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ESSAYS ON THE RELATIONSHIP BETWEEN MUNICIPAL PUBLIC POLICIES AND ELECTION CYCLE

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"L'avenir n'est jamais que du présent à mettre en ordre. Tu n'as pas à le prévoir, mais à le permettre."

Antoine de Saint-Exupery

ABSTRACT

This thesis consists in a set of three essays about elections and public spent in federative systems, linked with a central research problem: How elections affect the allocation of public revenues in local governments and in federations with various levels of government? One of the main questions of democratic politics concern the interactions between popular choices (expressed by voting) and public policy and federative systems usually propose decentralization and interdependence between different levels of government as an important mechanism for increasing efficiency, transparency and accountability. However, other authors have pointed out that, when it comes to incumbents' choices about allocation of public budget, there are much more elements to consider than solely the public welfare. We intent to cover additional issues to contribute in explaining where, how and why policymakers allocate public revenues in fiscal federations. We perform that in three interconnected essays, by using different (and complementary) methodological shapes, but always combining theoretical propositions and empirical evidences. In the first essay, we addressed political and electoral reasons in the allocation of intergovernmental transfers in a federative state. We performed a panel data analysis encompassing 2856 Brazilian municipalities from 1999 to 2011. Results suggest that deputies play an important role in the allocation of grants, as well as the alignment between local and central chief executives, and there is a negative correlation with opposition parties' mayors. Moreover, changes in alliance status between budget-voting year and budget-implementation year influence the amount of transfers. However, the main effect over the allocation of grants was the electoral calendar, encompassing both local and central elections. The second essay theoretically discuss the timing of elections and its effects in the allocation of short-term and long-term expenditures federative systems. Guided by the stylized fact that synchronized elections produce lower bias levels in the expenditures, we built a system equations' model and solve it to show that incumbents have stimuli to increase short-term expenditures in electoral years. We also discussed theoretical implications of this anticipation effect by contrasting local versus central elections and synchronized versus staggered elections. In the third essay, we demonstrate spatial correlations in public spent at local level, due to spillovers in provision of public goods in local and regional layers. We performed a spatial analysis in health expenditure at the local level in all 399 municipalities in the Paraná state, from 2005 to 2012. We find that the spatial effect has a significant role in explaining health expenditures in the local level, both in electoral and non-electoral years. Furthermore, the electoral calendar seems to change the intensity of the coefficients in some independent variables (e.g., population age) and even changes the direction in some variables' effects (as population density). Indeed, the negative effect of population density changes in positive, probably as a political strategy to seduce voters. Estimations suggest that health spent constitute an important tool to seduce voters, especially in local elections (which an effect almost twice stronger than central ones) and both central and local elections' years rise the local public budget allocation in health. Although we have strongly based our essays in previous studies, this thesis is more than an afterthought of Cox & McCubbins (1986) and Lindbeck & Weibull (1987) models. First, for the best of our knowledge, we are the first to add the issue of deputies' role in intergovernmental grants. Second, the comparison of electoral effects in synchronized and staggered elections and the addition of spatial effects when it comes to budget allocation is also an innovation in the literature. Previous scholars have issued this factors, but their approach differs because the focus is far from elections timing, and when they issue synchronized and staggered elections, the focus is not the budget allocation. These essays may be useful to additional investigations that aim to discuss political alignment and its influence in allocation of public resources, in order to enhance understanding and create or ameliorate mechanisms of regulation that improve efficiency in political processes and public spent.

Keywords: Intergovernmental Transfers. Political alignment. Elections. Cooperative games. Health expenditure. Spatial econometrics.

JEL classification: H72. H77. D72. C71. I18. C33.

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SUMARY

INTRODUCTION

This thesis consists in a set of essays about electoral cycle and public policies, in which we provided theoretical statements and empirical evidences, related to some questions that we grouped in a central research problem: How the allocation of public revenues in local governments and in federations with various levels of government are affected by elections? In this thesis, we focused on this major problem from different perspectives, to provide complementary answers to the central question. As federation systems usually propose decentralization and interdependence between different levels of government as an important mechanism for increasing efficiency, transparency and accountability (Oates, 1999; Costa-Font & Moscone, 2008; Silva, 2005), the first dimension we focused was the intergovernmental unconditional transfers. The second perspective we investigate was the role of staggered elections in comparison with synchronized ones, about the policymakers' choice between short and long-term spent in the local level. The final issue we addressed was the interaction between elections and spillover effects in provision of local public goods (health expenditures specifically).

Because of this multi-perspective approach, we could split our initial research problem in auxiliary questions, which allowed deepen and enrich the central analysis. Here we present these complementary queries. Does political alignment determine level of intergovernmental grants? Which is the role of Congressional Representatives in the grants allocation? Do elections affect grants' allocation and, if so, in which extension? Do elections affect policymakers, when it comes to decide between short-term and long-term budget allocation? Does the local expenditure have the presence of spatial correlation and, if yes, electoral calendar changes the spillover effects of these spent?

All of those questions got a strong linkage with two main issues: elections and public spends. The relationship about elections and public policies is an ancient worry in literature, and one of the central questions of democratic politics concern the interactions between popular choices (expressed by voting) and public policies (Ginsberg, 1976). Since far from the XVIII century, votes seems to have a straight linkage with partisan attachments' major reorientations, according to historical investigations in USA (Key, 1955). Moreover, the democratic accountability theory takes politicians as office seeking, i.e., states that the main motivation for politicians is the desire to retain public offices (Golden & Min, 2013). In this sense, there is far consensus that elections are useful not only to choose best platforms, but also to discipline incumbents, by threatening them with the loss of office for inadequate performances (Ferejohn,

1986). However, the performance has also multiple interpretations, as voters may undervalue social benefits in contrast with corporatists or individual benefits. Despite of that (or maybe exactly because of that), we can observe specific patterns in the distribution of public revenues (both in intergovernmental and in budget allocation issues) and the main explanation for these patterns is 'politics' (Golden & Min, 2013).

The bulk of models in the literature issuing the relationship between federalism and public budget allocation derived from Lindbeck & Weibull (1987), Cox & McCubbins (1986) or Dixit & Londregan (1998). These kind of models states that voters have preferences which result voting decisions; however, these preferences may change according to incumbents' decisions in the allocation of budget (in other words, votes can be 'bought' by the appropriate allocation of public revenues). A fraction of voters has ideological (or partisan) preferences, which means that the 'price' of his votes is higher than the non-ideological one. The difference among those models is the focus on ideological (or core-supporter) or non-ideological voters. However, poorer voters (both partisan and non-ideological) require smaller per capita public funds to shift votes (Golden & Min, 2013).

Other scholars posits that the core-supporters (Cox & McCubbins, 1986) or the swing-voters model (Lindbeck & Weibull, 1987) focus solely in one of the faces of the issue: the persuasion. The models became more complex by including two additional issues, coordination and mobilization, into the analytical view (Cox, 2010). Coordination means, in short, votes in another arena than the electoral: the political arena, taking deputies and senators, for instance, as voters (which is crucial for issues as governability). Mobilization is a strategic issue before the elections: it represents the energy spent in electoral campaigns, which is essential even in mandatory-vote systems.

All these models suggest that, when it comes to incumbents' choices about allocation of public budget, there are much more elements to consider than solely the public welfare. In this thesis, we intent to cover additional issues to contribute in explaining where, how and why policymakers allocate public revenues in fiscal federations. We perform that in three interconnected essays, by using different (and complementary) methodological shapes, but always combining theoretical propositions and empirical evidences.

In the first essay, we disclose political and electoral reasons in the allocation of intergovernmental transfers in a federative state. We posit that literature does not cover some issues when it comes to allocation of grants; among them we highlight the influence of political alignment between the central government and congressional representatives who have strong

connections with lower layers of government, and the changing nature of alliance status because of the effect of delayed budget proposition. We performed a panel data analysis encompassing 2856 Brazilian municipalities from 1999 to 2011. Results suggest that deputies play an important role in the allocation of grants, as well as the alignment between local and central chief executives, and there is a negative correlation with opposition parties' mayors. Moreover, the results show that changes in alliance status between budget-voting year and budget-implementation year influence the amount of transfers. However, the main effect over the allocation of grants was the electoral calendar, encompassing both local and central elections.

In the second essay, we explore the intuition that staggered elections impact the allocation of short-term and long-term expenditures in a different way than synchronized elections. We first provide some evidence about electoral effects in the way incumbents spent public revenues, comparing elections calendar coefficients in both elections done in same years (Brazilian central and regional elections) and elections lagged performed (Brazilian municipal and federal elections). Guided by the stylized fact that synchronized elections produce lower bias levels in the expenditures, we built a system equations' model and solve it to explain what we named the anticipation effect in public budget allocation. In this essay we demonstrate that incumbents have stimuli to increase short-term expenditures in electoral years. Besides that, we discuss theoretical implications of this anticipation effect by two contrasting issues: first comparing local and central elections; and second opposing synchronized versus staggered elections.

The third essay develop an analysis from the assumption that there are spatial correlations in public spent, due to spillovers in provision of public goods in local and regional level. If this spatial effect really exists, what occurs in elections years: a smoothing or a strengthening of these joint movements due to proximity? In order to answer these issues, we performed a spatial analysis in health expenditure at the local level in all 399 municipalities in the Paraná state, encompassing the period from 2005 to 2012. We find that the spatial effect has a significant role at 1% level in explaining health expenditures in the local level, both in electoral and non-electoral years. Furthermore, the electoral calendar seems to change the intensity of the coefficients in some independent variables (e.g., variables related to age) and even changes the direction in some variables' effects (as population density). Indeed, the negative effect of population density changes in positive, probably as a political strategy to seduce voters (Cox, 2010). As a conclusion in this essay, the health spent seems to constitute an important tool to seduce voters, especially in local elections (which have an effect almost

twice stronger than central ones) and both central and local elections' years rise the local public budget allocation in health.

Although we have strongly based our essays in previous studies (Solé-Ollé & Sorribas-Navarro, 2008; Caldeira, 2012; Brollo & Nannicini, 2012; among others), this thesis is more than an afterthought of Cox & McCubbins (1986) and Lindbeck & Weibull (1987) models. First, for the best of our knowledge, we are the first to add the deputies' role in intergovernmental grants. Second, the comparison of electoral effects in synchronized and staggered elections and the addition of spatial effects when it comes to budget allocation is also an innovation. Despite previous scholars have issued this factors, their approach differs because the focus is far from elections timing, and when they issue synchronized and staggered elections (Kaiser & Taugourdeau, 2013), the focus is not the allocation issues.

By adding the issues listed above, we believe that our essays will help to improve the theoretical explanation about grants allocation and budget spent in multilevel governments, in an attempt to enlarge the scope of literature on this subject. The coordination issues approach provided in this thesis allow us to go beyond persuasion, and provide more complex explanations for public spent, in order to cover the multiplicity of factors highlighted by Cox (2010). Obviously, other issues can be included in this sort of studies, and we expect that our results encourage other scholars to contribute in the explanation of relationships between politics, elections and public spent.

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2. GRANTS FOR WHOM AND WHY? THE POLITICS OF ALLOCATION OF TRANSFERS IN BRAZIL

Abstract:
In this study we disclose political and electoral reasons in the allocation of intergovernmental transfers in a federative state. We tested the influence of political alignment with the central government and with deputies, electoral calendar effects, the changing in alliance status and personnel structure in the Brazilian discretionary transfers. We performed a panel data analysis encompassing 2856 municipalities in the period from 1999 to 2011. The results suggest that the central government buys support in the Assembly by giving grants to deputies. Moreover, the alignment between local and central chief executives is central in the allocation of monies, and there is a negative correlation when the mayor is affiliated with an opposition party or connected with an opposition deputy. Furthermore, changes in alliance status between budget-voting stage and budget-implementation stage influence the amount of transfers. However, the main effect over the allocation of grants was the electoral calendar, encompassing both local and central elections.

2.1. INTRODUCTION

Traditional wisdom on fiscal federalism is that intergovernmental transfers are crucial to enable the central government to fulfill its basic allocative, distributive, stabilizing, and regulatory functions (Musgrave, 1959; Oates, 1972). However, this assumes that policymakers are benevolent planners driven by the need to maximize social welfare. Instead of it, evidence suggests that what governments ought to make differ from what they actually do (Solé-Ollé & Sorribas-Navarro, 2008). Policymakers are politicians who may be *opportunistic* (trying to maximize their chance of re-election), as well as *partisan* (concerned with supporting their allies), both of which results in allocation bias (Arulampalam, Dasgupta, Dhillon, & Dutta, 2009).

Many scholars have found evidence of bias in grants in developed and developing countries. Some recent studies show distortions in transfer allocations in Argentina (Rumi, 2014), Portugal (Veiga & Veiga, 2013), Brazil (Brollo & Nannicini, 2012), India (Arulampalam et al., 2009), Denmark, Finland, Norway and Sweden (Tavits, 2009), France (Foucault, Madies, & Paty, 2008), and Spain (Solé-Ollé & Sorribas-Navarro, 2008)[1]. Although the allocation of grants based on a formula aims to limit the discretionary power of policymakers in providing grants, political distortions may go beyond discretionary transfers and have an impact on formula-based transfers too, as observed in Senegal (Caldeira, 2012), Brazil (Litschig, 2012) or

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[1] For an overview of studies on distributive politics (150 in the past decade alone), see Golden & Min (2013).

Ghana (Banful, 2011). Even rule-based transfers may become a tool to co-opt uncommitted voters, to reward supporters and political allies, or as an exchange mechanism in the formation of political alliances (Cox, 2010).

The hypotheses for these biased transfers derive from two main electoral competition models on redistribution targeting: patronage and tactical redistribution (Caldeira, 2012). The first one posits that policymakers will provide funds to *core supporters*, i.e., regions strongly attached to the incumbent party, especially when the providers are risk-averse, investing where they already have strong support (Cox & McCubbins, 1986). The second implies that the distribution of grants is biased by targeting *swing voters* (regions with a high level of non-ideological voters—those that do not have a strong attachment to either the government or opposition parties—which means higher potential new voters) to maximize their expected vote share (Dixit & Londregan, 1998; Lindbeck & Weibull, 1987).

An extension of the *core supporter's model* (Arulampalam et al., 2009) suggests that grants may suffer from distortion by the *aligned swing effect*, which means that the grantor chooses to provide monies to his supporters and especially targets swing-voters' districts. They tested this prediction using Indian election data and found sizeable levels of grants or distortions in favor of aligned swing states. In a similar model, Brollo & Nannicini (2012) pointed out that the transfers may have a double effect: as the grantee can claim a small portion of the credit for the grant, the central government can use a non-allocation of grants as political punishment, eroding the image of the local non-aligned government, in a kind of *tying enemies' hands effect*. Regardless of how the bias is produced, the common thread in a bulk of these studies is the political alignment hypothesis, which means that distortions in the allocation of grants may be greater when local and central chief executives are affiliated with allied parties (or with the same party).

Most of these empirical studies suffer from the following three limitations. First, they do not consider the role played by congressmen. The chief executive[2] is usually the target of the analysis as he has influence ex-ante (he proposes the budget) and ex-post (he controls agencies that distribute the funds) (Berry, Burden, & Howell, 2010). Although the chief executive's role is important, in many countries, the deputies' influence is crucial to earn grants as the parties' efforts are divided between two focuses: the electoral arena (votes to win seats) and the political arena (votes to pass bills) (Cox, 2010). This means that the chief executive has

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[2] In Brazil the chief executive is the president. However, in parliamentary regimes, the chief executive is the premier.

to bargain with congressmen and one of the main tools for that is the allocation of grants to jurisdictions that have those deputies' supporters. Second, few of these analyses include in their models the fact that the parliament votes in the budget the year before its implementation (which is not always mandatory). Thus, after the election years (both local and central), the status of a local government may change from allied to unallied and vice-versa (Berry et al., 2010). Under this situation, the chief executive may use his ex-post influence to move the monies addressed in the budget to those local governments, according to their new status. A third issue concerns the fragility of the staff structure in small municipalities, especially in developing countries. As most capital grants take the form of *project grants*, the local government must apply by submitting projects, in adherence to specific qualifying and ranking criteria, which calls for qualified staff to be able to access such grants[3]. In addition, investment expenditures have a significant influence on re-election while current expenditures do not (Sakurai & Menezes-Filho, 2008), which makes capital grants more attractive than current ones.

In this study, we test the alignment hypothesis in Brazil, merging electoral results and central government grants information in more than 2,850 municipalities,[4] from 1999 to 2011. This database helps us overcome the limitations described above. First, we consider the alignment between the deputies and the central government, which allow us to control for the political arena effects. Second, following Berry et al. (2010), we divide the municipalities in four groups: (1) Full allies (when the budget was passed and when the outlays were made), (2) Full opponents (both in the previous year and the current one), (3) Allies that turned opponents, and (4) Opponents that become allies. Third, we divide the municipalities in three groups as high, medium, and low, for available staff structure. We use population size and ranking in the Human Development Index (HDI-education) as a proxy for skill level.

The study is organized as follows. In the Section 2.2, we provide some information about political institutions, electoral systems, and public budget issues in Brazil. Section 2.3 describes the data and our methodology, and presents the empirical analysis. Section 2.4 concludes the study.

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[3] As discussed in Solé-Ollé & Sorribas-Navarro (2008), this feature is not solely found in Spain but also in many democratic countries.

[4] The dataset encompasses all Brazilian states (except Rio de Janeiro, owing to lack of data). In appendix 2.3, we show the regional representation.

2.2. INSTITUTIONAL BACKGROUND OF POLITICS AND GRANTS IN BRAZIL

Brazil is a republican federation under presidential system and has three autonomous layers of administrative divisions. Besides the central government, there are 27 regional divisions (26 states and one federal district that has the capital, Brasília) and 5,565 municipalities.[5] Each of those layers has its own executive, and legislative incumbents are directly elected (except in the federal district, which obeys different rules), but the elections are not synchronized. Elections for mayors and city councils are held in October every four years, whereas the other politicians are elected in a two-year staggered election, as shown in Figure 2.1. The terms begin in January of the year following the election and last four years.

