and this number could reach 73, given that 41 groups are attempting to achieve official recognition as parties from this body through the collection and validation of signatures (TSE, 2015).

In the face of this breadth of parties whose interests and ideologies range from a more traditional defense of socialism/capitalism through egalitarian/libertarian ideals to a defense of the environment as espoused by the Green Party (PV) and the National Ecological Party (PEN), the characterization of these parties according to a classic left-right definition has become more and more difficult.

In terms of ideological position, the terms left and right in political science are used to designate distinct party ideologies that drive political movements. According to Bobbio (1995), left and right have opposite meanings and for more than 200 years have been used to designate the differences between ideologies and postures that separate different forms of thought and politics. According to the author, the French revolution gave birth to the left and thus the right as well, being by definition its opposite. Since then, through evolution and revolutions, the right has become more associated with libertarian ideas while the left has become more associated with liberal egalitarianism.

Within this context, the area between these two ideological classifications is assumed by the center. Even though ideological guidelines offer the paths to be followed by political parties of the left and right, there is no political doctrine that defines the ideological guidelines of centrist parties, and their space is defined as part of the left-right continuum.

In regard to Brazil, Zucco Jr. (2009), in an eminently empirical study, has verified that Brazil parties are, ideologically speaking, centered. This is very much in line with the academic thinking. With the exception of the Popular Socialist Party (PPS), the other political parties have not presented any great changes in their ideological positioning over the years. The author further states that, within the Brazilian political ideology scenario, the Socialism and Liberty Party (PSOL) is on the extreme left of the left-right continuum, the Democrats (DEM) are on the extreme right, and the center is filled by parties like the Brazilian Democratic Movement Party (PMDB), PPS and the Brazilian Social Democratic Party (PSDB).

In general terms, according to Carvalho (2011), left-wing political parties tend to favor greater state control of the economy and greater interference by the government in all areas of social life. As for fiscal policy, left-wing parties tend to influence the economy through the State. According to Arvate, Avelino and Lucinda (2008), these parties, attentive to the needs of the less prosperous, tend to make the State more and more present in everyday life, either by market regulation or the management of public resources as a tool to limit inequalities that result from the usual consequences of a market economy.

On the other hand, according to Ferreira (2015), right-wing parties, in addition to favoring greater market freedom, defend the rights of individuals and place patriotism and religious and cultural conservatism above any projects related to societal reform.

In terms of fiscal policy, right-wing parties tend to reduce the size of the State and allocate resources in areas that favor regional economic development via private initiative, such as investments in transport and technological and industrial development. Thus, private initiative stimulates local economic development and the State only acts as needed to correct any deviations.

Hiramoto (2012) indicates that, in relation to the ideological spectrum affecting governmental action, when right-wing and centrist parties are in power, they tend to spend less than left-wing parties, which is consistent with the results of Arvate, Avelino and Lucinda (2008). Bobbio (1995:35), in discussing the left-right continuum and the central area between these two extremes, states that:

The distinction between left and right does not exclude in any way, even in lay terms, the configuration of a continual line between the extreme left and the extreme right in which intermediate positions occupying the central space between the extremes are normally designated as the center.

The question of this intermediate position between the left and the right on the ideological political continuum becomes more relevant in Brazil given the multiple nature of political parties in this country. Thus, various authors have sought to create classifications that ideologically position the Brazilian parties, which are described as follows.

### **2.3 IDEOLOGICAL CLASSIFICATION OF BRAZILIAN POLITICAL PARTIES**

The ideological position of political parties on the left-right continuum is treated in a variety of ways in the literature. The views of specialists, polls of voters and politicians themselves, analyses of government policies and congressional decisions, and the ideological identity defended by these parties themselves are just some of the variables used in studies of the left-right classification of Brazilian political parties (Botelho, 2002; Carreirão, 2006; Avarte, Avelino and Lucinda, 2008; Zucco Jr., 2009). Avarte, Avelino and Lucinda (2008) state that two scales are predominantly used in the political science literature to measure party ideology. One of these scales segregates ideological classification into five subdivisions. Thus, this scale speaks in terms of left-wing, left-centrist, centrist, right-centrist, and right-wing parties. The other scale generally employs a simpler division of left-wing, centrist and right-wing parties.

