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Behavior of budget expenditures during the election period: an analysis in panel data in the Brazilian municipalities

Comportamiento de los gastos presupuestarios durante el período electoral: un análisis en los datos en panel en los municipios brasileños

Comportamento das despesas orçamentárias durante o período eleitoral: uma análise em painel de dados nos municípios brasileiros

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Abstract

Objective: From the political budget cycle (PDC) lens, we investigated the behavior of committed expenditures, investment spending and borrowing in the electoral period, in Brazilian municipalities with a population of 50,000 or more, in the period 2000-2016, comprising 353 clusters and 6001 observations. It was also investigated whether these municipalities meet the legal requirements on the use of budget resources in an election year. The study was motivated by the lack of consensus in the literature on the subject in question.

Methodology: Four research hypotheses were built to assist in achieving the proposed objectives. Data were collected from IBGE, TSE and STN websites. Data were analyzed using the balanced panel data method, grouped by municipality and region, with Tobit regression application and Hausman, Breusch-Pagan Lagrange and F de Chow robustness tests. This method covered confidence with the interval of 99%, 77%, 79% and 84% explaining behavior between the variables.

Results: The results show that there were no changes in expenditure committed before, during and after the election period, regardless of party equality and two-round election, unlike the results of some studies. As for spending on investments and borrowing in the election period, the study suggests an average increase of 9% and 68% respectively, and this is more intense when there is party equality between municipal and state governments, especially in the process of reelection. Regarding compliance with legal requirements on the use of budgetary resources in an election year, the study indicates that local governments do not comply with regulatory requirements.

Contributions of the study: contributes to the specific literature, because it presents robust results on the lack of consensus on the subject in question, as well as for future research involving municipalities with smaller population and comparison between regions and countries.

Keywords: Political budget cycle; Tobit regression; Data pane.

Resumem

Objetivo: Desde la lente del ciclo del presupuesto político, investigamos el comportamiento de los gastos comprometidos, gastos de inversión y préstamos en el período electoral, en municipios brasileños con una población de 50,000 o más, en el período 2000-2016, que comprende 353 grupos y 6001 observaciones. También se investigó si estos municipios cumplen con los requisitos legales sobre el uso de los recursos presupuestarios en el año

electoral. El estudio fue motivado por la falta de consenso en la literatura sobre el tema en cuestión.

Metodología: se construyeron cuatro hipótesis de investigación para ayudar a lograr los objetivos propuestos. Los datos fueron recolectados de los sitios web de IBGE, STE y STN. Los datos se analizaron utilizando el método de datos de panel equilibrado, agrupados por municipio y región, con la aplicación de regresión tobit y las pruebas de robustez de Hausman, Breusch-Pagan Lagrange y F de Chow. Este método cubrió un intervalo de confianza del 99%, 77%, 79% y 84% explicando el comportamiento entre las variables.

Resultados: Los resultados muestran que no hubo cambios en el gasto comprometido antes, durante y después del período electoral, independientemente de la igualdad de partidos y la elección de dos vueltas, a diferencia de los resultados de algunos estudios. En cuanto al gasto en inversiones y préstamos en el período electoral, el estudio sugiere un aumento promedio de 9% y 68% respectivamente, y esto es más intenso cuando existe igualdad de partidos entre los gobiernos municipales y estatales, especialmente en el proceso de reelección. Con respecto al cumplimiento de los requisitos legales sobre el uso de los recursos presupuestarios en un año electoral, el estudio indica que los gobiernos locales no cumplen con los requisitos reglamentarios.

Contribuciones del Estudio: contribuye a la literatura específica, ya que presenta resultados sólidos sobre la falta de consenso sobre el tema en cuestión, así como para futuras investigaciones que involucren municipios con una población más pequeña y comparación entre regiones y países.

Palabras clave: ciclo de presupuesto político; Regresión Tobit; Panel de datos.

Resumo

Objetivo: A partir da lente de ciclo orçamentário político (COP), investigou-se o comportamento das despesas empenhadas, dos gastos com investimentos e captação de empréstimos em período eleitoral, nos municípios brasileiros com população igual ou superior a 50 mil habitantes, no período de 2000-2016, compreendendo 353 *clusters* e 6001 observações. Investigou-se também se esses municípios cumprem as exigências legais sobre o uso de recursos orçamentários em ano de eleição. O estudo foi motivado pela falta de consenso na literatura sobre o tema em questão.

Metodologia: Foram construídas quatro hipóteses de pesquisa para auxiliar na consecução dos objetivos propostos. Os dados foram coletados dos *sites* do IBGE, STE e STN. Os dados foram analisados por meio do método de dados em painel balanceado, agrupados por municípios e região, com aplicação de regressão *tobit* e testes de robustez de *Hausman*, *Breusch-Pagan Lagrange* e *F de Chow*. Esse método abrangeu intervalos de confiança em 99%, 77%, 79% e 84% de explicação de comportamento entre as variáveis.