The election of chief executives at all the three levels follows the majority rule and except in municipalities with fewer than 200,000 voters, there is a two-round system at the central, regional, and local levels. In the first round, the election concludes when a candidate receives more than 50% of valid votes; if no one obtains this, the two highest-polling candidates go through a second and final round.

There are local, regional, and central legislative councils. Legislative Council members are elected by a proportional rule, according to electoral coalitions (which may or not be sustained after the elections) in all three layers. The regional jurisdiction for legislative elections coincides with that of the states and the federal district (so, there are 27 regional legislative councils) and they elect both regional and central representatives. The central legislative council has 513 seats, filled by regional jurisdictions based on a population rule.[6]

Although there is no formal link between the municipalities and deputies (because they are regionally elected), municipalities tend to have strong connections with some deputies. This can be seen from the fact that while the number of candidates to the federal chamber of deputies is high (between 37 and 183 candidates in each state in the past four elections), the two most voted candidates by municipality had, on average, 49.78% of the local votes.[7]

In 1997, a constitutional amendment allowed re-election so chief executives can run for an extra four-year term. On the other hand, there are no restrictions for re-elections in legislative

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[5] From those, almost 1/3 of the municipalities (27.5%) have less than 5000 inhabitants. On the other hand, only 19.2% are greater than 30 thousand citizens.

[6] Each regional jurisdiction has at least 8 seats into the Federal Deputies' Chamber and the remaining seats are shared in accordance with the population's distribution.

[7] According to Electoral Supreme Court data, in the 2010 elections, at least in 315 cities the most voted deputy had more than half of the votes.

councils. The Figure 2.1 exhibits some features about electoral timing in Brazil in the past two decades.

Figure 2.1 - Electoral timing in Brazil.
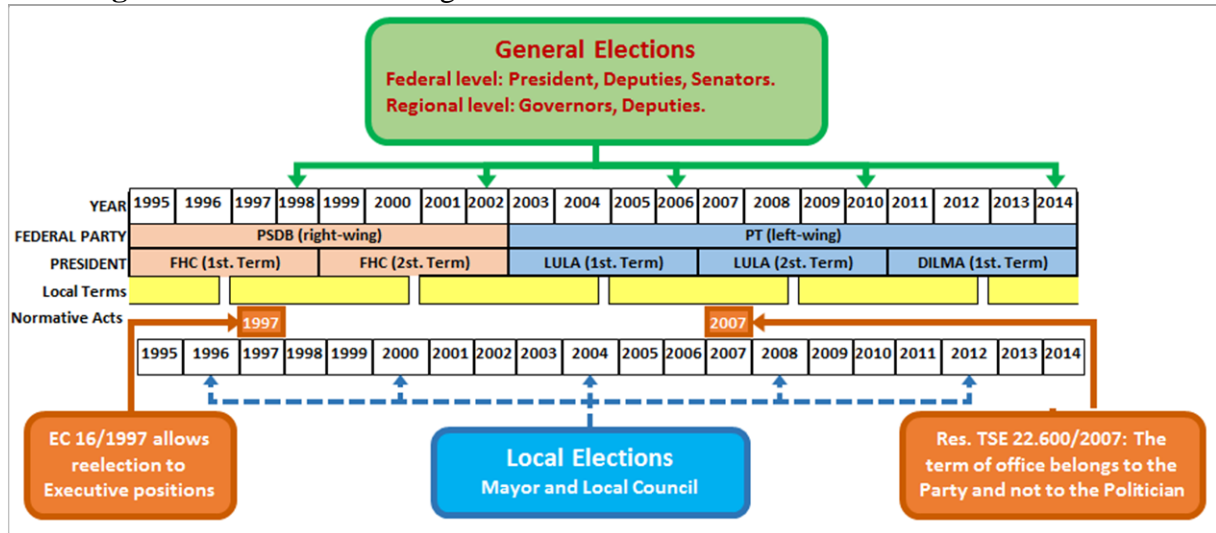
Source: The author.

Brazil's party system is strongly fragmented, with 32 mainstream parties.[8] However, the big four—Worker's Party (PT), Brazilian Social Democracy Party (PSDB), Brazilian Democratic Movement Party (PMDB) and Democrats (DEM) – fill most of the seats (in the federal council, those parties held, on average, 60 % of the seats in the past four terms). Although the composition of coalition governments at the federal level changes often, these parties usually keep their positions for the entire term (even as a supporter or as the opposition). Since 1994, there has been a polarization of the PSDB (right wing) and the PT (left wing) in the federal government. The current president, Dilma Rousseff, is affiliated with PT and was re-elected in 2014. Besides Dilma Rousseff (2011–2014), former presidents include Luiz Inácio Lula da Silva, affiliated with PT (elected in 2002 and re-elected in 2006) and Fernando Henrique Cardoso, affiliated with PSDB (elected in 1994 and re-elected in 1998). PMDB has been supportive of the federal government since the end of the military regime in the late 1980s and was a part of the coalition in the PT and PSDB governments.

Local politics play a strategic role in the Brazilian federal system for many reasons. First, as the elections for superior levels are always direct, it is important for the candidates to have their local supporters. Second, local governments provide most of the public goods and services (municipalities are in charge or have a relevant share of those provisions), especially regarding health, infrastructure, and formative education years, with state and federal

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[8] The appendix lists the mainstream parties, as per the Electoral Supreme Court.

governments assuming a subsidiary role. Despite this decentralization of expenditures at the local level, there is a high centralization of the fiscal structure in Brazil (as one can see in the Table 2.1). The central government perceives two thirds of tax burden, whereas local governments barely reach a 5% share.

Owing to this fiscal centralization, transfers from the central and from regional governments is the most important source of municipal revenues, which amounted to an average of 83.2% of the municipal budget in 2012.[9] The municipalities receive both conditional and unconditional transfers, mainly from the central government. The conditional grants may be mandatory or voluntary. The unconditional transfers are distributed among municipalities according to some formula (depending on the kind of transference but usually taking population as the main criterion).

Table 2.1 - Fiscal structure in Brazil, 1999-2014.

Year	GDP[1]	Tax Burden*	Tax Burden**	Share of Tax Burden by layer		
				Federal	Regional	Local
1999	1,092,276	304,941	27.9%	69.1%	26.0%	4.9%
2000	1,202,377	354,196	29.5%	68.2%	27.2%	4.6%
2001	1,316,318	403,745	30.7%	69.0%	26.8%	4.2%
2002	1,491,183	482,486	32.4%	70.8%	25.3%	3.9%
2003	1,720,069	553,179	32.2%	70.7%	25.2%	4.2%
2004	1,958,705	650,135	33.2%	69.9%	25.5%	4.6%
2005	2,171,736	734,108	33.8%	70.1%	25.4%	4.5%
2006	2,409,803	817,052	33.9%	69.9%	25.5%	4.7%
2007	2,718,032	923,585	34.0%	70.5%	24.9%	4.6%
2008	3,107,531	1,059,731	34.1%	69.8%	25.5%	4.7%
2009	3,328,174	1,102,954	33.1%	68.9%	26.1%	5.0%
2010	3,886,835	1,312,257	33.8%	68.2%	26.9%	4.9%
2011	4,374,765	1,527,156	34.9%	68.9%	26.2%	4.9%
2012	4,713,096	1,631,433	34.6%	68.5%	26.3%	5.2%
2013	5,157,569	1,807,054	35.0%	68.2%	26.5%	5.3%
2014	5,521,256	1,955,804	35.4%	66.1%	28.5%	5.4%

Source: Brazilian National Treasury.
* Current values in millions of BRL (Brazilian Reais). ** Percentage of GDP.

The central government, as well as the deputies, have discretionary power over conditional grants, which are mostly tied to health, infrastructure, or basic education programs. These grants may be applied to current or capital expenditures; they are always discretionary when tied to capital spent (for example, to buy fixed assets such as vehicles, machines, etc. or add value to an existing fixed asset, such as building hospitals, schools, bridges, and so on).

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[9] Source: Brazilian National Treasury.

Although the municipal budget depends heavily on those transfers, usually the local politician can claim a substantial portion of the political credit for the monies. Thus, alignment with upper-layer governments (the grantors) is decisive in obtaining the monies. The relevance of alignment probably increased after the Electoral Supreme Court decided in 2007 that the mandate belongs to the party (in other words, a politician stands to lose his term when he changes his party).

Despite the relevance of alignment with the federal and/or regional chief executive, the role of the council is important not only at the federal but also at the regional level. The Brazilian budgetary process follows the open-rule budget, which means that congressmen can submit amendments to the budget proposed by the chief executive, subject to the president's veto power.[10] Moreover, some of the grants may be tied to specific municipalities directly in the budget, but the latter may include resources whose disbursement will be decentralized without specifying in advance which municipality will receive the grants.

According to many researchers, federal spending benefits congressional incumbents (Levitt & Snyder, Jr., 1997), probably because of the political arena, as mentioned in Section 2.1 (Cox, 2010). Given this budget feature and confirming the premise of other studies, congressmen have some kind of ex-ante and ex-post discretionary power over the budget. The former is exercised by proposing amendments. The latter occurs both through these amendments and by helping allied mayors to access funds controlled by governmental agencies that may be spent in a decentralized way but are not tied with any lower jurisdiction (this influence may even take the form of pork-barrel, earmark, or logrolling).

2.3. EMPIRICAL ANALYSIS

In this section, we intend to determine how Brazilian discretionary transfers are politically motivated, according to alignment with the central government and with deputies, electoral effects, changing alliances during the budget gap (passing to implementing), and staff structure. We first specify our sample selection and then present our empirical methodology, estimation, and findings.

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[10] For more details about open versus closed amendment rules, see Baron & Ferejohn (1989) Frechette, Kagel, & Lehrer (2003) and Primo (2007).

2.3.1. Sample selection and variables of interest

As explained above, Brazil holds elections every two years in a staggered way between local and central elections.[11] Considering this scenario, we used a mix of political, fiscal, and economic variables in a dataset with a 13-year (1999–2011) balanced panel of 2,856[12] Brazilian municipalities, which represents 51% of the municipalities and 59% of the population. Our study encompasses, at least partially, four federal terms (four years of a rightwing party, PSDB, from 1999 to 2002, and nine years of a leftwing party, PT). We took political data from the Brazilian Electoral Supreme Court, fiscal data from the Brazilian National Treasury, and economic data from the Brazilian Institute of Geography and Statistics. The fiscal variables are in real per capita terms, in Brazilian currency units (Real-R$)[13] at 2011 prices[14]. The Table 2.2 summarizes the variables, ordered by category, as well as the expected effect in the estimation.

We define the (dependent) grant variable as the *per capita* sum of conditional transfers tied to capital expenditures (*per capita* discretionary transfers, or pc_KDT), from the federal government to the municipalities. We focus on conditional capital grants because of three reasons: first, they are always discretionary (sometimes, the current ones are not); second, they capture both the influence of alignment with the chief executive and the congressmen; third, capital grants are spent on highly visible expenditures (usually buildings or acquisition of vehicles or equipment), which means that they are suited to entice voters and win votes.

We develop a first set of independent variables to control the political alignment between local and central governments by comparing the parties the chief executives are affiliated with. We describe these variables in Table 2.2 as federal alignment dummies. Some studies suggest that coalition leaders gain more from a coalition (Baron & Ferejohn, 1989), but empirical evidence shows that strong coalition partners gain more than other partners (Ansolabehere, Snyder, Strauss, & Ting, 2005). Hence, we define three dummies: allied (comprising the pivotal parties in the federal coalition), opposition (pivotal opposition parties in the central layer), and same-party municipalities.

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[11] See Figure 2.1 for an illustration of the timing of elections.

[12] We cut off all municipalities with missing values and those which informed zero spent in at least one main category in the entire period. We cut off also municipalities which were split during the period and their mother cities.

[13] The Brazilian currency – Real (R$) – was roughly equivalent to US$ 0.28 in April 2016.

[14] Adjusted according to the Brazilian official inflation index.

Table 2.2 - Determinants of Brazilian per capita discretionary grants to local governments.

Category	Variable	Description	Expected Effect
Federal Alignment (dummies)	a	Allied: Local Government Party allied with Federal Government in $Year_t$	Positive
	o	Opposition: Mayor Party opposition in the federal level in $Year_t$	Negative
	sp	Same-party: Local and Federal Government were same party in $Year_t$	Positive
	ao	Allied-opposition: Mayor turned from allied in $Year_{t-1}$ to opposition in $Year_t$	Negative
	oa	Opposition-allied: Mayor turned from opposition in $Year_{t-1}$ to allied in $Year_t$	Positive
	fo	Full opposition: Local Government was opposition in $Year_{t-1}$ and $Year_t$	Negative
	fa	Full allied: Local Government was allied in both $Year_{t-1}$ and $Year_t$	Positive
	fsp	Full same-party: Local Government was same party in $Year_{t-1}$ and $Year_t$	Positive
	a2	Allied 2: Allied but not full allied	Positive
	a3	Allied 3: Allied but not full allied nor Opposition that became Allied	Positive
	o2	Opposition 2: Opposition but not full opposition	Negative
	o3	Opposition 3: Opposition but not full opposition nor Allied that Became Opposition	Negative
	sp2	Full same-party: Same-Party but not Full Same-Party	Positive
Deputies Alignment (dummies)	Dep_op	Deputy opposition: The 'local deputy' is opposition to the president	Negative
	Dep_al	Deputy allied: The 'local deputy' is aligned with the president	Positive
	Dep_sp	Deputy same-party: The 'local deputy' is affiliated with the president's party.	Positive
Electoral Years	l_elec	Local elections: elections performed in $Year_t$ for local incumbents.	Negative
	c_elec	Central elections: elections performed in $Year_t$ for federal incumbents.	Negative
Personnel Structure	l_staff	Low staff: Small and medium municipalities with low HDI_Education level.	Negative
	h_staff	High staff: Large and medium municipalities with high HDI_Education level.	Positive
Controls	FPM	per capita revenues from FPM, at 2011 prices.	Positive
	GDP	per capita local GDP, at 2011 prices.	Positive

Source: The author.

The president has a crucial role in the allocation as he has the last word on the grants. The budget law is voted on the year before its implementation, which is not mandatory in Brazil (the budget process allows the chief executive to perform an expenditure in the next year, but there are no penalties if he does not comply with all budget items; moreover, he can relocate a small part of this budget). Owing to this gap between the budget vote and its execution, and considering that there are elections every two years, it is possible that a municipality was allied with the president when the budget law was passed and not during its implementation, and vice-versa.

Considering this scenario and the alignment dummies described before (allied, opposition, and same-party), we define another five dummies: full allies (when the budget was passed and when the outlays were made), full opposition (the opposite situation), full same-parties (considering $Year_t$ and $Year_{t-1}$), allies that turned opponents, and opponents that became allies.

To avoid duplicating the alliance status, we rebuilt the $Year_t$ variables to remove from them observations covered by the dummies mentioned above. Figure 2.2 depicts this process related to the allied dummy to prevent a double measure of alignment status in $Year_t$. We adopt a similar approach to the opposition and same-party dummies.

Figure 2.2 - Electoral allies according to the alliance status in preceding year.
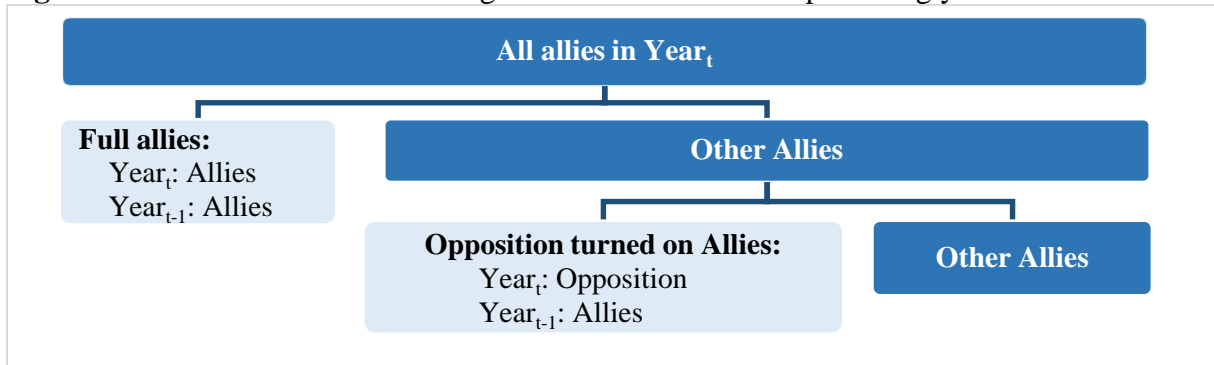
Source: The author.

The support of a federal deputy is important and sometimes essential in the allocation mechanism, both explicitly monies (for instance, by proposing amendments to the budget) or in less visible ways (by using his influence in the agencies or ministries that control the allocation of non-binding grants). Hence, we have tried to identify strong relations between the deputy and municipality by identifying the first voted deputy in the municipality who had more than the average votes among all first deputies and whose difference from the second deputy was bigger than the average. We find that 18.7% of first deputies are strongly connected with municipalities. We define three dummies for those municipalities, based on the relationship between the deputy and federal chief executive: allied, same-party, and opposition deputies, as described in Table 2.2.

As local governments must usually apply for fund transfers (by submitting several projects), we create dummy variables for the available staff in local governments.[15] By combining the size of the municipality and the HDI-Education index, we divide the municipalities into three levels as high, medium, and low staff-level structure. Using quartiles of population, the first and fourth ones are classified as low and high staff levels, respectively. We add to the low-staff level, municipalities from the second quartile that had HDI-Education that is lower than the average. The municipalities in the third quartile that had an HDI higher than the average were added to the high staff-level structure. We include dummies for low and high levels of staff structure in our estimation.

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[15] Solé-Ollé & Sorribas-Navarro (2008) mention this *project grants* feature, but do not control for staff qualification in the municipalities.