These authors, in works that seek to gauge the influence of party ideology on the fiscal results of Brazilian states, present arguments to use this second scale rather than the first. Thus, for these authors, when we speak of fiscal management, for example, a left-wing government will be larger, have a greater deficit and spending that is preponderantly social in nature, with right-wing governments tending to have the opposite characteristics. But where does that leave the center? If we use the left-centrist and right-centrist subdivisions, the methodological procedures to evaluate differences in fiscal management become unworkable. Also according to these authors, from the empirical point of view a scale divided into five subdivisions for the left-right continuum will have even greater difficulties in describing the Brazilian context, due to the plethora of parties as well as its great regional diversity.

Given the objectives of this study and corroborating the arguments presented the authors mentioned, we will adopt the second scale presented in this work which define parties as left-wing, centrist and right-wing.

Thus, based on the literature presented and the classifications formulated by the works of Botelho (2002), Carreirão (2006), Arvate, Avelino and Lucinda (2008) and Zucco Jr. (2009) in particular, we will define in this study the ideological classification of Brazilian parties on the left-right continuum according to the following summary:

Left-Wing Parties: PDT, PT, PSB, PMN, PPS, Pros and SD.

Centrist Parties: PMDB and PSDB.

Right-Wing Parties: PTB, DEM, PP, PSD and PFL.

The above summary only considers the political parties that elected at least one state governor during the period from 2003 to 2014.

## 2.4 PUBLIC INVESTMENTS IN INFRASTRUCTURE AND ECONOMIC GROWTH

Gross Domestic Product (GDP) is, in objective terms, the sum of finished goods and services produced by a country during a determined period of time. There are various factors that directly influence its growth or decline. Among the main variables that explain variations in GDP are spending compared to private consumption, which is family spending on goods and services, capital investments by private companies, the balance of trade, governmental tax and fiscal regulations and, finally, public spending.

Thus, since public spending is one of the variables that directly influences variations in GDP and, as a result, the country's economic growth, the use of public resources as a tool for encouraging economic growth becomes vital to governments, mainly when the country's growth is very low, as it is nowadays.

Rocha and Giuberti (2007), in a study that seeks to evaluate which components of public spending contribute to economic growth, conclude that when the relationship between government expenses and economic growth is negative, the relationship between (productive) capital expenditures and the rate of economic growth is positive.

Thus, once at the head of the executive branch, whether on the city, state or federal level, the government leader who seeks to encourage economic growth in the region should allocate spending in a balanced way, so that it is always possible to apply resources in investments in a regular way, making it possible to meet infrastructure demands as well as stimulating the local economy in general. Spending on infrastructure is the type of spending that contributes the most to economic growth. Here we understand infrastructure to be, according to the studies of Rocha and Giuberti (2007) and Bertussi and Ellery Júnior (2012), capital spending on the energy, transport and telecommunications sectors. By investing in infrastructure, the State generates positive externalities that result in increased productivity in other fields, allowing other activities to improve their economies of scale. In this sense, by bringing electricity to regions that still lack this input, the government provides the necessary conditions for private initiative to build, for example, a new industrial park in the region, which will generate direct and indirect employment, stimulate the region's development and generate tax revenue for the nation (Araújo Júnior, 2006; Rocha and Giuberti, 2007; Bertussi and Ellery Júnior, 2012). In the same manner, Bertussi and Ellery Júnior (2012) state that investments in the area of transport, either in highways, railways or waterways, diminish business operations costs due to factors such as an increase in the number of usable transport routes available and regional integration, for example.

Araújo Júnior (2006), in seeking to evaluate the impact of public investments in infrastructure on economic growth, indicates that increasing these investments affects long-term economic growth, which reinforces the affirmations found in the literature in relation to this topic. Furthermore, this author states that investments in infrastructure such as highways, railways, and ports, etc. motivate the private sector to invest more because they have greater prospects of realizing positive returns on their investments.

It should be remembered that investments in infrastructure generally involve large sums of money and long periods of time to be completed, which ends up being an obstacle for them to being performed by private initiative. Thus, it ends up being almost a necessity for the government to finance this kind of investments.

However, it should be noted that public investments in these sectors, mainly in countries where this infrastructure still does not fully meet the needs of private investors, as is the case in some regions of Brazil, can make all the difference in stimulating sustained economic growth in a region, given that more favorable infrastructure can contribute to the opening of new economic frontiers and enable the installation/growth of companies, which generates employment, turns around the economy, and also brings with it another positive externality in the form of increased tax revenue for the State.

In terms of the legal tools that can affect the volume of resources allocated to public investments in infrastructure, the Complementary Law — LC n° 101/2000 —, known as the Fiscal Responsibility Law or simply the LRF, implements a series of rules and limitations that need to be observed by state entities in the management of public resources.