Resultado: Os resultados apontam que não houve mudanças das despesas empenhadas antes, durante e após período eleitoral, independente de igualdades partidárias e eleições em dois turnos, diferente do resultado de alguns estudos. Já quanto aos gastos com investimentos e captação de empréstimos em período eleitoral, o estudo sugere aumento médio em 9% e 68% respectivamente, e isso é mais intenso quando há igualdade partidária entre governos

municipais e estaduais, principalmente em processo de reeleição. Quanto ao cumprimento das exigências legais sobre uso de recursos orçamentários em ano eleitoral, o estudo indica que os governos locais não cumprem as exigências normativas.

Contribuições do Estudo: contribui para a literatura específica, porque apresenta resultados robustos sobre a falta de consenso existente no tema em questão, com também para futuras pesquisas envolvendo municípios com menor população e comparação entre regiões e países.

Palavras chaves: Ciclo orçamentário político; Regressão *tobit*; Painel de dados.

1 Introduction

Studies demonstrate determining elements about the political budget cycle (PBC) in the electoral period in local governments (Franzese & Jusko, 2006; Mendes, 2004; Sakurai & Menezes Filho, 2008). These elements are homogeneously present in government structures, in the available policy instruments and in the uniformity of electoral rules (Sakurai & Menezes Filho, 2011; Veiga & Veiga, 2007). The presence of these elements is more noticeable in developing countries with a young democratic regime, as they are more likely to manipulate fiscal policies with electoral bias (Brender & Drazen, 2005). Possibly, because they are more flexible in fiscal maneuvers, such as spending on investments and infrastructure (Shi & Svensson, 2003).

Other studies claim that the government in power loses vote when spending increases in the electoral period (Nordhaus, 1975; MacRae, 1977), that the increase in spending on the eve of the election is associated with inefficient and opportunistic policies (Peltzman, 1992), which electoral deficits in old democracies reduce the chances of re-election (Brender, 2003; Brender & Drazen, 2008), which voters in developed countries are antagonistic to the production of fiscal deficits and increased spending in an election year (Nakaguma & Brender, 2010), that the economic and political environment in developing countries is made up of weak institutions and opportunistic behaviors (Pelagidis & Mitsopoulos, 2009; Phelps, 2015), that the growth of expenses in the electoral period occurs regardless of election or reelection (Chortareas, Logothetis, Andreas & Papandreou, 2016).

It is in this perspective that this study seeks to verify whether there is a positive (increasing) influence on budgetary expenditures during the election period in local governments with population equal or higher of 50 thousand inhabitants, and whether these governments comply with the current rules regarding the use of budgetary resources to settle electoral expenses. For that, the variables committed expenses, processed and unprocessed remains to pay, own and transfer receipts, surplus and deficit, Municipal Gross Development Product (GDP), municipal and educational development index, electoral shift, election and reelection and government party to investigate the proposed objectives, in the period from 2000 to 2016.

Based on the listed proposal, we used the method of estimating linear longitudinal regression models for panel data, grouped by municipalities and regions, whose data were extracted from the database of the National Treasury Secretariat, specifically, in Brazilian Finance and Brazilian Public Sector Accounting and Tax Information System, on the website of the Brazilian Institute of Geography and Statistics and the Supreme Electoral Court.

The choice of the municipal population range is related to the probability of greater dissemination of information on budget execution by municipalities (Menezes Filho, 2011). As

well, because it represents 6% of the municipalities and 66% of the Brazilian population (see Table 2).

The study is justified because: (i) it expands the researches carried out over six decades, by Downs, (1957), Key Jr (1966), Nordhaus (1975), MacRae (1977), Tufte (1978), Peltzman (1992), Blais and Nadeau (1992), Galli and Rossi (2002), Brender (2003), Mendes (2004), Sakurai (2005), Brender and Drazen (2005), Aklmedov and Zhuravskaya (2004), Shi and Svensson (2006), Franzese and Jusko (2006), Veiga and Veiga (2007), Barreto (2008), Brender and Drazen (2008), Deliberador and Komata (2008), Drazen and Eslava (2010), Nakaguma and Brender (2010), Sakurai and Menezes Filho (2008; 2011), Aidt, Veiga and Veiga (2011), Sjahrir, Kis-katos and Schulze (2013), Aidt and Mooney (2014), Balaguer Coll, Brun-Martos, Forte and Tortosa-Ausina (2015), Chortareas, Logothetis and Papandreou (2016); (ii) uses a statistical method little applied in studies on the proposed theme; and finally, (iii) their results can contribute to the understanding of the practices carried out by local governments in the electoral period, for information users, researchers and society.

2 Literature Revision

In this section, the legal aspects, empirical studies on the political budget cycle and the construction of research hypotheses are contextualized.

2.1 Legal aspects and empirical studies on PBC

The Fiscal Responsibility Law (FRL) aims at balancing public accounts, permanent fiscal adjustment, debt control, transparency and social control. As well as protecting and punishing the public manager in relation to the manipulation of budgetary resources, if not for the purpose of benefits to society (Brasil, 2000). The aforementioned Law also establishes rules on expenditures for the last year of the government's mandate, such as, personnel expenses, expenses that exceed the current year, contracting of credit operations, indebtedness and voluntary transfers of resources, as well as control of assets public (Fernandes & Bezerra Filho, 2006).