We control by electoral year too, given that politicians want more visibility in those years. Considering that we have elections every two years, we create two dummies, one for central elections and the other for local elections.

In addition, we use two control variables of which one is the Municipalities Participation Fund (FPM). It is the main transfer of federal funds to municipalities and, on average, accounts for 39.7% of the entire budget revenues of municipalities. As it is based on criteria that favor smaller municipalities (whose fiscal power is lower), it can work as a proxy for equity policies. Second, we use the per capita GPD as dummy for lobbying power (Chakraborty, 2003).[16]

2.3.2. Empirical methodology, estimation and findings

We test for the presence and magnitude of the influence of political alignment with the central government and with deputies, elections effects, changes in alliances, and staff structure in Brazilian discretionary transfers from the central to local governments, from 1999 to 2011 using the following general linear panel model:

$$pc\_KDT_{it} = \alpha + f_i + \beta Fed\_Al_{it} + \gamma Deputy\_Al_{it} + \delta Elec\_Year_{it} + \vartheta Staff_{it} + \lambda Control_{it} + \varepsilon_{it}$$

In the general model, the dependent variable pc_KDT_{it} is the per capita amount of discretionary transfers. The constant term is represented by α. The municipal fixed effects are f_i,[17] and ε_{it} is the idiosyncratic error. We represent a set of alignment dummies between central and local governments with Fed_Al_{it}. The alignment between deputies and the central government is represented by $Deputy\_Al_{it}$. We control in the model by election years, staff level, local GDP and the main local revenue source, FPM.

We perform two main splits: first, we group the allies and opposition models, both for the mayor's and for the deputies' alignment status; second, we progressively add the alignment dummies. This strategy yields six different allied models and three for the opposition.

Using the set of variables described above in the general model, we first perform the Breusch–Pagan test to verify if panel estimations are required as against pooled estimation. Then we perform the Hausman test to select the best panel structure (fixed or random effects). We also test for autocorrelation problems by performing the Wooldridge test. Finally, we test for group-wise heteroscedasticity using the Modified Wald test. Based on the results of these

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[16] Although it can also work as an equity predictor because equity concerns suggest that the richer a municipality is, the lower will be the grants that it will receive from the central government.

[17] We confirmed the fixed effects as the best fitted model according to Hausman tests.

tests (available in the appendix), we perform a robust panel estimation with fixed effects with Stata SE 12.0.

Table 2.3 and 2.4 presents the results of our estimations. We divide the estimations results into two tables; the first presents the results for the allied models and the second shows the coefficients for the opposition models. In each table, we first present the models for $Year_t$ and then we change the model by adding variables that also consider the status in $Year_{t-1}$, to verify the effects of the alliance status between the budget-voting stage and the budget-implementation stage.

Table 2.3 - Estimation results for Allied Models (AM).

Var.	DESCRIPTION	AM1	AM2	AM3	AM4	AM5	AM6
a	allied	6.688 *** (1.210)	9.258 *** (1.261)				
a2	a but not fa			5.596 *** (1.323)	7.619 *** (1.360)		
a3	a but not fa nor oa					8.265 *** (1.504)	10.272 *** (1.555)
fa	full allied			7.060 *** (1.390)	9.798 *** (1.439)	7.046 *** (1.389)	9.795 *** (1.439)
oa	opposition to allied					-0.206 (2.305)	1.908 (2.285)
sp	same party		15.412 *** (1.704)				
sp2	sp but not fsp				4.647 *** (1.607)		4.785 *** (1.613)
fsp	full same-party				20.941 *** (2.115)		20.971 *** (2.116)
dep_al	deputy allied	11.012 *** (2.244)	11.125 *** (2.236)	11.007 *** (2.244)	11.179 *** (2.235)	10.830 *** (2.239)	10.996 *** (2.229)
dep_sp	deputy same-party		9.047 *** (3.322)		8.870 *** (3.322)		8.701 *** (3.310)
l_elec	local elections	8.655 *** (0.770)	8.922 *** (0.770)	8.407 *** (0.868)	7.546 *** (0.891)	8.441 *** (0.867)	7.588 *** (0.889)
c_elec	central elections	17.174 *** (0.991)	16.888 *** (0.992)	16.953 *** (1.052)	15.524 *** (1.057)	16.934 *** (1.054)	15.514 *** (1.058)
fpm	per capita FPM	-0.052 *** (0.017)	-0.056 *** (0.017)	-0.052 *** (0.017)	-0.055 *** (0.017)	-0.052 *** (0.017)	-0.055 *** (0.017)
gdp	per capita GDP	0.052 *** (0.006)	0.054 *** (0.006)	0.051 *** (0.006)	0.053 *** (0.006)	0.052 *** (0.006)	0.053 *** (0.006)
l_staff	low staff level	3.680 (2.717)	3.110 (2.703)	3.910 (2.785)	3.962 (2.774)	3.272 (2.745)	3.329 (2.736)
h_staff	high staff level	3.225 (2.469)	3.796 (2.466)	3.111 (2.483)	3.257 (2.482)	3.237 (2.479)	3.381 (2.479)
_cons		10.883 *** (5.184)	8.026 (5.174)	10.962 ** (5.177)	8.788 * (5.156)	10.831 ** (5.177)	8.651 * (5.157)
R^2	within	0.0640	0.0671	0.0640	0.0681	0.0642	0.0683
	between	0.1693	0.1693	0.1701	0.1726	0.1675	0.1700
	overall	0.0852	0.0875	0.0854	0.0890	0.0851	0.0886

Notes: Estimations performed with Stata SE 12.0. No serial correlation control needed. Heteroscedasticity adjusted by robust estimation. Robust Standard errors in parentheses. Stars indicate statistical significance at 1% (***), 5% (**) and 10% (*) levels.

Is the alignment between local and central governments important in the allocation of transfers? According to the results, those municipalities whose mayors were allied, especially when affiliated with the same party as the president, received more monies (with the coefficients 6.688 for *allies* in model AM1, and 9.258 for *allies 2* and 15.412 for *same-party* in model AM2, all significant at the 1 % level). It appears that local governments with more political power received larger transfers. This result is consistent with many empirical studies such as those by Caldeira (2012), Arulampalam et al. (2009), Solé-Ollé & Sorribas-Navarro (2008), Foucault et al. (2008), and Ferreira & Bugarin (2007). Moreover, our first opposition model OM1 highlights the negative effect of being in opposition to the president, as discussed in Brollo & Nannicini (2012). In the Model OM1, the variable *opposition* has a coefficient of − 12.017, with a high significance level.

Table 2.4 - Estimation results for Opposition Models (OM).

Var.	DESCRIPTION	OM1	OM2	OM3
o	opposition	-12.017 ***		
		(1.314)		
o2	o but not fo		-12.463 ***	
			(1.277)	
o3	o but not fo nor ao			-12.657 ***
				(1.618)
fo	full opposition		-11.814 ***	-11.814 ***
			(1.541)	(1. 540)
ao	allied => opposition			-12.216 ***
				(1.715)
dep_op	deputy opposition	-12.043 ***	-12.041 ***	-12.042 ***
		(2.445)	(2.444)	(2.443)
l_elec	local elections	9.275 ***	9.205 ***	9.212 ***
		(0.765)	(0.779)	(0.779)
c_elec	central elections	17.169 ***	17.099 ***	17.102 ***
		(0.993)	(1.008)	(1.005)
fpm	per capita FPM	-0.055 ***	-0.055 ***	-0.055 ***
		(0.017)	(0.017)	(0.017)
gdp	per capita GDP	0.053 ***	0.053 ***	0.053 ***
		(0.006)	(0.006)	(0.006)
l_staff	low staff level	3.521	3.531	3.542
		(2.714)	(2.712)	(2.722)
h_staff	high staff level	3.300	3.268	3.266
		(2.466)	(2.464)	(2.464)
_cons		19.602 ***	19.698 ***	19.698 ***
		(5.184)	(5.222)	(5.222)
R^2	within	0.0664	0.0664	0.0664
	between	0.1629	0.1630	0.1630
	overall	0.0856	0.0856	0.0856

Notes: Estimations performed with Stata SE 12.0. No serial correlation control needed. Heteroscedasticity adjusted by robust estimation. Robust Standard errors in parentheses. Stars indicate statistical significance at 1% (***), 5% (**) and 10% (*) levels. Standard errors in parentheses.

Does the alliance status in the year before the implementation of the budget explain the distribution of grants? This answer has two stages. First, the unchanging status has a strong

effect on the allocation of transfers. The coefficients for variables *full allied* and *full same-party* are positive and significant at the 1 % level, with *fa* ranging from 7.046 to 9.798 and *full same-party* ranging from 20.941 to 20.971. Moreover, in all the allied models that consider the previous alliance status (AM3 to AM6), the coefficients for other alliance status (*allied 2, allied 3* and *same-party 2*) were quite different from those observed in the variables *full allied* and *full same-party*, which represents the maintenance of $Year_{t-1}$ alliances. This difference was not so significant in the opposition models (see the slight differences in coefficients for variables *opposition 2, opposition 3* and *full opposition* in Table 2.4), suggesting that the previous status is strongly important for allies but not for oppositions.

The other side of the answer is related to those municipalities that changed their status (*opposition turned in allied* and *allied turned in opposition* variables). The ex-opposition municipalities appear to not have benefited from their brand new alliance status (with no significance in the coefficients for *opposition turned in allied*), but the new opposition local governments are penalized (*allied turned in opposition* has a negative coefficient of −12.216, with a 1% significance level). When it comes to supporting the supporters, it appears that one fiscal year is not enough to change the channel of the grants (which means that brand new allies – the *opposition turned in allied* variable - do not benefit from their status in the first year), but the punishment of grant withdrawals for the new opponents is faster. In other words, the process of allocation of monies may be slower than the tying hands effect (Brollo & Nannicini, 2012).

Do the deputies influence the allocation of transfers? If yes, to what extent? The deputies' status alliance seems to play an important role in the scenario (in all models the deputies' coefficients were significant). Furthermore, the influence of a same-party deputy (ranging from 8.701 to 9.047) in the allocation of grants appears to be lower than that of an allied one (which vary from 10.830 to 11.125). The Brazilian political context (described in Section 2.2) helps to understand these results, especially when it comes to the highly fragmented party system and the low ideological orientation of most of the parties. The president can usually count on the votes of his party's deputies. However, the alliances with other parties are not always solid and reliable. It is common in this scenario for the government to favor grants to allow the federal chief executive to pass bills (even if this implies pork-barrel, earmarks, and quid pro quo monies). This result does not refute Berry et al. (2010), and mirrors Cox (2010) because besides electoral votes, parties need legislative votes.

The electoral calendar represents an important effect in our estimation. In all models, local elections as well as central elections are significant at the 1% level. Besides, central

elections show a higher coefficient than municipal ones: the first varies from 15.514 to 17.174 and the local elections coefficient ranges from 7.546 to 9.275. These results appear to contradict the predictions of the political business cycles, suggesting that capital expenditures should decrease during electoral years as capital expenditures are seen by voters only with a time lag.

Before considering the estimation results, we recall that the dependent variable does not comprise all capital expenditures, but only those from federal unconditional discretionary grants. In other words, more federal capital grants do not necessarily mean that capital expenditures as a whole were bigger in the municipality in comparison with other fiscal years because there are other sources of capital expenditures (local sources, regional sources and even, to a lesser extent, federal conditional sources).

Moreover, even if the entire local capital expenditure was bigger, Klein & Sakurai (2015) provided an explanation for it: first, Brazil holds elections only at the end of the year. As the Brazilian electoral law imposes restrictions on expenditures closer to the elections, the government must execute the budget in a somewhat shrunken fiscal year and because of that, capital expenditures are an easy way to do that. Therefore, Klein & Sakurai (2015) argued that there are some capital expenses that can be quickly incurred and are strongly visible to voters, such as acquisition of equipment, machinery, ambulances, school buses, or medical equipment.

In fact, Klein & Sakurai (2015) found that since re-election is allowed for mayors, for mayors nearing the end of their first term, the capital spent increases in municipalities (this does not happen in the end of the second term). This may help understand why central election years showed a bigger effect than local ones: reelected mayors got less interest in capital expenditures than deputies and central chief executive officers. Our data cover a period in which the central government saw a rough dispute between two parties, PT and PSDB, and we have seen re-elections twice in the past four central elections.

Finally, on the fragility of the staff structure in small municipalities, we did not find evidence of this in our estimation. Although our dependent variable comprises capital grants that usually demand that local governments apply by submitting technical projects, the variables' coefficients were not significant. However, when we perform the Wald test, in some models, we observe that the variable *low_staff* is different from zero (we could not say the same for the *high_staff* variable).

When comparing the results of all estimation models, we believe that the allied model best fits is the AM6 because not only does it have the biggest explanatory power (R^2) but also

the fact that all alignment variables (for local governments, previous alliance statuses, and deputies) are significant at the 1% level and the constant coefficient is one of the lowest, enhancing the explanatory power of the variables. Meanwhile, coefficients in the opposition models are not very different and their explanatory power is very similar.

2.4. CONCLUSION

Intergovernmental transfers are an important mechanism of the public budget constraint and the factors that determine their allocation are strongly relevant to fiscal federalism, because imply not just equity and efficiency concerns as well as embedded political considerations. In this study, we tested the influence of political alignment with the central government and with deputies, electoral calendar effects, the changing in alliance status and personnel structure in the Brazilian discretionary transfers. We performed a panel data analysis encompassing 2856 municipalities in the period from 1999 to 2011.

The results of our estimation suggest that political and electoral factors strongly affect the allocation of intergovernmental fiscal transfers. According to the literature, we found that the alignment with central government results in more monies to municipalities, while opposition mayors receive less federal funds. Beyond the alignment between chief executives (local and central), we added another issue important issue: the role of the deputies in the allocation of grants. Albeit their participation couldn't be easy to track, the pork-barrel, earmarks and quid-pro-quo monies are relevant to explain how central government shares the discretional transfers.

The influence of deputies in the grants is a strategic tool to central government to coopt votes in the parliament. Because of that aim, same party deputies exert less influence than allied deputies in the transfers. The reason is that the decision of voting for the deputies from the same party of President is strongly affected by ideological or partisan issues. Contrasting this behavior, deputies from other parties are more likely to change their votes in the Assembly against monies to their supporters.

Another result is related to changes in the alliance status during the gap between budget voting and implementing. The previous alliance status has a strong impact in the allocation of grants, except for new allies (opposition municipalities that became allies). One of the possible explanations for this is that for central government is easier to penalize ex-allies than favor new-allies. The budget formulation is mandatory, but the chief executive has leeway space, which

means that he may change the municipalities in the allocation or simply do not transfer all the estimated grants in the year after budget formulation. As the former often results in political exposure, is easier to politicians do not transfer monies than change the municipality target by the grants.

The last (and stronger) factor of the grants' allocation was the electoral calendar; in the electoral years, municipalities receive more capital grants (especially in central elections), in line with the literature. As reelected mayors usually decrease capital expenditure in the end of second term, this effect reduces the electoral effect in local election years. On the other hand, central elections do not exhibit this smoothing effect in discretionary capital spent. Moreover, Brazil holds elections in the end of the year, and this shrinks the fiscal year, which means that some kind of expenditures are not allowed close the electoral race. Because of that, small capital spent (as vehicles, medical equipment and so on) is an effective and faster way to execute the budget.

Although the allocation of grants should observe a set of criteria to provide equity and reduce inequalities, we found that opportunism promotes a deviation in the distribution of monies. This opportunistic behavior touches all categories of politicians studied: mayors, deputies, president. Moreover, those biases are directly related not only to electoral process (or may be observed not only in electoral years), but also in political alignment, quid-pro-quo politics and other issues that reduces the benefits of public budget allocation. Even if such deviations of efficient spent does not infringe the law, the social cost (in terms of lack of efficiency in public spending) represents enough motivation for further studies to improve mechanisms to provide a more virtuous allocation of resources.

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2.6. APPENDICES

Appendix 2.6.1 - Brazilian Political Parties*

PARTY**	ORIGINAL NAME	TRANSLATED NAME	FOUNDED
PMDB	Partido do Movimento Democrático Brasileiro	Brazilian Democratic Movement Party	06/1981
PTB	Partido Trabalhista Brasileiro	Brazilian Labour Party	11/1981
PDT	Partido Democrático Trabalhista	Democratic Labour Party	11/1981
PT	Partido dos Trabalhadores	Workers' Party	02/1982
DEM***	Democratas	DEMOCRATS	09/1986
PC do B	Partido Comunista do Brasil	Brazil's Communist Party	06/1988
PSB	Partido Socialista Brasileiro	Brazilian Socialist Party	07/1988
PSDB	Partido da Social Democracia Brasileira	Brazilian Social Democracy Party	08/1989
PTC	Partido Trabalhista Cristão	Labor Christian Party	02/1990
PSC	Partido Social Cristão	Social Christian Party	03/1990
PMN	Partido da Mobilização Nacional	National Mobilization Party	10/1990
PRP	Partido Republicano Progressista	Progressive Republican Party	10/1991
PPS	Partido Popular Socialista	Popular Socialist Party	03/1992
PV	Partido Verde	Green Party	09/1993
PT do B	Partido Trabalhista do Brasil	Brazil's Labourite Party	10/1994
PP	Partido Progressista	Progressive Party	11/1995
PSTU	Partido Socialista dos Trabalhadores Unificado	Socialist Unified Workers Party	12/1995
PCB	Partido Comunista Brasileiro	Brazilian Communist Party	05/1996
PRTB	Partido Renovador Trabalhista Brasileiro	Renewal Labor Brazilian Party	02/1997
PHS	Partido Humanista da Solidariedade	Solidarity's Humanist Party	03/1997
PSDC	Partido Social Democrata Cristão	Social Democratic Christian Party	08/1997
PCO	Partido da Causa Operária	Workers Cause Party	09/1997
PTN	Partido Trabalhista Nacional	National Labor Party	10/1997
PSL	Partido Social Liberal	Social Liberal Party	06/1998
PRB	Partido Republicano Brasileiro	Brazilian Republican Party	08/2005
PSOL	Partido Socialismo e Liberdade	Socialism and Freedom Party	09/2005
PR	Partido da República	Republic's Party	12/2006
PSD	Partido Social Democrático	Social Democratic Party	09/2011
PPL	Partido Pátria Livre	Free Homeland Party	10/2011
PEN	Partido Ecológico Nacional	National Ecological Party	06/2012
PROS	Partido Republicano da Ordem Social	Republican Social Order's Party	09/2013
SD	Solidariedade	Solidarity	09/2013

Source: Electoral Supreme Court.
Notes: *The parties are sorted by foundation date. ** There still exist 6 new parties waiting for approval to launch candidates in the 2016 elections. *** His ancient name was PFL (Liberal Front Party).