Among the rules and limitations that can influence the amount of money allocated to capital investments we can mention the limits on spending on human resources, debts, credit operations, intergovernmental transfers and unsettled debts in the last year of a government's mandate, among others.

For example, when credit operations are limited, this may result in a limiting of investments, given that this kind of expense is frequently used. When the Law stipulates a ceiling on human resources spending, it also has an indirect impact on capital expenditures, and debt limits can lead to the same consequences (limiting investments) and so on and so forth.

These propositions are corroborated by studies such as Nakaguma and Bender (2006), which verifies that the LRF has caused an average reduction in total revenues on the order of 9%, a significant decline in capital receipts of roughly 55%, as well as a reduction in credit operation revenues of roughly R\$ 78 per capita. They also verify that expenses declined 8.4% overall and that there was a significant reduction in capital expenses, that achieved 23.9%. Thus, we can infer that the rules imposed by the LRF have affected public accounts, especially in terms of the amount of resources allocated to capital investments.

Finally, on March 17, 2015 Constitutional Amendment n° 86 was approved, which alters Articles 165, 166 and 198 of the 1988 Federal Constitution and deals with the so-called “imposed budget.” In general terms, henceforth individual congressional amendments will be financially and budgetarily binding up to a limit of 1.2% of Net Receipts (RCL), with half of this percentage being destined to public health care activities and services. These amendments, now having become mandatory, can increase the amount of state government resources allocated to infrastructure annually.

### 3. METHODOLOGY

This study uses a fixed effects panel data regression model to gauge the effect of political cycles on the allocation of resources in infrastructure investments in state government budgets. It should be noted that, in order to control for unobserved characteristics in each state that do not vary over time, it will be necessary to use fixed effects that will serve to capture these characteristics, thus reducing potential bias problems in terms of omitted variables, which are common in traditional OLS Pooled models. Each state is unique and its individual characteristics can influence infrastructure investment decisions. By using fixed effects, we can control for the effects of these particular characteristics on investments.



Our sample consists of data from the budgets of 26 Brazilian states and the Federal District during the period from 2003 to 2014 as well as electoral and party information over the same period. This information comes from the websites of Brazilian Finances (Finbra),<sup>2</sup> administered by the National Treasury (STN); the Brazilian Institute of Geography and Statistics (IBGE); the Institute of Applied Economic Research (Ipea); and the Supreme Electoral Court (TSE).

The financial data has been deflated by the General Market Price Index (IGP-M), administered by the Getulio Vargas Foundation.

The IGP-M has been selected due to the fact that it measures the monthly variation of the price that directly affects economic units, given that it measures producer and consumer goods. The index is comprised of the Wholesale Market Price Index (IPA-M), the Consumer Market Price Index (IPC-M) and the National Construction Cost Market Index (INCC-M), with weights of 60%, 30% and 10% respectively.

The basic model used in the estimates is described by:

$$InvInfra_{it} = \beta_i + \beta_1 LeftPart_{it-1} + \beta_2 CentPart_{it-1} + \beta_3 PreElectYear_{it} + \beta_4 ElectYear_{it} + \beta_5 PostElectYear_{it} + \beta_6 LPPrEY_{it} + \beta_7 LPEY_{it} + \beta_8 LPPoEY_{it} + \beta_9 CPPrEY_{it} + \beta_{10} CPEY_{it} + \beta_{11} CPPoEY_{it} + \beta_{12} PrimSpend_{it} + \beta_{13} DebtAmort_{it} + \beta_{14} DebtInt\&Fees_{it} + \beta_{15} Gov=Pres_{it} + \beta_{16} BudRev_{it} + \beta_{17} CapTR_{it} + \beta_{18} StGDP_{it} + \epsilon_{it}$$

In the model  $i = 1, 2, \dots, 27$  represents the states, and  $t = 2003, 2004, \dots, 2014$  represents the years, or in other words, the variations not explained by the model.

Dependent variable:

*InvInfra<sub>it</sub>* — Investment in infrastructure by State  $i$  in Year  $t$  — Indicates the value in reais of the infrastructure<sup>3</sup> investments by State  $i$  in Year  $t$ .