Supporting the FRL, Law 11.300/06 permanently prohibits the use of budgetary resources for purposes of settling electoral expenses that do not come from a specific account of the electoral party, under penalty of disapproval of the candidate's accountability. And if proven abuse of economic power, the registration of the candidacy may be canceled or the diploma granted due to the electoral result revoked (Brasil, 2016). It is pertinent to emphasize that the electoral reform 2015 establishes how much should be spent on municipal electoral campaigns for the position of mayor. This amount is calculated based on the highest expenses declared in the previous election (Brasil, 2015).

Based on these arguments, the incumbent politician is expected to generate a larger and effective PBC. Although there has been progress in the imputation of administrative and criminal penalties to the manager for the misuse of public resources, it is possible that governments still continue to practice actions that generates positive media with budgetary resources for capitation of the vote in the election period to be re-elected (Capovilla, Gonçalves, Dantas & Oliveira, 2018).

It is known about the PBC, successive budgets that are repeated over time and replenish each new cycle. This process, from its most remote origins, has been understood as a political instrument, as it establishes parameters for the collection of taxes and setting limits for the

realization of public expenditures - budget allocation, as well as defining responsibilities (Sanches, 1993).

Kalescki (1943) was one of the first researchers to predict that the PBC would be present in the future economic regime of capitalist democracies. However, it was in 1957 that Downs developed the Political Economic Theory (Economic Theory of Democracy), which among other competencies, explains the behavior of the candidates for government who are in power, act rationally in maintaining their continuity and exposing their political performance in election period. Paldam (1997), Alesina, Roubini and Cohen (1997) and more recently, Drazen (2008), offer arguments for the existence of opportunistic PDCs in national and local elections in developing countries.

Vasconcelos, Ferreira Jr., Pinto and Nogueira Jr. (2013) suggest that the control mechanisms inhibit inappropriate actions in the use of budgetary resources in election year. However, the results of this research can be used as a control parameter to combat opportunistic behavior, clientelism and friendship, suggested by Pelagidis and Mitsopoulos (2009) and Phelps (2015). Chortareas, Logothetis, Andreas and Papandreou (2016) analyzed the impact of expenditure in the electoral period in 109 municipalities in Greece, using the variables total expenditure, loans, investments, GDP per capita, unemployment and ideology in the period from 1985 to 2004, and concluded expenditure growth in the electoral period, whether for election or reelection.

These exhibitions, shown in greater emphasis in election year by candidates for reelection, aim at maximizing votes to remain in power (Downs, 1957). These candidates also seek to influence the outcome of an election by distributing resources and favors to voters (Corvalan, Cox & Osorio, 2018). This power, according to Watson (1913), provides a feeling of pleasure and well-being to the individual. These statements are supported by Key Jr. (1966), who noted that the voter's voting decision is based on recent information about the candidate's current behavior and economic performance indexes.

Nordhaus (1975) agrees with the statements of Downs (1957) and Key Jr. (1966) in suggesting that voters are short-sighted - adaptable expectations and the voting decision is based on the present analysis. This suggestion took as a parameter the results from a study carried out in nine democratic countries. Based on the arguments of Nordhaus (1975), MacRae (1977) studied the strategy of the American voter in choosing the vote for president in the period of 1957-1972, and found that the government in power loses vote dramatically when spending increases in the election period.

Peltzman (1992) is emphatic in stating that spending on the eve of an election campaign is associated with inefficient and opportunistic policies. More recently, Nakaguma and Brender (2010) confirm that voters in developed countries are antagonistic to the production of fiscal deficits and increased spending in election year. These records make it possible to understand that producing deficits and increasing expenses during the electoral period significantly reduces the likelihood of reelection of the local government.

Tufte (1978), expanding the sample of the study by MacRae (1977), investigates the behavior of expenditure in the electoral period in 27 democratic countries in the period 1961-1972, involving the variables transfer between governments and grow taxes, and concluded that there is positive fluctuations in the electoral period in the public accounts of these governments. More studies that confirm this result are found in Blais and Nadeau, (1992); Galli and Rossi, (2002); Akhmedov and Zhuravskaya, (2004).

Mendes (2004), Sakurai (2005) and Sakurai and Menezes Filho (2008), carried out research in Brazilian municipalities with the purpose of comparing the results presented by the authors mentioned above, and concluded that there was no positive impact on expenses in an

election year. Barreto (2008) investigated Brazilian municipalities with a population greater than 200 thousand inhabitants, and concluded that 70% of these municipalities re-elect their governments regardless of fiscal results. This conclusion is accepted by Deliberador and Komata (2008) after investigating 15 São Paulo municipalities and 26 Brazilian capitals. For Lee (2008), on the other hand, only 40% of candidates for reelection reach the goal, and this is only possible because the public machine is available for use in the election campaign.