Appendix 2.6.2 – Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations	
pc_KDT	overall	40.35495	86.55944	-7.742207	7277.379	N =	37128
	between		39.40319	0	620.8503	n =	2856
	within		77.07416	-580.4954	6696.884	T =	13
a	overall	.4143234	.4926115	0	1	N =	37128
	between		.2799016	0	1	n =	2856
	within		.4053967	-.4318304	1.260477	T =	13
o	overall	.2668067	.4422965	0	1	N =	37128
	between		.22922	0	.8461538	n =	2856
	within		.3782874	-.5793471	1.189884	T =	13
sp	overall	.1094861	.3122523	0	1	N =	37128
	between		.1686849	0	.8461538	n =	2856
	within		.2627853	-.7366677	.9556399	T =	13
ao	overall	.0304083	.1717104	0	1	N =	37128
	between		.0397063	0	.1538462	n =	2856
	within		.167058	-.1234378	.9534852	T =	13
oa	overall	.0265298	.1607069	0	1	N =	37128
	between		.0386104	0	.1538462	n =	2856
	within		.1560014	-.1273163	.9496068	T =	13
fo	overall	.1974251	.3980612	0	1	N =	37128
	between		.1980504	0	.6923077	n =	2856
	within		.3453135	-.4948826	1.120502	T =	13
fa	overall	.326546	.4689559	0	1	N =	37128
	between		.2544964	0	.9230769	n =	2856
	within		.393919	-.5965309	1.249623	T =	13
fsp	overall	.0756033	.2643659	0	1	N =	37128
	between		.1327762	0	.6923077	n =	2856
	within		.2286165	-.6167044	.9986802	T =	13
a2	overall	.0877774	.2829747	0	1	N =	37128
	between		.0489929	0	.2307692	n =	2856
	within		.2787027	-.1429918	1.010854	T =	13
a3	overall	.0612476	.2397871	0	1	N =	37128
	between		.0446381	0	.2307692	n =	2856
	within		.235597	-.1695217	.9843245	T =	13
o2	overall	.0693816	.2541054	0	1	N =	37128
	between		.050747	0	.2307692	n =	2856
	within		.2489882	-.1613876	.9924585	T =	13
o3	overall	.0389733	.1935339	0	1	N =	37128
	between		.0489027	0	.1538462	n =	2856
	within		.1872556	-.1148729	.9620502	T =	13
sp2	overall	.0338828	.1809299	0	1	N =	37128
	between		.0440417	0	.1538462	n =	2856
	within		.1754895	-.1199634	.9569597	T =	13
Dep_op	overall	.0869694	.281794	0	1	N =	37128
	between		.1680515	0	.9230769	n =	2856
	within		.2262205	-.8361075	1.010046	T =	13
Dep_al	overall	.1438806	.3509734	0	1	N =	37128
	between		.2262848	0	1	n =	2856
	within		.2683171	-.7791963	1.066958	T =	13
Dep_sp	overall	.0336673	.1803738	0	1	N =	37128
	between		.1008046	0	.9230769	n =	2856
	within		.1495875	-.8894096	.9567442	T =	13
l_staff	overall	.2968649	.4568826	0	1	N =	37128
	between		.4243235	0	1	n =	2856
	within		.1695569	-.626212	1.219942	T =	13
h_staff	overall	.3102241	.4625915	0	1	N =	37128
	between		.4292368	0	1	n =	2856
	within		.1726448	-.6128528	1.233301	T =	13
FPM	overall	619.8981	484.048	6.242975	6921.531	N =	37128
	between		441.0808	10.50445	4638.456	n =	2856
	within		199.5322	-1205.232	2902.973	T =	13
GDP	overall	957.7959	871.995	5.905289	13993.92	N =	37128
	between		683.713	16.45476	7185.439	n =	2856
	within		541.3529	-3572.81	7766.273	T =	13

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Appendix 2.6.3 – Econometric tests

TEST	OBJECTIVE	ALLIED MODELS						OPPOSITION MODELS		
		AM1	AM2	AM3	AM4	AM5	AM6	OM1	OM2	OM3
Breusch Pagan $\overline{\chi}^2$	Pooled or Panel data treatment	3201.21	3189.80	3201.50	3198.86	3207.67	3204.92	3251.83	3251.93	3250.00
Prob $>\overline{\chi}^2$		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hausman χ^2	Chose fixed or random effects	57.50	60.52	57.06	56.57	71.11	69.64	60.91	64.76	69.92
Prob $> \chi^2$		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Wooldridge F (1, 2855)	Presence of autocorrelation in	0.108	0.073	0.107	0.066	0.108	0.065	0.077	0.077	0.077
Prob $>$ F	panel data	0.7428	0.7866	0.7434	0.7978	0.7421	0.7983	0.7812	0.7819	0.7814
Modified Wald χ^2	Groupwise heteroskedasticity	1.2e+07	1.1e+07	1.1e+07	1.0e+07	1.2e+07	1.0e+07	9.8e+06	9.7e+06	9.7e+06
Prob $> \chi^2$		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Appendix 2.6.4 - Representativeness of the Sample per Region

BRAZILIAN REGION	MUNICIPALITIES	SAMPLE	PERCENT	POPULATION[1]	PERCENT	LOCAL SPENT[2]	PERCENT
South	1191	957	80.4%	27.39 million	14.4%	19,356 million	16.0%
Southeast	1668	1003	60.1%	80.36 million	42.1%	61,186 million	50.5%
Center-west	466	207	44.4%	14.06 million	7.4%	7,470 million	6.2%
Northeast	1794	600	33.4%	53.07 million	27.8%	25,509 million	21.0%
North	450	89	19.8%	15.86 million	8.3%	7,567 million	6.3%
TOTAL	**5569**	**2856**	**100.0%**	**190.75 million**	**100.0%**	**121,088 million**	**100.0%**

Source: IBGE.

[1] According to the 2010 census. [2]Average of expenditures for the entire period (1997 to 2011) at the municipal level, in Brazilian Real.

3. TIMING OF ELECTIONS AND PUBLIC BUDGET ALLOCATIONS IN A FEDERAL SYSTEM

Abstract:
This study analyzes the elections' timing and its effects in the formulation of municipal policies, dividing them into two categories: the short-term and the long-term focus policies. Employing the instruments provided by Game Theory, we built a dynamic set of eight periods with imperfect information, in which two players (local and central policymakers) decide about the budget formulation policy, oriented to maximize next elections results. We analyze two models: first, we discuss a staggered election model, in which elections occur every two years, alternately, to local and central government layers). The second model explores the possibility of unification of local and central elections, in a synchronized way with the coincidence of mandates of the studied politicians (local and central governments). Results suggest that the vote-seeking behavior drives to sub-optimal allocations in both models, in a kind of anticipation effect. However, we highlight differences among incumbents' anticipation effect: its intensity is higher in local allocations than in central ones, because central expenditures increase local incumbent's image more than the opposite. Moreover, in synchronized elections, the deviation from optimal allocation would be lower than in staggered ones.

3.1. INTRODUCTION

Many studies have examined the relation between economic fluctuations and elections (Ferreira & Bugarin, 2007). Elections may shift the accountability in public spending through two main channels – political competition that reduces moral hazard (Ferejohn, 1986; Barro, 1973) and adverse selection (Rogoff, 1990). Elections could therefore provide better incumbents, and re-election prospects may result in incentives for efficient governance. However, electoral pressures could also introduce a bias in policymaking as politicians seek to increase their popularity with an eye on re-election (Vergne, 2009).

A focus on motivation could mitigate this undesirable effect of elections. Most models look at an election as a set of voter choices based on a comparison of candidate profiles and platforms (Battaglini, 2014). However, when it comes to candidate comparisons, economists generally measure a politician's quality only by ability and pay no attention to motivation issues (Fedele & Naticchioni, 2015), although the latter has been discussed in public administration theory (see e.g., Carpenter, Doverspike, & Miguel, 2012). The result of this simplification is that as the private sector is more flexible in rewarding performance (as against fixed wages in the public sector), common wisdom suggests that a political system produces a perpetual (adverse) selection of low-ability politicians, stuck in a path dependency cycle (Caselli & Morelli, 2004).

By relaxing this assumption of mutually exclusive sectors (public and private), a few recent studies have focused on other features of politicians' performances. One of these is *public-fit citizen*, which posits that such individuals are closely aligned with the values of the political system, either with positive or negative interests (Fedele & Naticchioni, 2015). This approach explains why a politician's careerism is a feature of many national political systems, i.e., citizens who enter public life tend to stay in it for long periods, even if they are highly able. As *public-fit citizens*, some politicians' choices to broaden their perspectives of a political career may hinder efficient allocation of the public budget. It is a trade-off between electoral prospects and the public interest, especially if a "political culture" incentivizes the politician's opportunistic behavior (Beniers & Dur, 2007).

We examine budget management at the local level as a game to evaluate the effects of political alignment at different levels of government, unconditional grants (from the central to local levels) and budget allocation between short-term and long-term spending. Further, it discusses two representations of the model; one with staggered elections and the other with synchronized elections.[1]

This study is organized as follows: Section 2 describes the current budget model in Brazil (particularly at the local level) and the extent of dependence on external transfers (both conditional and unconditional). Section 3 defines the parameters of the general model of the game. Next, we present and solve the game in its extensive form and finish by considering the unification of elections at the local and central levels. Section 4 concludes the study and points to potential areas of further research.

3.2. BUDGET FEATURES AT DIFFERENT GOVERNMENT LEVELS IN BRAZIL

Although the municipalities have benefited from the Constitution of 1988 with increased revenue, decentralization of public functions (such as health, primary education, environment, and social security) have had a strong impact on local finances, generating fiscal vulnerability

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[1] In 2015, the Brazilian Parliament discussed a proposal for the unification of local and central elections. The main argument was that it would reduce costs. Staggered elections, by their turn, were seen as contributing to the politicization of citizens (Moura, 2015). Although it was decided not to unify the elections, the margin of victory was narrow and other proposals for unification are still waiting consideration. Given this scenario, we retain the possibility of unified elections in our analysis.

of municipalities (Teixeira, Mac Dowell, & Bugarin, 2003). In practice, most municipalities rely heavily on funds from the state and federal levels.[2]

Various criteria have been used to describe and categorize the budgetary resources of the municipalities (Abrantes & Ferreira, 2010). Based on the origin of the money, there are two sources—own revenues and transfers from the regional or central government (Rezende, 2001).

Own revenues can be further grouped as original or derived. Original revenue refers to revenue resulting from an offer of goods or services to citizens. Derived revenue is that which accrues from the imperative action of the state to tax without offering compensatory measures (in the form of goods or services), as is the case with taxes on property (Ribeiro Filho, Diniz, and Vasconcelos, 2003). Therefore, according to Brazilian law, even own revenues include taxes and contributions, as well as property, agricultural, industrial, and service revenues.

With regard to transfers from other levels of government, Prado 2001 (apud Schlesinger and Rolim, 2008) proposed three types of classifications: (1) transfers as instruments of fiscal policy of the federation, (2) transfers in the transferor budget (legal or discretionary transferences), and (3) the transfers in the receptor (free or tied transfers).

The first type covers both transfers from tax devolution as well as redistributive transfers linked to sectoral policies. Redistributive transfers help minimize social and economic disparities or inequalities through direct transference of wealth from the most economically dynamic regions to the most depressed regions. With respect to the transfers from tax devolution, they primarily represent a refund to the local region of a portion of the taxes collected by another level of government (state or federal) when the taxable event is linked to the municipality. The last case of transfers related to instruments of fiscal policy are linked to the implementation of sectoral policies, where the planning is centralized but implementation is shared with the local agent.

The second type of classification is based on legal norms (such as provisions under the Constitution) or discretionary decisions (where municipalities may negotiate budgetary contributions from state or federal governments, as in the case of parliamentary budget amendments). According to the authors, discretionary contributions play a complementary or emergency role. However, they constitute an important mechanism from the point of view of sustainability and of drumming up support for re-election campaigns.

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[2] According to the Brazilian National Treasury, transfers from the central and regional governments accounted for, on average, 83.2% of the municipal budget in 2012.

The last type (free or tied transfers) is determined according to the degree of freedom that the receiver will have to manage the resource. If the resource allocation is conditional, that is, if it has specific purposes and cannot be substituted, we call them a tied transfer. On the other hand, unconditional transfers are those in which the local manager can choose the most appropriate use, based on criteria that he decides.

3.3. ELECTIONS AND BUDGET ALLOCATION IN BRAZIL: STYLIZED FACTS

Stylized facts are a stepping one suggested by Kaldor (1961) in the process of modelling. Even if this stylized view of the facts is broad enough to support initial abstractions, it is not necessarily a generalization, but a description of some features based on empirical observation of a phenomenon that is being analyzed (Meyer, 2011). The concept of stylized facts is a very useful and spread tool in dealing with simulation issues (Heine, Meyer, & Strangfeld, 2005), as we done in this study.

In the specific case under study here, our main interest is the impact of elections in the budget allocation, especially if and how they affect allocations in the short and long term. We first examine electoral effects in budget allocation and derived a stylized fact about synchronized and staggered elections. We construct two databases on public budget allocations in the lower levels of the Brazilian government. The first database encompasses the period 2005 to 2012, where the data is drawn from more than 2,700 municipalities;[3] the second one provides information about all 27 states of the Brazilian federation, for the 2004-2011 period.

We collect similar information about the budget at both levels, which includes own revenues from taxation, unconditional transfers from the central government, and local GDP and spending in four main areas: investment, health, social security, and education.[4] We change all variables into per capita constant values (Brazilian reals of the last year of each database) and calculate the natural logarithm to express the elasticity in regressions. To verify the elections calendar effect, we add a dummy for electoral years, which takes the value 1 in central and local elections for the first dataset (municipal budget allocation) and takes the value 1 only in central elections for the second dataset (regional budget allocation).

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[3] All municipalities in the dataset provide observations for at least six years. In 2010, we had the lowest number of observations (2,769) while in 2005, we had the highest coverage (3,836 municipalities).

[4] In the Brazilian federation, education is a public good provided by all three layers: the municipal government is responsible for education until the first level (till about 10 years of age); regional governments provide education till high school and, in some states, to college too; central government offers university and technical education.

In both datasets, we perform four similar panel regressions, estimating the effects of the election calendar and other control variables in the four expenditures. Table 3.1 provides estimation from the Municipal Budget Allocation dataset. We highlight that in all models, the elections calendar effect was significant at the 1% level. Moreover, in the first three models (investment, health, and social security spending), the effect was positive. In the fourth model, the dummy that reflects the electoral staggered calendar negatively influences the level of spending on education. One possible explanation for this negative effect is that spent in education is not the better channel to win votes in the short-term.

Table 3.1 - Elections Effect in Municipal Budget (Staggered Elections)

	(1) Investment	(2) Health	(3) Social Security	(4) Education
Local GDP	0.554 ***	0.488 ***	0.680 ***	0.657 ***
	(0.033)	(0.027)	(0.030)	(0.046)
FPM Transfers	0.124 ***	0.228 ***	0.174 ***	0.204 ***
	(0.024)	(0.043)	(0.031)	(0.028)
Taxation	0.496 ***	0.252 ***	0.264 ***	0.352 ***
	(0.020)	(0.022)	(0.018)	(0.026)
Elections (d)	**0.279 *****	**0.032 *****	**0.061 *****	**-0.151 *****
	(0.007)	(0.005)	(0.005)	(0.008)
_constant	0.619 ***	2.148 ***	0.128	1.733 ***
	(0.144)	(0.223)	(0.174)	(0.192)
R-sq Within	0.2278	0.2006	0.2042	0.0767
Between	0.2680	0.3327	0.0934	0.0010
Overall	0.2221	0.2391	0.0990	0.0060

Notes: Estimations performed with Stata SE 12.0. Marginal effects. No serial correlation control needed. Heteroscedasticity adjusted by robust estimation. Robust Standard errors in parentheses. Stars indicate statistical significance at 1% (***), 5% (**) and 10% (*) levels. (d) For discrete change of dummy variable from 0 to 1.

For the regional (or state) budget allocation, whose outputs are in Table 3.2, we perform similar panel regressions to compare the elections years' dummy effect. Although the predictive power of the models was higher, the election calendar effect was lower. Indeed, in the first model, elections positively influenced the amount spent but it was lower than under the staggered elections model in Table 3.1. In all other three models, the coefficients for elections were not significant. We reiterate that the main difference between these two datasets is that the second has synchronized elections.

Our first analysis suggests that the incumbents choose a budget allocation that broadens electoral prospects both for themselves (in the local elections) and for their partisan allies (in central elections). They seem to increase expenditures in more visible areas (which may coax voters). These preliminary results were similar to those reported by Sakurai & Menezes-Filho (2008) and Klein & Sakurai (2015).