Variables of interest:

*LeftPart<sub>it-1</sub>* — Left-Wing Party and *CentPart<sub>it-1</sub>* — Centrist Party. These are dummy variables that represent the party's political ideology while leading the state government. They will assume a value of 1 when the government is left-wing and 0 when the opposite is true, and a value of 1 when the government is centrist and 0 when the opposite is true.<sup>4</sup> The obtained results represent their influence in comparison with a state managed by a right-wing party, given that this will be a constant variable in the model.

*LPPrEY<sub>it</sub>* — Left-Wing Party in a Pre-Election Year; *LPEY<sub>it</sub>* — Left-Wing Party in an Election Year; *LEPoEY<sub>it</sub>* — Left-Wing Party in a Post-Election Year; *CPPrEY<sub>it</sub>* — Centrist Party in a Pre-Election

<sup>2</sup> Deactivated in 2015 and substituted by the Fiscal and Accounting Information System for the Brazilian Public Sector (Siconfi).

<sup>3</sup> (Energy, Transport and Telecommunications) by state  $i$  in year  $t$ . These are understood to be investments in infrastructure according to Government Function 24 — Communications, Subfunction 722 — Telecommunications, and Functions 25 — Energy and 26 — Transport, whose nomenclature deals with the budgetary classification of public spending and is regulated by Government Ministry Decree nº 42/1999.

<sup>4</sup> They are delayed a year, given that the government budget, the instrument which authorizes tax collection and expenditures, is approved a year in advance.

Year; *CPEY it* — Centrist Party in an Election Year; and *CPPoEY* — Centrist Party in a Post-Election Year. These six dummy variables will capture the influence of the interaction between political ideology and the electoral calendar. The results represent their influence in comparison to right-wing parties and the electoral calendar, given that these will be constant variables in the model.

Control variables:

*PrimSpend it* — Primary Spending. Represents in reais the total budgetary spending in State *i* in Year *t*, excluding expenses due to the debt amortization, interest and fees (or in other words, primary expenses<sup>5</sup>), which are variables themselves in the regression and whose values have been substituted to avoid multicollinearity.

*DebtAmort it* — Debt Amortization Expenses, and *DebtInt&Fees it* — Debt Interest and Fee Expenses. This shows the impact of the payment in reais of infrastructure investment debts.

*Gov=Pres it* — Governor of State *i* in Year *t* belongs to the same party as the President. These are dummy variables which will be assumed to be 1 and 0 respectively when they are not members of the same party.

*BudRev* — Budgeted Revenues. This represents the value of total budgeted revenues (minus revenues from capital transfers, which is a variable itself) collected by the state for the reference year in reais.

*CapTR it* — Capital Transfer Revenues for State *i* in Year *t*. This measures the effect of capital transfers received in investments in reais.

*StGDP it* — GDP of State *i* in Year *t*. This measures the influence of the variation in State GDP on infrastructure investments. The values for this variable are presented in millions of reais.

*Eit* — Error. This is the residual value not explained by the model.

### 3.1 DESCRIPTIVE STATISTICS

The 12 years of the sample (2003 to 2014) multiplied by the 27 federal units of Brazil yield a total of 324 years of state government management. During this period, the ideology that was most often in power was represented by centrist parties, with a total mandate of 159 years, which represents 49% of the total for this period. This was followed by left-wing parties with 134 years representing over 41% of the time in power, and finally by right-wing parties with 31 years in power which represented less than 10% of the total time in power.

In terms of which parties were most often in power during the study's sample period of 2003-14, PMDB led the way with 85 periods in power, followed by PSDB with 75, PT with 53 and PSB with 48. It should be noted that this result is not surprising given that PMDB and PSDB are two of the oldest and most traditional parties in Brazil, while PT led the federal government for the entire sample period from 2003 to 2014, which affected state elections for governor.

Analyzing the financial statistics and cross-referencing the percentage of state infrastructure investments with state Gross Domestic Product figures (GDP) and the party ideology in power, we

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<sup>5</sup> Primary Expenses: Correspond to the total budgetary expenses minus expenses due to interest, the amortization of internal and external debt, the acquisition of capital stock, and expenses derived from the concession of loans with guaranteed returns. The result of this operation will be used to calculate the primary results (Manual of Tax Statements — MDF 2012).

reach the conclusion that, for the period studied, ideologically left-wing parties invested more proportionately than centrist or right-wing parties.

On average, left-wing parties invested an equivalent of 1.29% of GDP. Centrist parties came in second with an average investment of 1.01% of GDP and right-wing parties came in last with an average investment of roughly 0.7% of GDP. It should be noted that despite the statistics cited here, looking at the proportion of spending is not sufficient to state that the larger value invested by left-wing parties is due to their ideological position. Other motives may have influenced the obtained results, however this will be verified in the next section through our analysis using fixed effect panel data.