More recently (Guo, 2009; Conraria, Magalhães & Soares, 2013; Goeminne & Smolders, 2013; Gregor, 2016; Garmann, 2017; Corvalan, Cox and Osorio, 2018; Pierskalla & Sacks, 2018), through empirical studies carried out in municipalities in Latin American countries (Chile), Central Europe, China, South and Southeast Asia, the United States and Australia, indicate that expenditure in the electoral period is significantly increased.

In reference to the favorable arguments and against positive changes in spending in the electoral period, it is positive to state that there is still no absolute consensus in the literature. So, maybe, the results of this research will contribute to the literary consensus. Although it is evident that the PBC in the electoral period in Brazil differs from other countries.

2.2 Construction of research hypotheses

Rodolfo and Sibert (1988), explain that the PBC, with rational voters who obtain asymmetric information in relation to the competencies of elected governments, is conducive to spending realizations that promote media actions to improve the image of government performance. These voters are easy targets to be convinced by operators engaged in manipulating political and economic variables in election year.

Due to the discussions presented and with the purpose of corroborating one of the literary consensus, four research hypotheses were elaborated:

H₁ – expenditures committed in Brazilian municipal governments show positive changes in election year.

The electoral year is expected to have a positive effect on expenditures committed in the proposed cycles in the 2000-2016 period.

Vergne (2009), using samples from some countries, finds evidence that public spending in the electoral period changes to spending more visible to the voter. In line with this, other studies focusing on the analysis of local governments (Aidt & Mooney, 2014; Akhmedov & Zhuravskaya, 2004; Drazen & Eslava, 2010; Galli & Rossi, 2002; Veiga & Veiga, 2007) identified reductions in the budget balance and increased spending on investments in health, education and road construction in electoral periods. In this understanding, the second hypothesis arises:

H₂ – investment spending undergoes positive changes in electoral periods in Brazilian local governments.

Investment spending is expected to show positive changes (growth) in election years.

Aidt and Mooney (2014) investigated the PBC in 28 cities in England between the years 1902 and 1937, and observed that loan capitation for large-scale projects in an election year grew by an average of 79%, that is, from over £ 0.52 to £ 0.93 per capita. The authors suggest that these projects, of great media coverage and visual to the voter, aim to obtain votes. In this proposition, the third research hypothesis is born:

H₃ – loan capitation increases during election period in Brazilian municipal governments.

With reference to **H₃**, loan proceeds are believed to be higher in election years.

According to legal provisions in force in Brazil, specifically on budgetary spending guidelines in the electoral period - current and capital expenditures (credit operation), and voluntary transfers, under penalty of imputing a crime of fiscal responsibility (Brasil, 2000; 2015; 2016), the fourth and last hypothesis is formulated:

H₄ – Brazilian municipal governments comply with legal regulations regarding the use of budgetary resources in the electoral period.

With this hypothesis, it is expected that the discharge of electoral expenses will come from a specific account of the electoral party, as provided for in the LRF and Law No. 11,300 / 2006. Since the electoral reform that took place in 2015 establishes how much should be spent on municipal election campaigns for the position of mayor. This amount is calculated based on the highest expenses declared in the previous election (Brasil, 2015).

3 Methodological Procedures

3.1 Research strategy and method

In this research, a set of data on public finances was used, with the purpose of verifying increasing occurrences in committed expenses, investment expenses and capitulation of loans in the electoral period in Brazilian municipalities with a population of 50 thousand inhabitants or more.

For this, the databases of the Brazilian Institute of Geography and Statistics (BIGS), the National Treasury Secretariat (NTS) and the Supreme Electoral Court (SEC) were searched for the necessary information to carry out the study.

In the BIGS and SEC databases, municipalities and regions were identified for the proposed sample, as well as the variables gross domestic product, municipal and educational human development index, electoral shift, election and reelection, local government party and election year. In the STN database, specifically in the folders of Finance in Brazil and the Brazilian Public Sector Accounting and Tax Information System, the values corresponding to the first nine variables in Table 1 were extracted.

Table 1
List of variables used

Variable	Dependent	Independent	Description
LnDemp	x		Committed expense
LnInv	x		Investment
LnEmprst	x		Loan
Lnrpnp		x	Unprocessed rest to pay
LnRpp		x	Processed rest to pay
LnRecProp		x	Own revenue
LnRecUni		x	Revenue transferred by Union (Federal government)
LnRecEst		x	Revenue transferred by State (State government)
LnSup		x	Surplus
LnPop		x	Population
LnPib		x	GDP – Gross Domestic Product
Idhm		x	Municipal Human Development index
Idhme		x	Educational Municipal Human Development index
Turn		x	Electoral shift
EleRee		x	Election / reelection
Pgov		x	Local government political party
AnoElei		x	Election year

Source: survey data

3.2 Population and sample

633 municipalities with a population of 50 thousand inhabitants or more were selected. However, 280 municipalities were removed from the sample because there was no information on the dependent variables, in some years of the indicated period (2000-2016). The remaining 353 municipalities were grouped in their respective regions, as shown in Table 2. It is worth noting that this sample represents 66% of the Brazilian population, and 6% of the total of the municipalities.