Table 3.2 - Elections Effect in Regional Budget (Synchronized Elections)

	(1) Investment	(2) Health	(3) Social Security	(4) Education
Local GDP	0.170 (0.141)	0.070 (0.050)	0.139 (0.155)	0.197 *** (0.069)
FPE Transfers	-0.168 (0.264)	0.471 ** (0.208)	0.219 (0.441)	0.285 * (0.167)
Taxation	1.278 *** (0.368)	0.639 *** (0.211)	0.924 * (0.451)	0.467 ** (0.169)
Elections (d)	**0.194 *** **(0.039)	**0.022** (0.016)	**0.035** (0.049)	**-0.004** (0.017)
_constant	-4.418 *** (1.285)	-2.302 *** (0.525)	-6.201 *** (1.590)	-0.945 (0.583)
R-sq Within	0.5113	0.8079	0.3311	0.7395
Between	0.0048	0.4412	0.1510	0.4788
Overall	0.0379	0.5205	0.1808	0.5338

Notes: Estimations performed with Stata SE 12.0. Marginal effects. No serial correlation control needed. Heteroscedasticity adjusted by robust estimation. Robust Standard errors in parentheses. Stars indicate statistical significance at 1% (***), 5% (**) and 10% (*) levels. (d) For discrete change of dummy variable from 0 to 1.

By comparing the Table 3.1 and Table 3.2 coefficients, we can say that synchronized elections produce a different effect on public spending. However, these results are related to different government levels; hence, one should be prudent in drawing conclusions. To develop a theoretical explanation to understand this difference in synchronized and staggered elections, we present in the next section a model to illustrate the impact of elections on the allocation of the local public budget.

3.4. THE GENERAL MODEL

We present an extension of the models proposed by Battaglini (2014) and Kaiser & Taugourdeau (2013). The main difference between these models and ours is that we include the opportunistic behavior of politician as a cooperative game geared toward electoral prospects. Our model consists of a federation with two government levels: one central government G, and g local governments, where one local government is eligible for discretionary grants and N local governments are not eligible, or g = {1+N}. The size of the population in each municipality is normalized to 1, such that total population is $N+1$. There are four goods--a local public good l, a central public good c, an unconditional grant public good u, and a private good p. All are normal goods and their utility is additively separable.

3.4.1. Governments and budget allocation

Governments have the political authority to define the allocation of the public budget W based on whether they are at the local or central level during an entire term of office, which is four years long. The budget funds for the central government and for non-eligible local

governments are the amount of taxes in their layer. Although the central government targets eligible local government for unconditional grants u, the decision about the allocation of these grants rests with the central government; therefore, the local budget is the same for eligible and non-eligible municipalities. We represent the budget source for each government layer with the following equations:

$$W_t^G = (N + 1)\tau_t^G \qquad (1a)$$

$$W_t^g = \tau_t^g \ , \qquad g = 1 + N \qquad (1b)$$

Incumbents in both layers have a four-year term and can be re-elected, but the elections are not synchronized (the elections are done every two years). Hence, the first period, t = 1, corresponds to the first year of the local incumbent; t = 3 corresponds to the third year of the local incumbent, and the first year of the central government's term of office, and so on.

In each period, the incumbents produce public goods by allocating the entire public budget to either urgent, emergency, or short-term (s) spending or for structural and long-term expenditures (S). The latter requires one period to make available public goods[5]; on contrary, short-term spending result instantaneously in public goods. The incumbents at both the local and central levels have to incur a minimum[6] of short-term expenditures, which means that $s \in \{\underline{s}, ..., \overline{s}\}, \underline{s} > 0$. Thus, although the central government may spend its budget on unconditional short-term or long-term grants, the local incumbent does not know if he is the eligible for those grants or not.

$$W_t^g = W_t^{g,s} + W_t^{g,S} = \delta l_t + (1 - \delta)l_t, \qquad g = \{1, N\} \quad 0 < \delta < 1 \qquad (2a).$$

$$W_t^G = W_t^{G,s} + W_t^{G,S} = \mu c_t + \zeta u_t + (1 - \mu)c_t + (1 - \zeta)u_t \ , \ 0 < \mu < 1, \ 0 \leq \zeta \leq 1 \quad (2b).$$

The budget allocation rules also imply non-negativity constraints: ($s^{g,G} > 0$; $S^{g,G} \geq 0$) for each government level (which finances public spending via taxes). All the $1 + N$ local governments must decide every period about their level of short-term and long-term expenditures. The central government must take a decision on three different issues each period: the level of short-term and long-term expenditures, the level of short-term and long-term unconditional grants, and the municipalities to which these grants will be allocated.

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[5] We may use as examples of long-term spending, the building of hospitals, schools, bridges, highways, industrial clusters, and so on.

[6] The intuitive logic behind this minimum is that there exists some kind of current expenditure that may be reduced or controlled but cannot be completely cut off (such as wages of public servants).

3.4.2. Voters

At every period t (t=1, … , 8), voters have an initial endowment w and pay taxes τ both to local and central governments. They spend the entire endowment on taxes and consumption. The voters derive utility from the goods; the utility function (3) represents the utility for voter v in period t, subject to the endowment restriction w (4):

$$\Gamma_t^v = \sum_{r=t}^{T=8} \beta^{r-t} \left[U_t^s(p, l, c, u) + V_t^S(l, c, u) + q_r \right] \tag{3}$$

$$w_t^v = p_t + \tau_t^l + \tau_t^c \tag{4}$$

In equation (3), β represents the voter's inter-temporal discount rate (0 < β < 1). The function $U_t^s(p, l, c, u)$ shows voters' utility with private consumption and with consumption of public short-term goods. As its counterpart, the function $V_t^S(l, c, u)$ represents the utility generated by long-term public expenditure, which the incumbents allocate in the previous period. As the voters' utility function is related to allocation decisions in the previous period, this adds informational asymmetry between incumbent—who decides the budget allocation— and voters, who must wait one period to see the results of long-term expenditures (Ferreira & Bugarin, 2007). Both U and V functions are concave and monotonically increasing in all their arguments. To avoid corner solutions, we assume that marginal utility falls from infinity to zero as consumption rises from zero to infinity.

The term q_r ($i.i.d.\{-\bar{q}, \bar{q}\}, \forall t \neq r$) is a political random shock that affects voters at the end of period r-1 and whose mathematical expectation is zero. A positive shock ($q_r > 0$) represents gains for the incumbent in the electoral race, and a negative shock ($q_r < 0$) benefits the opposition candidate. This term adds uncertainty in political races,[7] as is usual in probabilistic voting models.

3.4.3. Voters' perception about local and central public goods

The voter in the eligible municipality hardly differentiates between the provision of goods from the local budget or from unconditional grants (Solé-Ollé & Sorribas-Navarro, 2008). We provide this information through the equations below:

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[7] There are several variables that may be taken as exogenous to our model and may work as an incumbent's popularity shock, such as external economic fluctuations, "expressive" motives, and religious issues (Glaeser, Ponzetto, & Shapiro, 2005).

$$l_t^1 = \delta l_t^1 + (1 - \delta)l_{t-1}^1 + \rho[\zeta u_t + (1 - \zeta)u_{t-1}], \quad \forall t \qquad 0 < \rho \leq 1 \qquad (5a)$$

$$l_t^N = \delta s_t^N + (1 - \delta)S_{t-1}^N, \quad \forall t \qquad (5b)$$

$$c_t = \theta s_t^G + (1 - \theta)S_{t-1}^G + \{(1 - \rho)[\zeta u_t + (1 - \zeta)U_{t-1}]\}, \quad \forall t \qquad 0 < \rho \leq 1 \qquad (5c)$$

The equations *5a* and *5c* state that, although local and central funds provide the local public good in the eligible municipality, the voter attributes some proportion ρ of central funds (the unconditional grants) to the local incumbent's political ability to bring external resources.

The social benefit *B* provided by structural spending *S* is, by definition, higher than the short-term social benefit *b* that results from spending *s* in the amount β. This means that, ideally, the prioritization of structural expenditures is preferable. However, there is a minimum expenditure level in short-term issues, as mentioned before. Equivalent budgetary costs of short-term and long-term expenditures results in different social benefit levels. Moreover, the government must disburse the money for structural spending one period before *B* occurs.

3.4.4. The politicians' payoff

The payoff for politicians is the improvement in their image from the realized spending and is equal to the difference between benefits (*B*, *b*) and expenditures (l, c, u). In our model, the image improvement with structural actions is *I* and the gain with urgent actions is *i*. Note that short-term expenditures $(\delta l_t + \mu c_t + \zeta u_t)$ and image improvement *i* occur in the same period; while *I* occurs a period after $\{(1 - \delta)l_t + (1 - \mu)c_t + (1 - \zeta)u_t\}$. An increase in *I* increases the re-election prospect, or the election of candidates supported by the incumbent.

The equations below represent the social benefits and image improvement, shared between the local level g and the central level G:

$$B_{t+1} = B_{t+1}^g + B_{t+1}^G = (1 + \gamma)b_t \qquad 0 < \gamma < 1 \qquad (6a)$$

$$b_t = b_t^g + b_t^G = i_t + (\delta l_t + \mu c_t + \zeta u_t) \qquad (6b)$$

$$i_t = \left(i_t^g + i_t^G\right) = b_t - [\delta l_t + \rho(\zeta u_t)] - [\mu c_t + (1 - \rho)\zeta u_t] \qquad (6c)$$

$$\left(I_{t+1}^g + I_{t+1}^G\right) = B_{t+1} - [(1 - \delta)l_t + \rho(1 - \zeta)u_t] - [(1 - \mu)c_t + (1 - \rho)(1 - \zeta)u_t] \quad (6d).$$

Note, however, that even if the benefit of *S* is greater by an amount γb, it will appear only in the next period. Therefore, on one hand, it is important for the politician to consider voters' perception of the social benefit and its dispersion in time. On the other, it is also important to the politician's popularity as well as the voter's sensitivity in relation to actions of

s and *S* type. This means that although *I* is greater than *i*, in electoral years the rational politician will increase s to enlarge *i*.

3.4.5. Timing of spending and the government objective function

When spending is the long-term type *S*, by the assumptions of the model, if the decision and disbursement occur at *t*, the benefits associated with this spending require a period of maturation to be observable, which results in the social return on public spending occurring in *t+1*. On the other hand, the short-term allocations *s* provide observable benefits in the same period as the disbursement. Therefore, the local incumbent has to decide the level of δ (for all *1+N* jurisdictions) in each period. As the short-term spending must be positive $(\underline{s} > 0)$, the allocation of grants for short-term expenditures could shift the investment limit for the local government. However, at the time of formulating the budget, the local incumbent does not know if his jurisdiction will be eligible or not. Hence, he will always have to decide the δ level on the assumption that $\underline{s}\ is$ done.

We can split the government objective function into social planer, the local incumbent, and the central incumbent, according to the equations below:

$$p_t + l_t + (1 + N)\, c_t + u_t \tag{7a}$$

$$p_t + (I_{t-1} + i_t) + \rho\, (I_{t-1} + i_t) \tag{7b}$$

$$p_t + \gamma_l(I_{t-1} + i_t) + (1 + N)\, \gamma_g(I_{t-1} + i_t) + (1 - \rho)\, \gamma_u(I_{t-1} + i_t) \tag{7c}$$

For voters, decisions consist of voting in favor of or against the politicians in the game, which will determine if the politician is elected or not. In contrast with politicians, the voter plays only in some periods of the game. In the general model, he plays at the end of periods 2 and 6 for central elections and in periods 4 and 8 for local elections. We assume that to guide their decision, voters will consider the relationship between social benefit and social cost as previously discussed.

3.4.6. Utility function of politicians

We assume that the main goal of the politician is to retain power (Carpenter et al., 2012; Caselli & Morelli, 2004). Therefore, the mayor will allocate resources to municipal budget expenditures that will maximize his probability of re-election **R**l. For his part, the central politician will allocate resources in both central public goods as well as in unconditional grants to allied municipalities that will maximize his probability of re-election **R**c.

According to the general model, there are local elections at the end of periods t = 4 and t = 8. Central elections occur at the end of periods t = 2 and t = 6. We assume that the electoral mandate is for the same length for both positions and mayors may run for re-election only once. Therefore, the mayor maximizes his chance of re-election by maximizing utilities from t = 1 to t = 4. On the other hand, the central politician's challenge is to maximize utility in periods t = 3 to t = 6 and in periods t = 7 to t = 2.[8] We do not consider here any inter-temporal discount rate.

The politician will achieve his goal (re-election) in the case his accumulated image AI is greater than that of his opponents' AI[9]. The equation below describes the accumulated image AI:

$$AI_t = (I_t + i_t) + \xi(I_{t-1} + i_{t-1}) + \xi^2(I_{t-2} + i_{t-2}) + \cdots + \xi^n(I_{t-n} + i_{t-n}) \qquad (8)$$

In equation (8), the accumulated image remains but decreases over time under a tax $\xi, (\xi < 1)$. This implies that the current image impacts voter's choices more strongly than past ones.

3.5. POLITICIANS' EFFICIENCY PROBLEM

3.5.1. Social Planner

We present a benevolent social planner as an efficiency benchmark for public policies. Such a planner will try to maximize the social benefit derived from public budget allocations. As the social planner does not care about his election prospects, his efficiency problem does not change in electoral years. Therefore, the social planner gets to solve a sequence of static efficiency problems as follows:

$$\max_{(\delta, \ \mu, \ \zeta)} b \ \sum_{1}^{N} p_t + l_t + c_t + u_t, \quad \forall t \leq T \qquad (9a)$$

With Equation 6 and considering that for the social planner, improvements to his image from realizing the spending is not worthless, we can rewrite Equation (9) sans issues of political image as:

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[8] For modeling purposes, we consider only eight periods. However, since for the central politician there is no limit to re-elections, one can speak of matching t = 7, 8 and t = 1, 2 assuming that after t = 8 the process will restart, albeit with a new mayor.

[9] For the sake of simplicity, we do not consider in the case of congressmen, issues related to electoral coefficients or the effects of party coalitions.

$$\max_{\substack{(\delta,\ \mu,\ \zeta)}} b \quad \sum_{1}^{N} p_t + \begin{bmatrix} (1-\delta)l \\ (1-\mu)c \\ (1-\zeta)u \end{bmatrix} . (1+\gamma)b_t + \begin{bmatrix} \delta.l \\ \mu.c \\ \zeta.u \end{bmatrix} . b_t, \quad \forall t \le T \qquad (9b)$$

$$s.t. \qquad W_t^g = \delta l_t + (1-\delta)l_t \,,$$

$$W_t^G = W_t^{G,S} + W_t^{G,S} = \mu c_t + \zeta u_t + (1-\mu)c_t + (1-\zeta)u_t$$

$$\delta l_t \ge \underline{s}\,, \qquad \mu c_t \ge \underline{s}\,, \qquad \zeta u_t \ge 0$$

Recalling that the benefits of long term expenditures are greater than those of short-term ones, the social planner will always choose the higher level of long-term expenditures to maximize benefits, which implies that:

$$\delta, \mu \geqslant \underline{s}, \quad \zeta \geqslant 0 \quad \forall\, t \ge T \qquad (10)$$

By choosing a minimal level of short-term expenditure, the social planner will provide a maximization of social benefits in the entire period (T = 1, … , 8).

3.5.2. Isolated decisions of local and central incumbents

As elections will not change the social planner's allocations, his policies will result in similar benefits in all periods. In contrast, both the local and central incumbent will distort the allocation in elections years, to maximize his image improvement and thereby increase his elections prospects. This distortion gives us our first proposition:

Proposition 3.5.a: *Incumbents increase short-term spending in electoral years (both in central and local elections) in an __anticipation effect__, to maximize their electoral prospects by influencing voters, according to voters' inter-temporal discount rate.*

Taken singly, those incumbents will deviate from the social planner's optimal allocation in electoral years, according to the level of the elections. In this sense, local incumbents will increase short-term expenditures in periods 4 and 8 (during local election years), whereas central incumbents will do that in periods 2 and 6 (synchronized with central elections). The short-term allocation is positively correlated with the voters' inter-temporal discount rate (the higher it is, the more the budget allocation will prioritize the short term).

$$W_t^g > \delta \geqslant \underline{s} \ \leftrightarrow\ t \ne (4,8); \ \lim_{\beta \to 1} \delta = \bar{s} \ \leftrightarrow\ t = (4,8) \qquad (11.a)$$

$$W_t^G > \mu \geqslant \underline{s}, \zeta \geqslant 0 \ \leftrightarrow\ t \ne (2,6); \ \lim_{\beta \to 1} \mu, \zeta = \bar{s} \ \leftrightarrow\ t = (2,6) \qquad (11.b)$$

We assume that the main interest of politicians is maximize their accumulated image instead of the social benefit. However, as the former is by symmetry derived from the latter (recall Equation (6)), we build Table 3.3 in terms of the kind of social benefit (b or B) targeted by each category of policy makers, to compare the differences in allocation when it comes to social planner or political incumbents.

Table 3.3 – Policy Makers Maximization Subject According to Elections Calendar

Policy Makers	Periods							
	T	t+1	t+2	t+3	t+4	t+5	t+6	t+7
Election level	-	central	-	Local	-	Central	-	Local
Social Planner	B_{t+1}	B_{t+2}	B_{t+3}	B_{t+4}	B_{t+5}	B_{t+6}	B_{t+7}	B_{t+8}
Central Incumbent	B_{t+1}	$\boldsymbol{b_{t+1}}$	B_{t+3}	B_{t+4}	B_{t+5}	$\boldsymbol{b_{t+5}}$	B_{t+7}	B_{t+8}
Local Incumbent	B_{t+1}	B_{t+2}	B_{t+3}	$\boldsymbol{b_{t+3}}$	B_{t+5}	B_{t+6}	B_{t+7}	$\boldsymbol{b_{t+7}}$

Source: the author.

The voters' temporal preferences are important to determine the switch back from long-term to short-term spending. Recalling that B is bigger than b (Equation (6.a)) and that voters prefer some spending anticipation (Equation (3)), two effects influence the incumbents' decision: β increases the short-term and γ increases the long-term allocation of public resources.