In analyzing the electoral cycle, it may be observed that the investments made in energy, transport and telecommunications as a percentage of state GDP are slightly greater than those made during election years and well above those made in post-election years. Thus, while investments in post-election years represent an average of 0.57% of GDP, in election years this rises to 0.7% and in pre-election years it is even higher, attaining 0.73% of GDP. In principle, this may be an indication that electoral cycles are influencing the allocation of budgetary resources in infrastructure.

Table 1 shows the correlation matrix which facilitates the analysis of the degree of association between our variables of interest (the party cycle and the electoral calendar) and infrastructure investments.

In analyzing the correlation matrix, in principle we do not see strong positive or negative associations between the variables of interest and infrastructure investments. However, this by itself does not tell us much, given that even without strong correlations of an isolated nature, these variables can still reveal that they have an influence on investments.

**TABLE 1** CORRELATION MATRIX FOR VARIABLES OF INTEREST

	InvInfra	LeftPart	CentPart	RightPart	PreElectYear	ElectYear	PostElectYear
InvInfra	1.00						
LeftPart	-0.20	1.00					
CentPart	0.23	-0.79	1.00				
RightPart	-0.06	-0.29	-0.35	1.00			
PreElectYear	0.03	0.03	0.00	-0.05	1.00		
ElectYear	0.05	-0.01	0.03	-0.03	-0.32	1.00	
PostElectYear	-0.05	-0.06	-0.03	0.13	-0.34	-0.32	1.00

**Source:** Elaborated by the authors.

**Note:** Study data.

In terms of the number of observations, the maximum possible value for each variable is 324. When there is a variable with a value that is less than the maximum, it is because the data does not exist or there were limitations to obtaining data, which was the case with budget and finance information for 2014 for the states of Ceará, Paraíba and Rio Grande do Norte, and the state GDP for the years 2013 and 2014.

Finally, we would like to point out that, on average, state infrastructure investments represented approximately 0.63% of state GDP and roughly 4.78% of total spending during the period. This total spending represented more than 13% of state GDP on average. While 4.78% of total spending went towards infrastructure investments, the average costs of interest and debt fees were roughly 4.08% of total spending during the same period, or in other words, the amount of money spent on interest and debt fees was very close to the amount spent on investments in energy, transport and telecommunications.

#### 4. ANALYSIS OF THE RESULTS

This section presents the results of the fixed effect panel data regressions.

Initially a regression was run without the interaction dummy variables ( $\beta_6$  to  $\beta_{11}$ ). This was done to identify the influence of the party and electoral cycles without examining their interaction, thus capturing the isolated influence of political ideology and the electoral calendar in the allocation of resources in infrastructure. Thus we arrived at the results presented in table 2.

**TABLE 2** EFFECTS OF POLITICAL CYCLES ON INFRASTRUCTURE INVESTMENTS

Variable	Coefficient	P-value
Left-Wing Party	1,051,876.00	0.981
Centrist Party	431,666.80	0.991
Pre-Election Year	110,000,000.00	0.045**
Election Year	70,800,000.00	0.062*
Post-Election Year	6,433,648.00	0.856
President's Party = Governor's Party	143,000,000.00	0.011**
Primary Spending	0.00	0.995
Debt Amortization	0.53	0.004***
Debt Interest and Fees	0.55	0.098*
Budgeted Revenues	0.09	0.024**
Capital Transfer Revenues	0.33	0.216
State GDP	2,940.38	0.596
Constant	216,000,000.00	0.154

\*, \*\*, \*\*\* indicate 10%, 5% and 1% levels of significance respectively.

Robust variance and covariance matrix with heteroskedasticity and serial correlation.

Source: Study data. Elaborated by the authors.

The model's variables of interest are the dummy variables used to represent the political ideology (left-wing, centrist or right-wing) of the governor of state  $i$  in year  $t$ , and in the regression, when the model is run, the right-wing party variable becomes a constant, or in other words, the results for the left-wing and centrist party variables are in comparison with the right-wing variable and the dummy variables for the electoral cycle with data for pre-election, election and post-election years.

In relation to one of the components of political cycles, the so-called party cycles, our findings were not statistically significant, or in other words, statistically speaking the political ideology of the governor did not significantly affect the volume of resources applied to infrastructure.