Table 2
Sample and population

Sample Region	Sample		Population		
	Number of municipalities	% Municipalities	Population	Number of Municipalities	Population
North	18	4%	11.415.743	450	17.296.580
Northeast	78	4%	37.680.894	1.794	57.092.263
Sutheast	114	7%	57.386.811	1.668	86.949.714
South	73	6%	19.565.666	1.191	29.644.948
Midwest	70	15%	10.478.099	467	15.875.907
Total	353	6%	136.527.213	5.570	206.859.412

Source: Adapted from IBGE (2016).

The data were organized by region, municipality, year and variables in an Excel spreadsheet. The values of the variables, with the exception of Turn, EleRee, Pgov and AnoElei, were decomposed into base 10 logarithm (Ln10), whose purpose was to standardize the inputs and avoid outliers. Then, they were exported to the Stata ® version 13 software, to assist in statistical analysis.

3.3 Data analysis technique

Tobit regression was used for data analysis with panel data, as it allows for greater precision of the differences existing in a given phenomenon between individuals (municipalities) in various cross-sections (years). In addition to allowing a greater amount of information, greater variability of data, less multicollinearity between variables, greater degree of freedom and greater efficiency when estimating its parameters (Marques, 2000).

To identify the type of data panel, the command 'xtset id i' was used in the software, and it was found to be a strongly balanced data panel for the estimation models of each dependent variable, represented by the equations (1), (2) and (3):

$$\begin{aligned} & \text{LnDemp}_{it} = a_i + b_1 \cdot \text{LnPop}_{it} + b_2 \cdot \text{LnRnp}_{it} + b_3 \cdot \text{LnRpp}_{it} + b_4 \cdot \text{LnRecProp}_{it} + b_5 \cdot \text{LnRecUni}_{it} + \\ & b_6 \cdot \text{LnRecEst}_{it} + b_7 \cdot \text{LnSup}_{it} + b_8 \cdot \text{LnDef}_{it} + b_9 \cdot \text{LnPibm}_{it} + b_{10} \cdot \text{Idhm}_{it} + b_{11} \cdot \text{Idhme}_{it} + b_{12} \cdot \text{Turn}_{it} + \\ & b_{13} \cdot \text{EleRee}_{it} + b_{14} \cdot \text{Pgov}_{it} + b_{15} \cdot \text{AnoElei}_{it} + (a_i - a + \varepsilon_{it}) \end{aligned} \quad (1)$$

$$\begin{aligned} & \text{LnInv}_{it} = a_i + b_1 \cdot \text{AnoElei}_{it} + b_2 \cdot \text{Turn}_{it} + b_3 \cdot \text{EleRee}_{it} + b_4 \cdot \text{Pgov}_{it} + b_5 \cdot \text{Pop}_{it} + b_6 \cdot \text{LnRuni}_{it} + \\ & b_7 \cdot \text{LnRest}_{it} + b_8 \cdot \text{LnPibm}_{it} + b_9 \cdot \text{Idhm}_{it} + b_{10} \cdot \text{Idhme}_{it} + (a_i - a + \varepsilon_{it}) \end{aligned} \quad (2)$$

$$\begin{aligned} & \text{LnEmprst}_{it} = a_i + b_1 \cdot \text{AnoElei}_{it} + b_2 \cdot \text{LnInv}_{it} + b_3 \cdot \text{LnRecUni}_{it} + b_4 \cdot \text{LnRecEst}_{it} + b_5 \cdot \text{LnDef}_{it} + \\ & b_6 \cdot \text{Idhm}_{it} + b_7 \cdot \text{Idhme}_{it} + b_8 \cdot \text{Turn}_{it} + b_9 \cdot \text{EleRee}_{it} + b_{10} \cdot \text{Pgov}_{it} + b_{11} \cdot \text{Pop}_{it} + (a_i - a + \varepsilon_{it}) \end{aligned} \quad (3)$$

Through the analysis of the estimators (equations 1-3), with their respective standard errors, the comparison technique between POLS estimation - between effects, fixed effects, robust fixed effect, random effect and robust random effects was applied to identify the degree of reliability of the results. Then, to identify multicollinearity between the variables, the estimator models for the dependent variables, as well as to make the results more robust, the Breusch-Pagan LM (Lagrange multiplier) tests, Chow's F test, Hausman test, and robust test Hausman, as described by Hoechle (2007) and Cameron and Trivedi (2009), were performed.

The Hausman and Breusch-Pagan Lagrange tests were applied to the estimation models in order to identify the best statistical significance, since the first test investigates whether the individual effects 'ai' of the individuals have a statistically equal correlation between parameters by fixed and random effect; and the second tests whether the variance between individuals is equal to zero - there are no significant differences between the variables. Therefore, the test results were $\text{Prob} > \chi^2 = 0.0000$ with 99% statistical significance.

It is worth noting that the Tobit regression model, proposed by James Tobin (1958), which describes the relationship between a non-negative dependent variable (y) and an independent variable (vector), is more appropriate, complete and robust for analyzing variables in logarithm, as stated by Hesketh, Touloupoulou and Murray (2001).