3.5.3. Interaction between incumbents in staggered elections

When we consider the interaction between central and local incumbents, we may recognize intuitively that the links among them may also interfere with the level of short-term spending. In cross-elections (central ones for mayors, local elections for central incumbents), the anticipation effect means some erosion of image improvement, but the incumbent expects a compensation in the following years. Compensation for local supporters is related to central incumbents' discretionary decision about where to allocate unconditional grants. If elected, a deputy can make budget amendments that favor his supporters. As the election is not taken for granted and the local incumbent himself will face an election in two years, the better his image, the higher will be the anticipation effect. The perspective of compensation yields our second proposition:

Proposition 3.5.b: *Local incumbents will increase the <u>anticipation effect</u> in central election years as a tool to acquire votes for their allies, according to their own level of accumulated image and their allies' electoral prospects (as being elected is a condition for allies to reward the supporters).*

As the image improvement ranges from 0 to 1, when it gets closer to the unity, the stimuli for local incumbents to create in <u>anticipation effect</u> are at their maximum. Similarly, the anticipation effect is present in the allies' probability of election (we called that ϕ, ranging from 0 to 1), both for local as well as for central elections.

Another issue that encourages mayors to support central elections' allies is that voters assign part of the benefits from unconditional grants to local incumbents (even if they are not from the same party of central incumbents). Hence, even if central incumbents support mayors in elections, local incumbents are more likely to feed an <u>anticipation effect</u> in cross elections than the opposition. Equation 12 highlights the difference in cross elections, according to the jurisdiction level:

$$\lim_{AI\to1;\phi\to1} \delta.l = \bar{s} \quad \leftrightarrow \quad t = (2,6) \tag{12.a}$$

$$\lim_{AI\to1;\phi\to1} \underline{s} < \begin{bmatrix} \mu.c \\ \zeta.u \end{bmatrix} < \bar{s} \quad \leftrightarrow \quad t = (4,8) \tag{12.b}$$

According to Equation 12, in electoral years the short-term spending will increase. If we represent the increase in <u>anticipation effect</u> by mayors as ψ_l and by central incumbents as ψ_c , the maximization in electoral years may be described as in Table 3.4:

Table 3.4 – Policy Makers Maximization Subject in Electoral Years – Staggered Elections

Policy Makers	Periods			
	t+1	**t+3**	**t+5**	**t+7**
Election level	Central	Local	Central	Local
Social Planner	B_{t+2}	B_{t+4}	B_{t+6}	B_{t+8}
Central Incumbent	b_{t+1}	$(1-\psi_c)B_{t+4}$ $+\ \psi_c\,b_{t+3}$	b_{t+5}	$(1-\psi_c)B_{t+8}$ $+\ \psi_c\,b_{t+7}$
Local Incumbent	$(1-\psi_l)B_{t+2}$ $+\ \psi_l\,b_{t+1}$	b_{t+3}	$(1-\psi_l)B_{t+6}$ $+\ \psi_l\,b_{t+5}$	b_{t+7}

Source: the author.

Recalling that ψ_l is higher than ψ_c and B is higher than b (equations 12 and 6.a), and combining information from tables 3 and 4, we can rank years from the most to the least efficient in the sequence, non-election years, central elections, and local elections. In the entire period, we will have four years with maximum efficiency, two with medium, and two with low efficiency.

3.5.4. Interaction between incumbents in synchronized elections

In Brazil, as described above, we have elections every two years. If the elections were synchronized, according to our model, we will see an interesting effect in the allocation, as a result of politician preferences. This issue gives us the following proposition:

Proposition 3.5.c: *Synchronized elections reduce stimuli for the incumbents to deviate from optimal allocation of public spending, when it comes to the trade-off between short- and long-term expenditures.*

Synchronized elections reduce the proportion of elections years in the entire period. Consider an eight-year period with only two elections years (t = (4, 8)). As politicians are vote seeking, incumbents will try to maximize their accumulated image and will, therefore, target long-term allocations in all years. Table 3.5 describes only the years with deviations from the optimal allocation (the social planner allocation):

Table 3.5 – Policy Makers Maximization Subject in Electoral Years – Synchronized Elections

Policy Makers	Periods	
	t+3	**t+7**
Election level	Central and Local	Central and Local
Social Planner	B_{t+4}	B_{t+8}
Central Incumbent	b_{t+3}	b_{t+7}
Local Incumbent	b_{t+3}	b_{t+7}

Source: the author.

The social gain will be strongly representative in years t_{+1} and t_{+5}. Allocation of public resources in those years will target the long term both for local as for central jurisdictions.

3.6. CONCLUSION

In this study, we analyzed the effects of the timing of elections in the formulation of public budget policies, dividing those policies into two categories according to the timeframe as short term and long term. Employing the instruments provided by Game Theory, we built a dynamic set of eight periods with imperfect information in which two players (local and central policymakers) decide the budget formulation policy, oriented to maximize the next election's results. We analyze two models: first, we discuss a staggered election model, where elections occur every two years, alternately, to local and central government layers. Our second model

explores the possibility of unification of local and central elections in a synchronized way with the convergence of mandates of the studied politicians (local and central governments).

We now highlight three main results of our theoretical discussion. Firstly, by comparing allocations of a hypothetical social planner with local and central incumbents, we demonstrate that the choices of those politicians in allocation of the public budget are sub-optimal in election years. When elections are held at the end of the year, the incumbents increase short-term expenditures as a tool to leverage their prospects in their respective elections. Such an anticipation effect is a source of low efficiency in public spending. This result helps to explain why politicians aim at electoral prospects against public interest. It is merely a matter of politicians' rationality, expressed by an opportunistic behavior. Taking political agents as rational players, one can see that expect better budgeting choices is a vain hope. Institutions must develop and/or improve tolls to control budget decisions. This focus does not suppress the relevance of discussing electoral decisions and the stimuli to ameliorate voters' choices mechanisms, but complement the latter.

A second issue emerges when we study cross elections, i.e., elections on a different level from the jurisdiction of the incumbent (local elections for central incumbents and central elections for mayors). We argue that deviations also occur in cross-election years, according to incumbent's accumulated image and allies' electoral prospects; however, the anticipation effect is greater in local allocations than in central ones because central expenditures increase the local incumbent's image.

Then, we discuss the results of synchronized elections. In this eight-period model, the vote-seeking incumbents in both layers will prioritize the long term in six periods (in the staggered model, they choose the long term only in four periods). This result emerges owing to the lack of a cross-elections effect (discussed above). Therefore, according to our model, synchronized elections reduce incentives for incumbents to change the allocation of public resources from the long term to the short term. In this sense, even if staggered elections may help to promote the political education of citizens, they have a social cost in terms of the allocation of the public budget.

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4. ELECTIONS AND EXTERNALITIES OF HEALTH EXPENDITURES: SPATIAL PATTERNS AND OPPORTUNISM IN THE LOCAL BUDGET ALLOCATION

Abstract:
We examine the determinants of local public health expenditure in a decentralized health system. We take into account the electoral calendar and the effect of central elections and local elections, besides spatial interaction among municipalities. We state that the expenditure in public health at the local level is positively influenced by vicinity and by elections years. Using data from 399 Brazilian municipalities from Paraná's State from 2005 to 2012, we found evidence of electoral impacts on the allocation of public health spent. Our empirical contribution lies in three issues: first, we demonstrate a positive spatial effect in the public health expenditure. Second, the estimations show that election-year public spent shifts, as a response for vote-seeking incumbents' behavior, and population density inverts its influence in the level of spent. Thirdly, central and local elections impact in different ways the local health spent, and demographic issues (aged and young population) are the main channels to this increase in expenditure.

4.1. INTRODUCTION

In recent decades, the literature on fiscal federalism has improved our understanding of the relationship among governments, both in the same layer or between different government tiers. Many of these studies emphasize the issue of externalities in decentralized governmental layers, when jurisdictions may choose the level of expenditure as well as taxation or regulation and this choice may (positively or negatively) affect the fiscal choices of other governments. Although this effect may induce lower efficiency in public expenditures(Akin, Hutchinson, & Strumpf, 2005), decentralization is usually prescribed as a powerful tool to provide citizens with more accountability about governments (Costa-Font & Moscone, 2008), even if centralization offers equality to unequal jurisdictions in terms of preferences or spillovers (Besley & Coate, 2003). One of the main channels for accountability is the emulation induced in same-level jurisdictions, in a yardstick competition (Besley & Case, 1995) or in a modified model of yardstick from the top (Caldeira, 2012).

The literature provides a taxonomy for the relationship among governments, naming vertical externalities in the interactions of two or more different government tiers and horizontal externalities if they involve the same layer of government. According to Foucault, Madies, & Paty (2008), most of the recent studies focus on horizontal externalities, implying mobility of taxpayers and information asymmetries between voters and incumbents (since those incumbents, politicians, usually do not behave cooperatively). By competing in taxation, the fiscal games that result from this interaction usually imply inefficient taxation. Moreover, this competition may

occur in public goods too. When a local government provides more public services (especially public goods that non-residents may absorb), it may result in their neighborhood jurisdictions benefiting from those services and/or competition in the level of public goods supply to maintain their citizens and enterprises' tax bases. This is the case of health services. Bigger cities attract a part of the demand for health services from their neighbor municipalities and simultaneously may raise the local level of health expenditures. However, even if in the short run, decentralization increases local health expenditures, there is evidence of expenditure cuts and strong spatial interactions of spending on public health in the long run (Costa-Font & Moscone, 2008). The institutional differences are important to explain the spatial effect in health expenditure; even if sharing borders, the spatial interactions may be lower if the institutional cluster of two regions differs and the within effect is stronger than the between effect (Atella, Belotti, Depalo, & Mortari, 2014).

On the other hand, a vote-seeking orientation usually provides incentives for the political agent's attempt to obtain desirable economic effects (even if not necessarily sustainable) in periods close to elections to reap electoral gains from such strategy (Rogoff, 1990; Ferreira & Bugarin, 2007; Drazen & Eslava, 2010). This effect is enlarged because voters usually make their choices according to the incumbents' retrospective evaluation and the prospective selection between the incumbent and his opponents (Crisp, Olivella, Potter, & Mishler, 2014). Nordhaus (1975) has explained this kind of incumbent behavior, which he called political business cycle.

One of those opportunistic behaviors manifests in an increase in expenditures in areas that are more visible and may seduce voters (Sakurai & Menezes-Filho, 2008; Drazen & Eslava, 2010), to re-elect the local incumbents and/or to elect the candidates supported by them both in other levels (deputies, governors, president) or in the same level (their successors). Because of this electoral bias, efficiency criteria play a limited role in the geographical distribution of investment and regional demands, leaving political factors with strong explanatory power (Castells & Solé-Ollé, 2005).

We investigate the spatial spillover effect on local public health expenditures in electoral and non-electoral years. Many scholars have found spatial positive or negative effects on the local level of public health expenditures (Moscone, Knapp, & Tosetti, 2007; Baltagi & Moscone, 2010; Videira & Mattos, 2011; Atella et al., 2014). However, the effects of an electoral calendar are not clear in these studies. Using data on public health expenditures in 399

municipalities of Paraná,[1] from 2005 to 2012, we examine if there is an electoral effect and a spatial pattern in this expenditure.

Among the main empirical investigations in health economics in Brazil, many of them focused on public health issues. Although they have discussed public policies (Andrade et al., 2015; Ferreira, Magalhães, Corrrêa, Rodrigues, & Viegas, 2014; Andrade, Chein, Souza, & Puig-Junoy, 2012; Cherchiglia et al., 2010), they do not address issues of spatial interaction. However, by using exploratory spatial data analysis, Rodrigues, Amaral, & Simões (2007) found that Brazilian public health network is superposed and poorly distributed among regions.

To answer our question about the spatial spillover effect and about electoral issues in the allocation of public health spending, we first estimate the hypothesis of spatial autocorrelation in the allocation of public health expenditure at the local level, taking the electoral calendar as a determinant of public spending in municipalities. As elections have a significant effect on public spending, we separately treat electoral and non-electoral years (differentiating between central and local elections), to check for spatial effects.

We structure this study as follows. The next section provides a brief overview of the literature on spatial interactions in health spending. Section 4.3 presents our general model and its implications. We also present and discuss the results of our estimations. Section 4.5 concludes the paper.

4.2. SPATIAL INTERACTIONS IN PUBLIC HEALTH SPENDITURE

The models that hypothesize spatial interactions basically state that the behavioral features of a group affects each individual's choice (Manski, 1993). One of the main assumptions in these models is that the proximity may help understand the nature and intensity of interactions between two individuals in an application of the first Tobler's Law [2] (Almeida, 2012). Owing to this interaction, collective behavior or an aggregate pattern may emerge and produce a significant spatial correlation for the empirical data (Anselin, 2010).

Many scholars offer theoretical propositions and empirical evidence about neighborhood effects on the local level of public expenditure (Besley & Case, 1995; Bivand & Szymanski, 1997; Baicker, 2005; Costa-Font & Moscone, 2008; Baltagi & Moscone, 2010; Yu,

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[1] Paraná State is one of 27 Brazilian regional jurisdictions. We chose this sample because of data availability and lack of municipality splitting in the period studied.

[2] The first Tobler's Law (also known as the first Law of Geography) posits that everything is related to everything else, but near things are more related to each other (Tobler, 1979).

Zhang, Li, & Zheng, 2013; Costa, Veiga, & Portela, 2015). Usually, the literature on spatial fiscal competition refers to three channels to explain how local governments interact fiscally: yardstick competition, expenditure externalities, and fiscal competition (Granado, Martinez-vazquez, & Simatupang, 2008).

The formal yardstick competition relies on the assumption that voters do not have perfect information about the ideal level of public services that a government should offer and compare expenditures and taxes in neighboring jurisdictions (Besley & Case, 1995). By comparing the local government's performance (measured by job opportunities, public health services, educational facilities, taxation level, etc.) the voter may move to another jurisdiction, in a process called *voting with their feet* (Tiebout, 1956). However, in Brazil, when a voter moves to another jurisdiction, he may keep his original electoral domicile, and this may smooth the yardstick competition effect.

The tax competition mechanism's main idea is that local governments compete with neighboring jurisdictions for increasing the tax base. The main theoretical issues can be found in Wilson (1999). The hypothesis of tax competition are related to two points: the legal framework of taxation and the intensity of tax base mobility and arbitrage across jurisdictions (Genschel & Schwarz, 2011). In Brazil, less than 5% of the tax burden, on average, is in the local layer,[3] but several metropolitan areas show that both citizens and firms choose to move to neighboring municipalities following tax competition.

The expenditure externalities hypothesis posits that provision of public goods (health, education facilities, public transportation, infrastructure, housing) in one jurisdiction may affect its neighbors. The literature provides empirical evidence of both positive and negative effects in spatial interactions of local health expenditures. Yu et al. (2013) found that Chinese provincial governments decrease their own health spending when their neighboring provinces increase theirs, but this result is affected by low citizen mobility (Caldeira, 2012). On the other hand, Moscone, Knapp, & Tosetti (2007) found positive spatial effects in specific health expenditures even with alternative contiguity spatial matrices (by population, population density, and political party). Although the cooperation effects at the municipal level may be not significant at the level of public spending, the benefit spillovers are strong, even for municipalities outside inter-

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[3] According to Brazilian National Treasury (2015), since 2000, the Federal Government has the main share in tax burden (69.2% on average), regional governments have 26.1% and the municipalities have only 4.7% of the public revenues sourced by taxes.

municipal communities (Frère, Leprince, & Paty, 2014) and incumbents may behave opportunistically, increasing public expenditures in pre-electoral periods (Foucault et al., 2008).

Another taxonomy suggested in the literature explains economic interaction by using a triple categorization: endogenous, exogenous, and correlated effects (Manski, 1993; Brock & Durlauf, 2001). The neighbors' influence determines endogenous effects, which means that individual behavior is to some degree the result of other group members' influence. The exogenous effects are an issue of belongings as a feature or attribute of the individuals that belong to the group. The correlated effect hypothesis posits that neighbors behave similarly because their opportunities, trends, features, and constraints are quite similar (Moscone et al., 2007).

It is reasonable to believe that those three categories of interactions may occur in local public health expenditures. Moscone & Knapp (2005) identify some drivers of those spatial interactions: a key actor may influence his pairs by his good (bad) performance, resulting in a mimicking (endogenous) effect; some municipalities may share an (exogenous) resource, e.g., a regional hospital; an entire group may have to observe specific laws (Brazil) or attend to upper-tier authority policies (exogenous factor). Some feature that is common to part of a group (a river, political alignment, or an airport) may generate common opportunities, challenges, or threats (correlated effects).

In general, both approaches (the yardstick, externalities, and tax competition approach and the endogenous, exogenous, and correlated view) suggest that interactions among neighboring jurisdictions may influence individual choices in terms of the overall budget allocation and level of public health expenditures.

In the next section, we describe the empirical model developed in this study before moving on to a discussion of the results.

4.3. THE GENERAL EMPIRICAL MODEL

We use a simple model in which public health is treated as a local public good with spillovers (Levaggi, 2010), in keeping with the decentralization of a public good's provision in fiscal federalism (Besley & Coate, 2003). We represent the citizen c utility function by:

$$U_c = u(h_c, (1-k)f(z_i) + kf(z_j)), \quad 0 < k < \tfrac{1}{2} \tag{1}$$

Where h_c is the demand for the public health good, z_i is the provision of this public good in i, z_j is the provision in j, and k is the spillover parameter. Depending on the extent to

which $k \to \frac{1}{2}$, the public good's spillover increases. The reason for $k < \frac{1}{2}$ is that residents prefer to consume more public goods in their jurisdiction than those outside (Solé-Ollé, 2006).

Proposition 4.3.a: *Policymakers increase health spending in electoral years (both in central as well as in local elections), to influence voters.*

The local government has a budget funded by taxpayers (the citizens) to allocate to local expenditures. It tries to maximize both citizen's goodwill and political capital, based on the electoral perspectives. Political capital is key to the voter's decision in the elections. Thus, local governments will have incentives both to reduce expenses that may be supported by their neighboring municipalities and to provide more money for visible expenditures (especially in election years), which are directly absorbable by voters. In a budget model developed from Dembour & Wauthy (2009), the incumbent's budget in region i is given by

$$B_i = t_i C_i - \left[s_i C_i + k l_i s_i C_j \right] + \left[k l_j s_j C_i \right] \tag{2}$$

where the budget is the result of tax revenues from citizens $(t_i C_i)$, the public goods spending (s_i) on his citizens and neighboring citizens $(C_i,\ C_j)$, and the spending on his citizens by neighboring jurisdictions $(s_j C_i)$, according to the level l of public goods provided by the jurisdictions. Higher levels of l in neighbors reduce the spending in a community. Although, with political capital being important in the elections and $k < \frac{1}{2}$, the incumbent tries to raise l to enhance his electoral chances of winning. However, two undesirable effects result when he does that: he attracts more neighbors (that will share the budget but are not voters in the incumbent's municipality) and simultaneously reduces the neighboring incumbent's political capital.