Even though the study objectives were different, our result differs from that observed by Arvate, Avelino and Lucinda (2008), who found empirical evidence of the influence of political ideology of state governors in obtaining better fiscal balances. They found that right-wing governors produced better fiscal balances by generating greater revenue.

In a more recent study, Arvate, Avelino and Lucinda (2008), in investigating the influence of party ideology on the size and composition of public spending, found evidence of influence again. In this case, they verified that a government led by a left-wing party tended to increase public spending by roughly 1.7% of state GDP, and found that the presence of right-wing parties did not result in consequences for public spending. This corroborates the work of Cossio (2000) who finds empirical evidence of increased spending in states led by left-wing parties.

Even though these studies have found evidence for the influence of political ideology on the management of public resources, there have also been studies which have not found any such evidence. Botelho (2002), for example, does not find any influence of political ideology in the variables he uses to determine state fiscal adjustments in the 1990s, and Bittencourt and Hilbrecht (2003) verify that ideological position did not affect the execution of state budgets during their period of study. Nakaguma and Bender (2006) also do not find any influence exerted by the definition of party ideology on state fiscal management, except in the area of education where left-wing parties spend more than centrist or right-wing parties.

These results are also corroborated by studies such as the work of Sakurai and Gremaud (2007:40), who state that:

Regarding the test for political parties, we find that a large portion of the results do not present any statistical significance, which may corroborate one of the hypotheses present in the Brazilian political science literature: the existence of little ideological consistency on the part of Brazilian political parties, notably in lower spheres of government power.

Analyzing the other component of political cycles, the so-called electoral cycles, which deal with the impact of the electoral calendar on public policy decisions, two of the three dummy variables of the model presented significant results. In other words, statistically speaking, the electoral cycle (pre-election years, election years and post-election years) significantly affects the volume of resources that are applied to infrastructure.

The results for the variables that represent the pre-election and election years had p-values of 0.045 and 0.062 respectively, which demonstrates that they are statistically significant. These variables have

a positive coefficient of R\$ 110 millions for the years immediately preceding election years and R\$ 70.8 millions for years in which governors were elected.

This data reinforces the results found in studies by Sakurai (2009), who verifies the existence of an electoral cycle in the composition of budgetary spending in Brazilian municipalities; Sakurai and Gremaud (2007) who find evidence of sensitivity in the variations of spending and investments in municipalities in the state of São Paulo; Salvato et al (2007) who find evidence of cycles in GDP growth, inflation, unemployment, public spending and debt indicators; and Vicente and Nascimento (2012), who find among other results, “opportunism” in municipal management due to the electoral calendar and the mayoral reelection process.

It should be noted that the variable which captures the effects on investments during post-election years was not statistically significant, which corroborates the previous results. In this sense, Arvate, Avelino and Lucinda (2008:798) state that government leaders seek to demonstrate their competence to the electorate through their administration of public resources, mainly in election years, “increasing spending, which produces immediate results. Voters cannot observe whether this spending is sustainable over time and since they benefit from this spending, they have more positive opinions about the leaders who do this”. Thus, possibly due to the opportunism of these government leaders, there is greater spending on infrastructure during pre-election and election years, which provides their management with visibility in the voters’ eyes, and after the election spending returns to regular levels of investment because the electoral objectives are no longer of primary importance.

Moving on to the analysis of the model’s control variables, in respect to the relationship between the state governor being of the same party as the president of Brazil (*Gov=Pres*), our findings were the opposite of what we had expected. We imagined that this variable would have a positive effect on the allocation of resources in energy, transport and telecommunications. However, with a p-value of 0.011 and a coefficient of less than R\$ 143 million reais, we found that the variable is statistically significant in a negative direction, meaning that the governor being of the same party as the president implies a reduction in the value spent on infrastructure.

Despite this counterintuitive result, it does corroborate the findings of Arvate, Avelino and Lucinda (2008), who observed that governors of the same party as the president did not have greater ease in the execution of the governmental budget.

In addition, one factor that could be affecting the previously referred results is that financial support due to the party alignment between the governor and the president via voluntary transfers, for example, is being directed towards other areas of government spending such as health, housing, and public safety, among others, which would end up exerting a negative influence on the variable studied. This could be verified by testing all of the areas of government spending covered by Government Decree nº 42/1999 in an isolated way, but this is not the purpose of our study.