Knowing the estimated results of the models corresponding to each dependent variable (see equations 1 to 3), variables that did not present a 95% confidence interval were removed from each model. Then, the estimation models, represented by equations (4), (5) and (6) for each dependent variable with their respective independent variables, were calculated again, and it was found that the estimated model for the dependent variable 'committed expenditure (LnDemp)', represented by equation (4), indicates that the degree of confidence interval is 99% ($P > |z| = 0.000$), and the level of explanation of the independent variables in relation to the dependent variable is 77 %.

$$\text{LnDemp}_i = a + b_1 \cdot \text{LnPop}_i + b_2 \cdot \text{LnRnp}_i + b_3 \cdot \text{LnRpp}_i + b_4 \cdot \text{LnRecProp}_i + b_5 \cdot \text{LnRecUni}_i + b_6 \cdot \text{LnRecEst}_i + b_7 \cdot \text{LnSup}_i + b_8 \cdot \text{Def}_i + b_9 \cdot \text{LnPib}_i + b_{10} \cdot \text{Pgov}_i + (a_i - a + \epsilon_i) \quad (4)$$

Likewise, for the dependent variable 'investment (LnInv)', conceived in equation (5), it indicates a 99% confidence interval ($P > |z| = 0.000$), with the degree of explanation of the independent variables in relation to the variable dependent by 78.5%.

$$\text{LnInv}_i = a + b_1 \cdot \text{AnoEle}_i + b_2 \cdot \text{Pop}_i + b_3 \cdot \text{LnRecUni}_i + b_4 \cdot \text{LnRecEst}_i + b_5 \cdot \text{LnPib}_i + (a_i - a + \epsilon_i) \quad (5)$$

Finally, the estimated model for the dependent variable 'loan (LnEmprst)', simulated in equation (6), with a 99% confidence interval ($P > |z| = 0.000$), and the degree of explanation of the independent variables in relation to the dependent variable in 84%.

$$\text{LnEmprst}_i = a + b_1 \cdot \text{AnoEle}_i + b_2 \cdot \text{LnInv}_i + b_3 \cdot \text{LnRecEst}_i + b_4 \cdot \text{Idhm}_i + b_5 \cdot \text{EleRec}_i + b_6 \cdot \text{Pgov}_i + b_7 \cdot \text{Pop}_i + (a_i - a + \epsilon_i) \quad (6)$$

These estimation models, with their respective results, managed by equations (4), (5) and (6), are exposed in Tables 4, 6 and 8. The variables that were removed because they do not present 95% significance in the estimation models were: in equation (1) - Idhm, Idhme, Turn and AnaElei; in equation (2) - Turn, EleRec, Pgov, Idhm and Idhme; and in equation (3) - LnRecUni, LnDef, Idhme and Turn. These variables, suppressed because they have no statistical significance in the proposed models, overlap the studies of Blais and Nadeau (1992),

Galli and Rossi (2002), Aklmedov and Zhuravskaya (2004), Sjahrir et al. (2013), Queiroz (2013), Aidt and Mooney (2014) and Chortareas et al. (2016).

4. Results and Analysis

The results presented in this section were calculated based on the tobit regression in a balanced data panel grouped by municipalities, adjusted to the robustness tests for 353 clusters (municipalities), 5 regions and 6001 observations. Thus, the results shown in Tables 3 to 8, calculated with the aid of the Stata® Software parameterized to the estimated tobit regression model for balanced panel data, represent the findings of this study.

Table 3 contains the descriptive analysis of the variables used to estimate the model provided in equation (4).

Table 3

*Descriptive statistics of the tobit regression variables with 6001 observations:
Equation 4*

Variable	Mean	Std. Dev.	Min	Max
LnDemp	8.200.326	.5193469	636.935	1.069.392
LnPop	5.148.502	.3734372	4.700.444	7.078.015
Lnrpnp	5.286.099	2.854.027	0	9.450.322
Lnrpp	6.594.505	1.353.579	0	9.339.387
LnRecProp	7.810.563	.6444379	5.212.273	10.577.340
LnRecUni	7.658.488	.4937606	0	9.509.854
LnRecEst	7.245.637	1.700.395	0	9.988.602
LnSup	4.879.461	3.214.785	0	9.495.585
LnDef	1.918.701	301.076	0	9.069.956
LnPibm	6.207.958	.6549734	3.395.306	8.798.005
Pgov	.1676387	.3735763	0	1

Source: Survey data

The two highest values recorded in the variables 'LnRecProp and LnRecEst' correspond to the municipality of São Borja / RS. When analyzing the data from this municipality, it is noticed that the revenue from transfers from the Union and the State, correspond on average to 65% (33% Union and 32% State) of its total revenue. It is worth mentioning that these revenues are equivalent to the fractional transfer of federal and state taxes, generated in the municipality itself.

As for the variables with a value of 'zero' (Lnrpnp, Lnrpp, LnRecUni, LnRecEst, LnSup and LnDef), it concerns the fact that some municipalities have not submitted information in the National Treasury Secretariat (NTS) database.