Proposition 4.3.b: *Policymakers respond positively to changes in the level of health spending in neighboring jurisdictions, by increasing expenditures on local public health.*

Even if raising expenditures on health brings undesirable effects, the local incumbents know that they will be evaluated and compared against politicians' decisions in time and space. Equation 3 captures the sense of this perception.

$$l_{i\,t} = \delta l_{i,t-1} + \gamma l_{j\,t} \tag{3}$$

The voter considers two issues when it comes to the level of public goods; he compares the historical level in his jurisdiction with the current level in neighboring jurisdictions.

Given this spatial relation and the incumbent's political orientation, the general equation given below explains the budget allocation for providing public health goods:

$$H = \alpha + \rho W_1 H + \beta_1 Elec + \beta_n X + \xi, \qquad \xi = \lambda W_2 + \xi \qquad (4).$$

where the allocation in health is related to neighboring allocations, electoral calendar, current X_t variables (demographic issues, income, urbanization, and so on), and a spatial error distribution.

4.4. ESTIMATION RESULTS AND DISCUSSION

4.4.1. Estimation results

We performed estimations under six different models. We built the models according to the general equation,

$$Y_{it} = \alpha_i + \rho W Y_{it} + \beta_1 Elec_{it} + \beta_2 HFac_{it} + \beta_3 Loc_{it} + \beta_4 Dem_{it} + \xi_{it} \qquad (5)$$
$$\xi = \lambda W \xi_{it} + \varepsilon_{it}$$

In the equation above, Y_{it} is the natural logarithm of the real per-capita municipal expenditure. According to the Hausman test, we use a fixed effects model, where the variable α_i represents the local heterogeneity. The second term on the right-hand side is the spatial lagged dependent variable, subject to the spatial matrix W. The third group of variables ($Elec_{it}$) is dummies for election years, and they control both for the occurrence of elections as well as for the election type: local elections (to choose mayors and municipal council) and central elections (voting for executive and legislative seats at the federal as well as the regional level).

In the fourth term, $HFac_{it}$, we control for the public provision of health goods by adapting the model proposed by Atella, Belotti, Depalo, & Piano Mortari (2014), using two variables as a proxy of healthcare infrastructure and facilities. The first is the number of public health facilities per thousand inhabitants provided by regional governments. Considering that the Paraná state drives public health policies by sub regions, we clustered data according to regional health facilities. The second variable we used was the local health infrastructure; by using factorial analysis, we built a factor for local public health, based on human resources, equipment and installations by municipality[4].

Additionally, in the term Loc_{it} we control for local features such as population density (following Baicker, 2005) and per capita FPM.[5] In the last set of controls (Dem_{it}), we gather

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[4] The factor we generated provide the following values for statistical tests: determinant of correlation matrix of 0.568; Bartlett test of sphericity with χ^2 of 1801.889 and p-value of 0.000 and Kaiser-Meyer-Olkin measure of sample adequacy (KMO) of 0.684.

[5] FPM, or Municipalities Participation Fund, is a *per capita* federal transfer to Brazilian municipalities. From 2005 to 2012, it represented 39.7% of the entire municipalities' budget revenues, according to

demographic data usually mentioned in the literature (Baltagi & Moscone, 2010) as having a role in determining healthcare expenditure: the dependency rates for old and young inhabitants [6] and the proportion of women and of rural people, related to total population. We changed all variables into natural logarithm, except the dummies. This log–log form allows us to interpret the coefficients as elasticities. Table 4.1 describes the variables for each category listed above, as well as the expected effect for them.

Table 4.1 - Determinants of per capita public health spent in local level.

Category		Variable	Type	Description	Expected Effect
Elec	Elections' Years	Elec	Dummy	Elections performed in $Year_t$ (both local or central)	Positive
		L_elec	Dummy	Local elections performed in $Year_t$	Positive
		C_elec	Dummy	Central elections performed in $Year_t$	Positive
HFac	Health Facilities	L_infra	Log	Public health infrastructure provided by the local government	Positive
		R_facil	Log	Public health facilities provided by the regional government	Negative
Loc	Local features	DPop	Log	Municipal population density in $Year_t$	Negative
		FPM	Log	FPM per capita in $Year_t$	Positive
Dem	Demographic controls	Old	Log	Dependency rate for population over 60 years old.	Positive
		Young	Log	Dependency rate for population below 15 years old.	Negative
		Fem	Log	Proportion of women in the total population	Positive
		Rur	Log	Proportion of rural inhabitants in the total population	Positive

Source: the author.
Notes: Details about features of all variables are available under demand.

Our Models 1 and 2 consider the electoral calendar as explanatory variables for per capita local spending on public health during the entire period of eight years. In the first model, we consider just the occurrence of elections and in the second, we differentiate between local and central elections. In Model 3, we do not consider all the years, but only those four years were elections did not happen. On the contrary, in Model 4, we consider exclusively the four election' years. Models 5 and 6 were split from Model 4 and they consider, by each turn, two periods: only central elections (Model 5) or only local election years (Model 6). We chose to estimate various spatial models instead of only one to avoid the incidental parameter problem [7] and reduce the

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National Treasury data. Its rules favor smaller municipalities (whose fiscal power is low), working as a proxy for equity policies.

[6] We define dependency rates for old and young people as the population of interest (aged over 60 and below 15) divided by the population aged 15–60 years.

[7] For short panels, where T is fixed and N→∞, it is not possible to estimate consistently the coefficients of the spatial fixed effects, because each n must have a dummy. There are several ways to overcome this limitation, and usually this problem does not matter when the coefficients of interest are β instead of the spatial fixed effects (Elhorst, 2003).

estimation time. We conduct all econometric analyses using Stata and GeoDa. Before the estimations with spatial techniques, we perform statistical tests to better fit the panel estimation (Breusch–Pagan, Hausman and Modified Wald Tests). The results of these tests (available in the appendix) suggest the most suitable estimation method is to use the fixed effects panel.

For the spatial estimation we use the adapted specific-to-general approach (Elhorst, 2010): first, we estimate the plain panel model (with no spatial treatment and according to the statistical test results mentioned above) and test for spatial correlation in the residuals by measuring Moran's I and Geary's C (Anselin, 1988). In all six models, those indexes were significant. Then we use spatial lag (SAR) and spatial error models (SEM) for all years in the range and separately for electoral and non-electoral years, comparing the Akaike and Schwarz criteria and adopting the most suitable. For central and local election estimations, we use the same model as for election years (because the data is available for only two years for both local and central elections and a four-year lagged variable would not be representative enough).

To select the best spatial weight matrix, we follow Almeida (2012). We test several matrices (queen, rook, distance, inverted distance, binary distance, and binary inverted distance).[8] The matrix that provided the bigger Moran's I and the further from 1 Geary's C for the residuals (in the fixed effects panel regression, without spatial instruments) was the binary distance[9] (binary means that we limit the municipalities considered neighbors to those that distance x or less kilometers (W^x), with x = 41). Then we perform the estimations with this matrix (adapted according to the size of T in each model).

We also cluster the data in the estimations (as done in Frère et al., 2014), according to the distribution of regional facilities in the entire period and considering the occurrence of regionalization in public health services. Figure 4.1 shows the distribution of those structures in 2005 and 2012. We see that the health facilities saw no significant changes in the state from the first to the last year in the data. Moreover, even if the facilities' amount or location changes

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[8] For distance-based matrices, we test three distance specifications: 41 kilometers (the greatest distance between two observations), 100 kilometers (as a placebo matrix, i.e., a matrix that includes a high level of spatial autocorrelation), and 50 kilometers, that is the generally used limit in empirical literature on spillovers between local governments (Costa et al., 2015).

[9] When testing the residual's spatial autocorrelation (after panel regression), we find high levels of Moran's I and Geary's C, are both significant at a 1% level in most cases. We list the statistics for these two spatial correlation indicators in Table 4.1, as Moran's I before and Geary's C before (which means before spatial correction).

slightly, the spatial distribution suggests that the policy of regionalization in public health facilities does not appear to have been replaced by other policies.

Figure 4.1 – Regional Health Facilities in Paraná State - 2005 and 2012
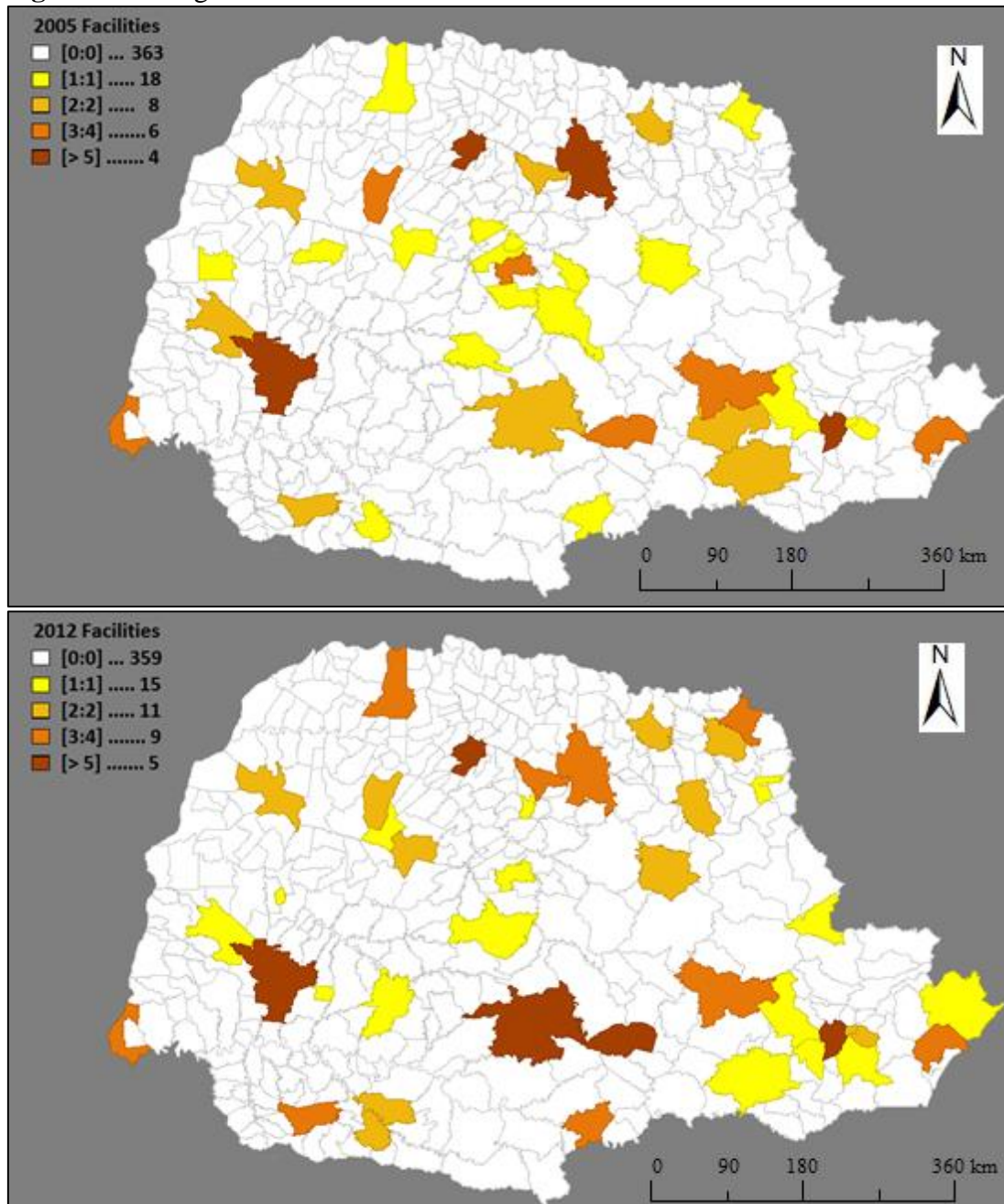
Notes: Mapped with Geoda software.

Based on panel estimation outputs, the spatial error regression model (SEM) is the most appropriate way to describe the data for all six models. We represent this in the equation below, by excluding the rho in (5) and changing the meaning of *t*.

$$Y_{it} = \alpha_i + \beta_1 Elec_{it} + \beta_2 HFac_{it} + \beta_3 Loc_{it} + \beta_4 Dem_{it} + \xi_{it}, \quad \xi = \lambda W \xi_{it} + \varepsilon_{it} \quad (6)$$

$$t = \begin{cases} election\ year \\ non - election\ year \\ central\ election\ year \\ local\ election\ year \end{cases}$$

Table 4.2 present estimations outputs for all six models, as well as the tests coefficients for spatial correlation (Moran's I and Geary's C values, significance level and standard deviation without spatial correction).

4.4.2. Discussion

The first question has to be whether there is a spatial pattern in the allocation of public health spending. The spatial indicators Moran's I and Geary's C suggest that there exists both global as well as local spatial autocorrelation, and the estimations should consider spatial effects. Moreover, Geary's C values lower than 1 (ranging from 0.570 to 0.765) suggest that the spatial effect is positive. The estimated lambda confirms that the spatial effect is positive at a 1% significance level. All models show the same coefficient for the lambda (0.099), suggesting that the spatial correlation in the errors affects both electoral and non-electoral year's expenditures, in central and local elections. In other words, we found a positive spillover effect in public health spending at the local level. A similar spatial pattern was also found in Moscone et al. (2007), but it differs from the negative correlation reported by Akin et al. (2005).

Applying the taxonomy proposed by Manski (1993), a possible explanation for the contrast is the exogenous and the correlated effects. In the former case, the Brazilian Federal Constitution establishes a minimum spending level in health (as well as in education) for each government layer. The law seems to exert a normative power (when it comes to the level of expenditure in each municipality), and this role can be labeled as an exogenous pressure. We can explain the correlated effects by looking at the coefficient of the local health facilities' effect. The local health infrastructure increases the health spending level in all models. For the entire period, its effect is between 0.015 and 0.016 at 1% significance level, except for electoral years' models. In Model 5 (Central Elections Years), its effect is lower (0.007), but its significance remains at 1% level. On the other hand, in Model 6 (Local Elections Years) its importance increases to 0.032.

Table 4.2 – Estimations outputs

	Model (1) All Years	Model (2) Elections Type	Model (3) No Election Years	Model (4) Election Years	Model (5) Central Elections	Model (6) Local Elections
MAIN:						
Fixed Effects	3.633	3.807	4.057	2.282	2.039	2.042
Elec	0.040 ***					
	(0.001)					
L_elec		0.052 ***				
		(0.002)				
C_elec		0.030 ***				
		(0.001)				
Loc_health	0.016 ***	0.015 ***	0.015 ***	0.016 ***	0.007 ***	0.032 ***
	(0.002)	(0.002)	(0.002)	(0.004)	(0.003)	(0.005)
Reg_health	-0.054 ***	-0.053 ***	-0.089 ***	-0.032 ***	-0.076 ***	0.067 **
	(0.013)	(0.014)	(0.021)	(0.009)	(0.017)	(0.031)
Dpop	-0.163 ***	-0.179 ***	-0.295 ***	0.403 ***	0.491 ***	0.611 ***
	(0.020)	(0.020)	(0.017)	(0.050)	(0.077)	(0.075)
FPM	0.442 ***	0.426 ***	0.443 ***	0.421 ***	0.492 ***	0.293 ***
	(0.010)	(0.011)	(0.027)	(0.008)	(0.025)	(0.034)
Old	0.393 ***	0.397 ***	0.335 ***	0.648 ***	0.590 ***	0.765 ***
	(0.030)	(0.031)	(0.018)	(0.061)	(0.099)	(0.090)
Young	-1.000 ***	-0.989 ***	-1.036 ***	-0.879 ***	-0.617 ***	-1.033 ***
	(0.038)	(0.038)	(0.035)	(0.085)	(0.028)	(0.144)
fem	0.478 **	0.477 **	0.633 ***	0.241	0.715 ***	-0.359 **
	(0.214)	(0.213)	(0.200)	(0.210)	(0.167)	(0.141)
rur	-0.018 **	-0.017 **	-0.015	-0.016 *	-0.001	-0.007
	(0.007)	(0.007)	(0.009)	(0.008)	(0.013)	(0.008)
SPATIAL:						
lambda	0.099 ***	0.099 ***	0.099 ***	0.099 ***	0.099 ***	0.099 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Moran's I	0.373 ***	0.374 ***	0.366 ***	0.330 ***	0.316 ***	0.313 ***
	(-0.003)	(-0.003)	(-0.003)	(-0.003)	(-0.003)	(-0.003)
Geary's C	0.736 ***	0.736 ***	0.765 ***	0.570 ***	0.595 ***	0.646 ***
	(-0.014)	(-0.014)	(-0.016)	(-0.013)	(-0.012)	(-0.022)
VARIANCE:						
sigma2_e	0.023 ***	0.023 ***	0.019 ***	0.021 ***	0.009 ***	0.022 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
N	3192	3192	1596	1596	798	798
Groups	399	399	399	399	399	399
Panel Length	8	8	4	4	2	2
R-squared						
Within	0.584	0.583	0.616	0.569	0.683	0.482
Between	0.335	0.330	0.310	0.043	0.030	0.000
Overall	0.363	0.358	0.332	0.089	0.061	0.003

Notes: Estimations performed with Stata SE 12.0. All estimations include unit fixed effects. Standard errors in parentheses. Spatial correlation indicator Moran's I and Geary's C shows the spatial autocorrelation before spatial estimations. Significance levels: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Seemingly, incumbents use local health facilities as a channel to spend more in election years, mainly during local elections, and this constitutes a correlated effect.[10] Figure 4.2 shows that such facilities are widely spread in all municipalities (in the first year of our panel there

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[10] This kind of *electoral tool* is consistent with our predictions in Chapter 3. The politicians use the anticipation effect to intensify health spending, considering that they are visible enough to seduce voters.

was no municipalities without local health facilities and in 2012 only one of the 399 local jurisdictions had less than two local facilities for public health), and this feature explains the use of them as a tool to intensify budget allocations for health.