This idea can be reinforced in view of the results found by Costa et al (2011), in which the authors, aiming at describing the factors associated with the nation’s Voluntary Transfers (TVUs), found empirical evidence that the alignment between the governor and the president had a positive impact on the quantity of resources of this nature distributed by the national government to state governments. It should be noted that most of the money in these transfers is used on capital expenditures.

Examining the model's financial variables, in accordance with the results obtained in table 3, we find that primary spending (*PrimSpend*) is not statistically significant at a 5% level of significance, which confirms the descriptive statistic previously obtained that infrastructure investments represent only 4.78%, on average, of total state spending. Thus, an increase or reduction in this spending does not influence the value of state infrastructure spending in a significant manner.

In addition, the implementation of the Fiscal Responsibility Law (LRF) could be one of the factors that has caused this insignificance, because among other things, it has had a negative impact on capital expenditures. According to a study by Nakaguma and Bender (2006), the authors verify, among other results, that the LRF has caused on average a reduction of total revenues on the order of 9%, which is a significant decrease in capital revenues of roughly 55%, including a reduction in revenues from credit operations of around R\$ 78 per capita.

They also verify that the Law has caused a decrease in total spending of 8.4% and a significant reduction in capital expenditures of 23.9%. Thus, we can infer that the rules imposed by the LRF have had an impact on public coffers, especially the resources allocated to capital investments.

In relation to the debt amortization variable (*DebtAmort*), it is statistically significant at a 1% level with a p-value of 0.004. According to our findings, a R\$ 1.00 increase in the payment of the debt's amortization reduces the allocation of resources for infrastructure by R\$ 0.53.

In the same way, the debt interest and fees variable (*DebtInt&Fees*) has also been found to be statistically significant, but only at a 10% level of significance with a p-value of 0.09. Thus a R\$ 1.00 increase in debt interest and fees reduces the allocation of resources for the dependent variable by R\$ 0.55. From the moment that the debt amortization was found to be significant, the same was expected of this variable, given that these two expenses walk hand in hand and represent the total costs that the state has to pay in relation to the loans it takes out.

This could be due to the fact that the debt payment is a compulsory expense, while investments, in general, are discretionary; thus, a mandatory expense takes priority over a facultative one.

Another variable which affects the amount of money allocated to infrastructure investments is total budgeted revenues (*BudRev*); the impact, as expected, is positive. With a p-value of 0.02, a R\$ 1.00 increase in total budget revenues produces an increase of approximately R\$ 0.09 in infrastructure investments.

For capital transfer revenues (*CapTR*), whose principal source of resources are derived from voluntary transfers – the agreements, which have specific objectives, mainly associated with capital expenditures – it was expected that, the larger the revenues, the greater would be the allocation of resources for telecommunications, energy and transport. However, the results for this variable were not significant, or in other words, a greater or lesser quantity of revenues did not affect the volume of investment in infrastructure. One motive that could explain this situation would be when most of the resources from these transfers are channeled towards other areas of the government such as health, sanitation, public safety, and housing. Like the variable that deals with the governor and president being members of the same party, this could be verified by testing all of the areas of government spending covered by Government Decree nº 42/1999 in an isolated manner, but this is not the purpose of our study.

In terms of state GDP, this variable was also statistically non-significant. Even though there was a strong correlation between GDP and collected revenues, with the latter being statistically significant, our findings leave no doubt as to the significance of variations in GDP in terms of the variations of the spending that comprises our dependent variable. This result also differs from what was expected.

Next, we ran a regression using the interaction dummy variables (ideology versus the electoral calendar). The results obtained after including the interaction dummy variables in the model are similar to those obtained previously. As shown in table 3, even though the pre-election year and election year did not present a significant influence, unlike our previous results, this was due to the fact that the individual effects of these variables were divided with those of the interactions.

**TABLE 3** EFFECTS OF THE INTERACTIONS BETWEEN POLITICAL IDEOLOGY AND THE ELECTORAL CALENDAR ON INFRASTRUCTURE INVESTMENTS

Variable	Coefficient	P-value
Left-Wing Party	16,700,000.00	0.721
Centrist Party	46,700,000.00	0.297
Pre-Election Year	38,300,000.00	0.459
Election Year	60,000,000.00	0.321
Post-Election Year	15,300,000.00	0.756
Left-Wing Party in Pre-Election Year	104,000,000.00	0.07 *
Left-Wing Party in Election Year	98,800,000.00	0.135
Left-Wing Party in Post-Election Year	6,477,949.00	0.894
Centrist Party in Pre-Election Year	211,000,000.00	0.025 **
Centrist Party in Election Year	197,000,000.00	0.009 ***
Centrist Party in Post-Election Year	32,800,000.00	0.578
President's Party = Governor's Party	147,000,000.00	0.009 ***
Primary Spending	0.00	0.857
Debt Amortization	0.53	0.003 ***
Debt Interest and Fees	0.54	0.10 *
Budgeted Revenues	0.09	0.023 **
Capital Transfer Revenues	0.34	0.204
State GDP	3,320.74	0.552
Constant	191,000,000.00	0.208

\*, \*\*, \*\*\* indicate 10%, 5% and 1% levels of significance respectively.