The maximum values of the variables 'LnDemp, Lnrpp and Lnrpnp', also from São Borja / RS, represented 35.4%, 29.2% and 29.3% of total revenue, respectively. Despite this, when comparing the 'LnDemp' variable with own revenue, the representativeness goes to 106%, that is, the primary deficit.

Table 4 shows the results of the model estimated at 99% statistical significance and 77% explaining the behavior of the independent variables in relation to the dependent variable.

It is pertinent to highlight that it was considered robust standard error and grouping of municipalities by region to calculate the results. Thus, based on the statistical security of the proposed estimation model, it is possible to affirm that there was no positive change in the expenditures committed in the electoral year, in the analyzed period. As well, the process of

reelection and party equality between governments was not statistically significant in the electoral period. Therefore, it is pertinent to state that the result presented does not confirm H_1 , that is, the expenditures committed to Brazilian municipal governments do not present positive changes in election year.

By means of results complementary to this study, it can be stated that, regardless of electoral year, the increase in one statistical unit in the variables LnPop, LnRecProp and LnRecUni, reflects positively on committed expenditure (LnDemp) in approximately 24%, 51% and 13% respectively, in each municipality analyzed.

Table 4

Estimation by tobit effect with robust standard error with grouping by municipalities

$\text{LnDemp}_i = a + b_1 \cdot \text{LnPop}_i + b_2 \cdot \text{LnRpn}_i + b_3 \cdot \text{LnRpp}_i + b_4 \cdot \text{LnRecProp}_i + b_5 \cdot \text{LnRecUni}_i + b_6 \cdot \text{LnRecEst}_i + b_7 \cdot \text{LnSu}_i + b_8 \cdot \text{Def}_i + b_9 \cdot \text{LnPibm}_i + b_{10} \cdot \text{Pgov}_i + (a_i - a + \varepsilon_i)$ —► Equation 4						
Random-effect tobit regression				Number of obs	=	6001
Group variable: Mun				Number of groups	=	353
				Obs per group: min	=	17
Random effect $u_i \sim \text{Gaussian}$				avg	=	17.0
Integration method: mvaghermite				max	=	17
				Integration points	=	12
				Wald chi2 (15)	=	77.31583
				Prob > chi2	=	0.0000
Log likelihood	=	5.884.274				
LnDemp	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
LnPop	.2379812	.011092	21.46	0.000	.2162414	.2597211
LnRpn	.0048034	.0005217	9.21	0.000	.0037809	.0058259
LnRpp	.0028183	.0009649	2.92	0.003	.0009272	.0047095
LnRecProp	.5097822	.0049385	103.23	0.000	.500103	.5194615
LnRecUni	.1280234	.0042566	30.08	0.000	.1196806	.1363662
LnRecEst	.0131525	.0007052	18.65	0.000	.0117702	.0145347
LnSup	.0082162	.0020056	4.10	0.000	.0042853	.0121472
LnDef	.0153979	.0020504	7.51	0.000	.0113791	.0194167
LnPibm	.0958164	.0050264	19.06	0.000	.0859649	.1056679
EleRee	-.0144778	.0024554	-5.90	0.000	-.0192902	-.0096654
Pgov	.0117513	.0033032	3.56	0.000	.0052771	.0182254
_cons	1.300.916	.059937	21.70	0.000	1.183.441	141.839
/sigma_u	.0613919	.0027049	22.70	0.000	.0560903	.0666935
/sigma_e	.0848461	.0008009	105.93	0.000	.0832763	.0864159
Rho	.3436379	.0205302			.30435	.3846925

Source: Survey data

In Table 5, descriptive analysis of the estimated model simulated in equation 5, the municipalities that received the most transfer revenue from the State (LnRecEst) and the Union (LnRecUni), were São Paulo (SP) and Rio de Janeiro (RJ).

Table 5

*Descriptive statistics of the tobit regression variables with 6001 observations:
Equation 5*

Variable	Mean	Std. Dev.	Min	Max
LnInv	6.994.788	.784057	0	9.714.401
AnoElei	.2941176	.4556831	0	1
Pop	261015.6	722702.2	50170	1.21e+07
LnRecUni	7.658.488	.4937606	0	9.509.854
LnRecEst	7.245.637	1.700.395	0	9.988.602
LnPibm	6.207.958	.6549734	3.395.306	8.798.005

Source: Survey data

With regard to 'zero' minimum values, it is because some municipalities did not present information in the NTS database, at some point in the analyzed period. Still on the municipalities of São Paulo and Rio de Janeiro, based on their data, revenues from transfers (State and Union) represent 48% and 52%, respectively, of their total revenues. As a complementary information, this study suggests that the own revenue of these municipalities does not support the total expenses. In relation to investment resources (LnInv), the municipality of Araraquara (SP) stands out as the largest investor in the analyzed period.

Table 6 shows the results by estimation of the tobit effect, equation (5), for each variable with robust standard error, grouped by municipalities.