Figure 4.2 – Local Health Facilities in Paraná State - 2005 and 2012
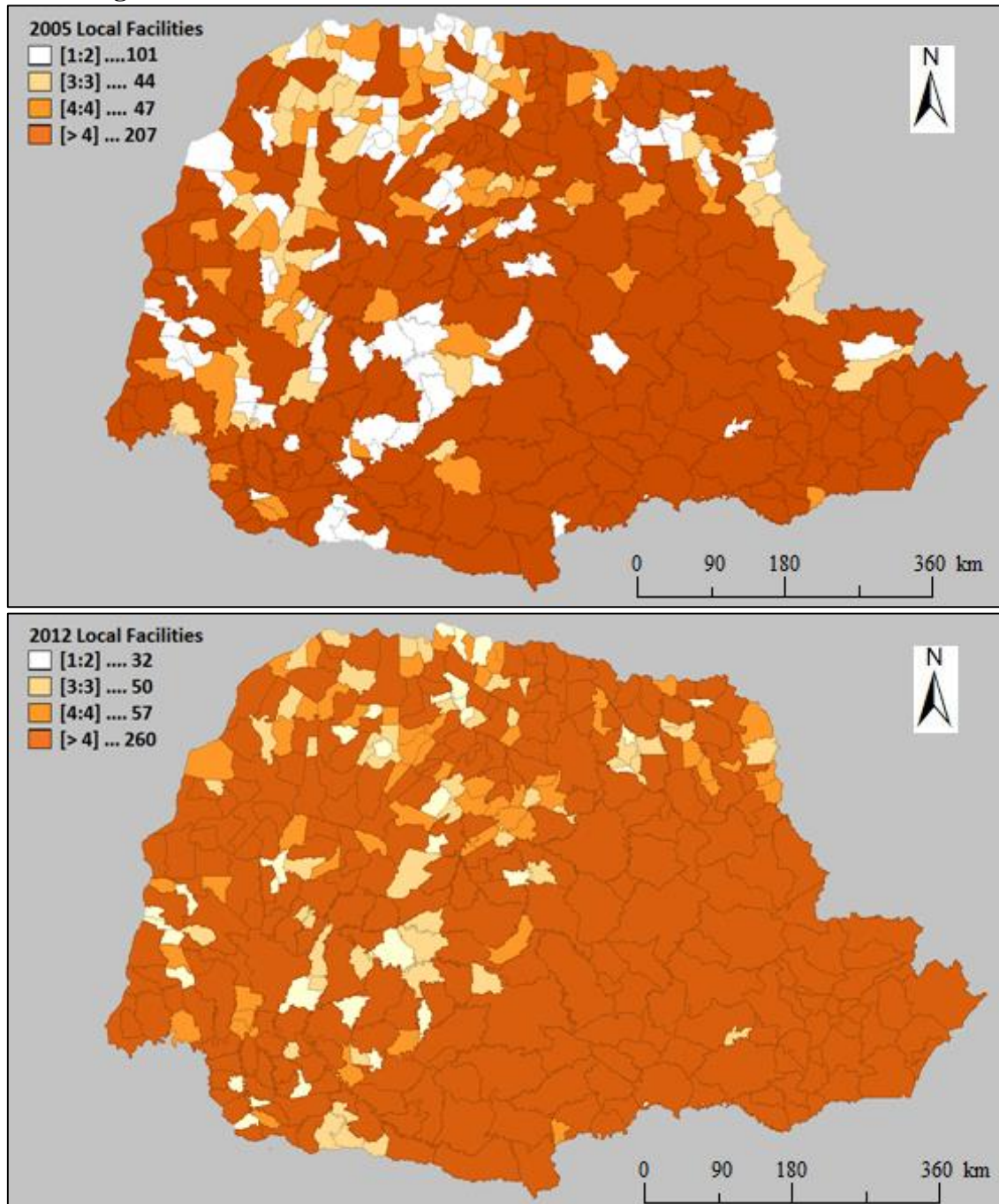
Notes: Mapped with Geoda software.

The second issue to address is whether elections as a whole affect health expenditure. According to the estimations, we can say at a 1% significance level that elections increase local spending with a coefficient of 0.040. When we split this effect according to the election type

(local or central), we see that the former has a higher effect (0.052) than the latter (0.030),[11] which means that local elections affect almost twice the health expenditures at the municipal level.

As verified before in capital and current expenditures (Sakurai & Menezes-Filho, 2008) or in grants (Ferreira & Bugarin, 2007), elections are strong enough to change the allocation pattern in local governments. Health spending seems to have a politically motivated component, stronger in local elections (considering an incumbent's re-election and/or his goal of electing the supported successor), but still significant at the 1% level when it comes to coaxing voters to support his allies in central elections. The relevance of central elections for mayors is probably tied to grants access (remember that municipalities shoulder less than 5% of the Brazilian tax burden).

More than discussing if elections change the allocation of public resources, we should check how the electoral calendar exerts pressure on every variable in our models. In other words, a third important question to answer is how local and central elections indirectly affect the health budget allocation. Although we began an answer earlier, the most interesting revelation of the estimations is that the variables' effects differ, according to election type (local or central), especially in the coefficient's values for age variables and population density. Even if the revenue variable (FPM) coefficient does not change much in the first five models (ranging from 0.419 to 0.491, with a 1% significance level), the main channels to explain the *per capita* health expenditure level in municipalities, according to all models, are demographic issues related to age and gender: old people exert a strong positive pressure (with a 1% significance level in all models). However, more young inhabitants in the total population tend to reduce this spending (with a 1% significance level). Moreover, the coefficients' values vary greatly in election years. Contrasting electoral and non-electoral years (models 3 and 4), the weight of aged people becomes stronger (from 0.342 to 0.666) and the negative effect of young people becomes weaker (from −1.036 to -0.879). The results related to age are not the same as Atella et al. (2014), but they also found that young people strongly reduce the local public health spending. A feature of the Brazilian public health system, namely, distribution of medication with no charges, may help to understand this, as it specially benefits the aged population).

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[11] The Wald Test results $(\chi^2 = 42.32)$ confirm that the coefficients are different for local and for central elections. Once again, this result (local elections with a higher effect in *distortions* in the budget allocation than central ones) is consistent with our predictions in Chapter 3.

The population density variable exhibits an interesting variation in the models. In the first models (all years' models and the non-electoral one), the concentration reduces the spending (the coefficient values were -0.163, -0.179 and -0.295, respectively). This result does not fit the British case (Moscone et al., 2007) but is similar to the Spanish pattern (Costa-Font & Moscone, 2008). However, in the last models (election years, central elections, and local elections years), the sign of this variable changes (0.403, 0.491 and 0.611) and its significance level still remain at 1%. One possible explanation is that the more densely populated a municipality is, the more the central government wants to entice voters because this feature reduces the unit cost of acquiring a vote (Cox, 2010), and this increases the level of public health expenditure in central election years, probably through grants from the central government to the local incumbents.

4.5. CONCLUSION

In this study, we tested the hypothesis that policymakers' choices with regard to health spending at the local level are spatially correlated and electorally oriented. We check the influence of a set of demographic, electoral, and economic determinants of public health activity. We performed a spatial panel data analysis encompassing 399 municipalities from 2005 to 2012, estimating six models, namely, all years, all years controlling by election type, non-electoral years, electoral years, central election years, and local election years. Our contribution to the literature lies in the following three findings:

First, we show that health spending is driven by (global and local) positive spatial autocorrelation and is persistent, meaning that spatial effects in the allocation of spending exist, independent of an electoral calendar. The parametric estimation that best fit the data was the spatial error model estimation (SEM), and the lambda value for all models were the same (0.099), indicating that the spatial correlation affects both electoral and non-electoral year's expenditures, in central and local elections. In other words, we found a positive spillover effect in public health spending at the local level. Policymakers pay attention in their neighbors before decide how much to spent in health. However, they do not maximize the spent but increase it in the same direction other municipalities do. Exogenous effects (normative power of the law when it comes to minimum values of health spending in the municipalities) and correlated effects (the role of local health infrastructure, particularly in local election years) help understand the channels of this spatial dependence.

A second issue is that elections are strong enough to change the allocation pattern in local governments, probably as a political strategy to entice voters. Health spending seems to have a politically motivated component, stronger in local elections (considering an incumbent's re-election and/or his goal of electing the supported successor) but still significant in central elections. Considering that less than 5% of the Brazilian tax burden is shouldered at the local level, the relevance of central elections is probably tied to grants access. Once again, we observe here that budget allocation's decisions are tied to electoral race prospective.

The last point is the difference between central and local election effects. The main channels to explain the per capita health expenditure level in municipalities, according to all models, are demographic issues related to aged people (positive effect) and young people (negative effect). Moreover, in election years, the positive aged-people effect increases and the negative young-people effect levels off. Another important issue is that the population density variable changes from a negative effect (in all years and non-electoral year models) to a positive effect in election year models. This suggests that the more densely populated a municipality is, the more efficient will be the campaign to entice voters, and one effective instrument to do that is to increase public health expenditure in election years.

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4.7. APENDICES

Appendix 4.7.1 - Statistical tests coefficients

Tests	Model 1 All Years	Model 2 All Years - Election's Type	Model 3 Non- Election Years	Model 4 Election Years	Model 5 Central Election Years	Model 6 Local Election Years
Breusch-Pagan						
$\bar{\chi}^2$	5483.71	5481.59	1193.42	1054.31	199.92	116.58
Prob > $\bar{\chi}^2$	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Hausman						
χ^2	188.94	184.37	96.25	166.10	93.05	97.22
Prob > χ^2	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
AIC – SEM Model	-2582.100	-2581.918	-1566.496	-1382.602	-1355.484	-674.898
AIC – SAR Model	-1850.262	-1853.962	-1218.439	-963.586	Not feasible	Not feasible
BIC – SEM Model	-2515.347	-2509.097	-1512.743	-1328.849	-1308.663	-628.077
BIC – SAR Model	-1779.044	-1776.809	-1162.476	-907.622	Not feasible	Not feasible

Appendix 4.7.2 – Data Descriptive Statistics

```
Variable        |     Mean   Std. Dev.       Min        Max |   Observations
----------------+--------------------------------------------+----------------
Health  overall |  5.936581  .4390776   1.810152   7.435058 |   N =    3192
        between |            .3765779   2.575073   6.957425 |   n =     399
        within  |            .2264716   2.890888   6.793344 |   T =       8
                |                                            |
R_facil overall |  .0631281  .2930255          0   2.564949 |   N =    3192
        between |            .2799936          0   2.371122 |   n =     399
        within  |            .0874044  -.8687119   1.016205 |   T =       8
                |                                            |
L_facil overall |  1.661268  .8772308          0   5.214936 |   N =    3192
        between |            .8520379          0   5.039746 |   n =     399
        within  |             .212504   .4922877   3.047562 |   T =       8
                |                                            |
DPop    overall |  3.355769  .8812257   1.170271   8.355924 |   N =    3192
        between |            .8810135   1.210232   8.320662 |   n =     399
        within  |             .045569   2.606341   3.776077 |   T =       8
                |                                            |
FPM     overall |  6.414672  .5890808   4.150872   8.229517 |   N =    3192
        between |            .5732814   4.367048   8.073168 |   n =     399
        within  |            .1381508   5.820819   7.049802 |   T =       8
                |                                            |
Old     overall | -1.669181  .2259521  -2.505926  -1.107149 |   N =    3192
        between |            .2170519  -2.415738  -1.182632 |   n =     399
        within  |            .0636093  -1.872506  -1.439783 |   T =       8
                |                                            |
Young   overall | -.9660084  .1585308  -1.492989  -.4340189 |   N =    3192
        between |            .1383126  -1.326489  -.5398076 |   n =     399
        within  |            .0777407  -1.171562  -.7843351 |   T =       8
                |                                            |
Fem     overall | -.7011681  .0244664  -.9108326  -.6349159 |   N =    3192
        between |             .021926  -.7873892  -.6451296 |   n =     399
        within  |            .0109044  -.8246115  -.5858592 |   T =       8
                |                                            |
Rur     overall | -1.358863  .8527182  -8.011628          0 |   N =    3192
        between |            .8355637  -5.168531          0 |   n =     399
        within  |             .174623  -4.643323  -.1795649 |   T =       8
```

5. CONCLUDING REMARKS

In this thesis, we discussed the relation between public policies and elections, both in a theoretical way as providing some empirical evidences in more than one situation that encompasses effects of elections in public policies. When it comes to public policies, we focused the issue of allocation of public resources in local governments, as well as in federations with various levels of government. The supporters of federation systems argue that this model provides at the same time decentralization and interdependence among the various layers of government, which should increase accountability, transparency and efficiency. We propose a set of essays to examine this assumption and add some points of view and data analysis to the debate about decentralization and interdependence in fiscal federalism. The main question (that made the connection with the different essays) was: How elections affect the allocation of public revenues in local governments and in federations with various levels of government?

We have discussed the research problem by different perspectives and using complementary methodologies (panel model, spatial estimations and game theory tools), to reveal additional features of the same problem. We changed the methodological approach in each essay, but even with different *modus operandi* in the chapters, we believe the studies are clearly supportive each other in answer the main question.

In the first essay (chapter 2), we discussed the intergovernmental, unconditional transfers from central to local jurisdictions, following the intuition that some issues are not appropriately covered by literature. By using a balanced panel data, we show that it is important to consider the role of deputies in the allocation of grants in federation systems, as a political-arena effect (Cox, 2010). Deputies got ex-ante and ex-post discretionary influence over budget allocation and this influence goes beyond budget amendments, because they may use (indeed, they actually do) their network to shorten the grant's path for their supporters. The influence of deputies in the grants is a strategic tool to central government to coopt votes in the parliament. Because of that aim, same party deputies exert less influence than allied deputies in the transfers. Moreover, another issue we addressed may change the level of grants: the changing alliance status, if considering the year when the Congress passes the budget act and the year when the central government effectively spend the budget. As the president got tools to influence the grants ex-post, he may punish ex-allies as well as reward the brand new ones, in a kind of budget-gap effect. The budget formulation is mandatory, but the chief executive has leeway space, which means that he may change the municipalities in the allocation or simply do not transfer all the estimated grants in the year after budget formulation. The last (and

stronger) factor of the grants' allocation was the electoral calendar; in the electoral years, municipalities receive more capital grants (especially in central elections), in line with the literature. We conclude in this essay that the literature over intergovernmental grants should add these three effects (deputies' role, budget-gap and electoral calendar) to explain the dynamic of transferences from central to local jurisdictions.

The previous essay revealed that the effects of local and central elections are quite different when it comes to discretional monies from central government. Therefore, it provided elements to the proposition the subsequent essay, which comes from the simple question: considering staggered or synchronized elections, which one is more suitable and desirable, in terms of efficiency in allocation of public resources? We first provide estimations outputs from Brazilian municipal and regional (state) level, as proxies for staggered and synchronized elections. Those outputs supported the main idea of this second essay: the timing in elections result in non-efficient allocation of public resources. We built a theoretical model and provided three propositions and their implications. First, we state that election years promote an anticipation effect in the allocation of public resources. Second, the anticipation effect occurs also in cross-election years, which mean that local incumbents will deviate their allocation in central election years too, and vice-versa (but with a lower effect in the opposite situation, because central spent directly increase local incumbent's image in local elections). The last proposition assert that synchronized elections reduce stimuli for incumbents to deviate from optimal allocation of public resources (in terms of trade-off between short and long-term expenditures).

In the chapter 4, we changed the scope of our investigation from intergovernmental grants to allocation of budget in local level. Especially, we chose to investigate the health spent, following the intuition that this kind of expenditure may be useful in buying votes, which is an assumption strongly widespread in political economy literature. We add the spatial effect in our model, considering that spillovers may affect the spatial allocation of health spent. We conclude in this section that not only there is a spatial effect in this kind of public good, but also that elections strongly affect them (and even change the sign of some variables), strengthening the idea that during elections years public spent is biased (getting off the Pareto efficiency allocation). Moreover, the evidences we provided in this chapter are in line with those propositions stated in the previous chapter, about anticipation effect and cross-election anticipation effect.

In a general sense, we believe we achieved our aim in this thesis, discussing some ways elections affect allocation of public resources in municipalities, both as grants or as allocation of local or central resources in local level. Moreover, we confirm the relevance of political alignment and its consequences on obtaining monies (a key issue in federative systems). We also add the role of congressmen as one of the determinants of intergovernmental discretionary transfers, which consists in an important feature of political alignment analysis, as well as electoral calendar. We demonstrated too that political factors impact not only in the amount of monies, but also in formulation of public policies, when it comes to the short or long-term in spending. Finally, we show that elections affect spatial effects in public spent at local level, and political opportunism are crucial to understand core features of budget allocation in municipalities.

Political opportunism does not mean corruption (although they may be associated) and it is important to differentiate these two features of political systems. We demonstrate that the rational politician will behave opportunistically, trying to maximize his electoral prospective. Whereas corruption may affect a portion of politicians, the rationality is embedded in their actions. This distinction helps to understand why the institutions should care about political rationality, besides corruption: bias in public spending may be due to both; whereas some politicians behave corruptly, all of them are simply politicians.

This set of essays may be useful to additional investigations that aim to discuss complementary issues related to political alignment and its influence in allocation of public resources. We believe that the polarization of politics around two parties in Brazil creates possibilities of comparison and replication of studies formerly focused on the United States reality and this may help not only to enhance understanding but also to create or ameliorate mechanisms of regulation that improve efficiency in political processes and public spent in Brazil.