Robust variance and covariance matrix with heteroskedasticity and serial correlation.

Source: Study data. Elaborated by the authors.



This is corroborated by the fact that the pre-election year left-wing party, pre-election year centrist party and election year centrist party variables presented significance levels of 10%, 5% and 1% respectively, in the same way that they were significant (with the electoral calendar) in the first regression. Thus, our findings demonstrate that isolated party ideology does not affect the amount of infrastructure investments, but when it interacts with the electoral calendar, ideology does influence infrastructure investments in a significant manner.

Note that, in addition to the results of Arvate, Avelino and Lucinda (2008) and Bittencourt and Hilbrecht (2011), which show the relationship between political cycles and party ideology with government spending in an independent manner, the present study demonstrates that cycle effects can be accentuated by the ideological bias of the party in power. The results indicate that left-wing and centrist parties tend to invest more in infrastructure during pre-election periods compared to right-wing parties.

Thus, left-wing parties spent on average R\$ 104 million more than right-wing parties in pre-election years. Centrist parties spent on average R\$ 211 million more in pre-election years and R\$ 197 million more in election years than right-wing parties.

This significant impact during the year before the election and the year of the election itself may be directly related to an opportunistic posture on the part of some government leaders in relation to the electoral calendar, in which they seek to reinforce the voters' positive perceptions by executing policies "that maximize the possibility of their reelection without concern for past situations, loyalty to party ideals or expected economic impacts" (Vicente and Nascimento, 2012:108).

These results on one hand corroborate most of the academic articles that have obtained empirical evidence of the influence of the electoral calendar on public management, and on the other hand reinforce the controversy about the influence of party ideology in the definition of public policy, given that it is only significant when cross-referenced with the electoral calendar, which does not assume an ideological party posture by the leader, but rather an electoral one.

Regarding the control variables, the coefficients do not significantly differ from those obtained in the regression performed without the interaction dummy variables. In other words, the variables that had significant effects in the first regression continue to display the same behavior, and those that were not significant remain the same.

Finally, a new regression was performed using fixed effects for the years of the study, namely 2003 to 2014, in order to capture whether there is a specific effect on the part of these years that could significantly affect our findings; however, no influence whatsoever was found in terms of the period that significantly affected the previously derived results for the model variables.

## 5. CONCLUSIONS

This work aimed at addressing the central question of whether political cycles influence the value of annual government investments in energy, transport and telecommunications made to stimulate economic growth. Thus, the objective of this study has been to evaluate whether the electoral calendar and party ideology have a significant effect on decisions regarding the allocation of public resources in state infrastructure investments.

The results show that among the model variables, without the interaction between ideology and the electoral calendar, pre-election and election years, total budgeted revenues, debt amortization, debt interest and fees, and the governor's being a member of the same party as the president, significantly affected spending on energy, transport and telecommunications, with the first three variables described having a positive impact and the last three variables having a negative impact on the amount of money spent on infrastructure investments.

This information relates to the question at hand by demonstrating that when political cycles are isolated, only the electoral cycle (for the pre-election and election years) influences infrastructure investments, while the party ideology does not present any influence on investment. Thus, considering our variables of interest, the stimulation of economic growth through public investment in infrastructure is not affected in a significant way by the party ideology of the government leaders, but it is affected by the electoral calendar.

The variable that indicates whether the governor is a member of the same party as the president, which presented a significant result, surprised us with a negative coefficient, meaning that a governor being a member of the same party as the president implies having fewer resources to invest in infrastructure, and not the opposite, as was expected.

Considering future lines of research, we suggest that the motives for this negative influence on the allocation of resources in infrastructure when the governor is a member of the same party as the president should be studied further. We also suggest that studies should be conducted to verify the force of public spending in terms of economic growth as well as the financial dependence of states on the federal government.

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