Table 6

Estimation by tobit effect with robust standard error with grouping by municipalities

$\text{LnInv}_i = a + b_1 \cdot \text{AnoElei}_i + b_2 \cdot \text{Pop}_i + b_3 \cdot \text{LnRecUni}_i + b_4 \cdot \text{LnRecEst}_i + b_5 \cdot \text{LnPibm}_i + (a_i - a + \varepsilon_i)$ → Equation 5						
Random-effects tobit regression					Number of obs	= 6001
Group variable: Munic					Number of groups	= 353
Random effects $u_i \sim \text{Gaussian}$					Obs per group: min	= 17
					avg	= 17.0
					max	= 17
Integration method: mvaghermite					Integration points	= 12
					Wald chi2(10)	= 78.51535
					Prob > chi2	= 0.0000
Log likelihood = 5942.6232						
LnInv	Coef.	Std. Err.	z	P> z	[95% Conf.	Interval]
AnoElei	.0936659	.0181967	5.15	0.000	.058001	.1293309
Pop	4.74e-08	1.62e-08	2.93	0.003	1.58e-08	7.91e-08
LnRecUni	.2351563	.0240212	9.79	0.000	.1880757	.2822369
LnRecEst	-.0216743	.0050694	-4.28	0.000	-.0316101	-.0117386
LnPibm	.4819943	.0212436	22.69	0.000	.4403577	.5236309
_cons	224.421	.2345031	9.57	0.000	1.784.592	2.703.827
/sigma u	.1820785	.0118487	15.37	0.000	.1588554	.2053017
/sigma e	.6348309	.005974	106.27	0.000	.623122	.6465398

Source: Survey data

This model has a 99% degree of statistical significance, with 78.5% explaining the behavior of the independent variables in relation to the dependent variable. These results indicate that spending on investments in electoral periods is positively impacted, on average 9%. Likewise, when there is an increase in revenue by transfer from the Union (LnRecUni) by an average of 23%, and in municipal GDP by an average of 48%.

This result confirms **H₂**, that is, investment spending undergoes positive changes in electoral periods. On the other hand, when there is an increase in revenue by state transfer (LnRecEst) and in the municipal human development index (Idhm), investment expenses decrease by an average of 2% and 1% respectively.

Table 7 presents the descriptive analysis of the estimated model represented in equation (6), which the municipality of Barretos (SP) was the one that most resorted to financial loans in the electoral period.

Table 7

*Descriptive statistics of the tobit regression variables with 6001 observations:
Equation 6*

Variable	Mean	Std. Dev.	Min	Max
LnEmprst	3.783.907	3.485.297	0	1.075.416
AnoElei	.2941176	.4556831	0	1
LnInv	6.994.788	.784057	0	9.714.401
LnRecUni	7.664.874	.4416382	6	9.509.854
LnRecEst	7.245.637	1.700.395	0	9.988.602
Idhm	.6307885	.0837192	.33	.82
Idhme	.4897012	.110308	.137	.746
EleRee	.4747542	.4994039	0	1
Pgov	.1676387	.3735763	0	1
Pop	260962	722706.9	36223	1.21e+07

Source: Survey data

This municipality, with a focus on its data in the period under analysis, the loan variable (LnEmprst) represented on average 34% of total revenue and 140% of the remains to be paid (Lnrrpp and Lnrrnp). It is possible that this impact on the remains to be paid is a consequence of borrowing, as stated by Aquino and Azevedo (2017). Regarding the minimum value 'zero', shown in the table, it is a reflection of the municipalities that did not present information in the NTS database. Table 8 shows the results from the estimated model of tobit regression, with robust standard error, grouped by municipalities.

Table 8

Estimation by tobit effect with robust standard error with grouping by municipalities

LnEmprst _i =a+b ₁ .AnoElei _i +b ₂ .LnInv _i +b ₃ .LnRecEst _i +b ₄ .Idhm _i +b ₅ .EleRee _i +b ₆ .Pgov _i +b ₇ .Pop _i +(a _i -a+ε _i)						
						Equation 6
Random-effects tobit regression		Number of obs		=	6001	
Group variable: Munic		Number of groups		=	353	
Random effects u _i ~ Gaussian		Obs per group: min		=	16	
		avg		=	17.0	
		max		=	17	
Integration method: mvaghermite		Integration points		=	12	
Log likelihood = 14959.567		Wald chi2(11)		=	83.71380	
		Prob > chi2		=	0.0000	
LnEmprst	Coef.	Std. Err.	z	P> z	[95% Conf.	Interval]
AnoElei	.6816712	.0802492	8.49	0.000	.5243856	.8389568
LnInv	102.098	.0569398	17.93	0.000	.9093801	113.258
LnRecEst	.1807032	.0224449	8.05	0.000	.1367121	.2246943
Idhm	1.226.606	2.941.037	4.17	0.000	6.501.737	1.803.039
EleRee	.446883	.079055	5.65	0.000	.291938	.601828
Pgov	-.4259164	.1054925	-4.04	0.000	-.6326779	-.2191548
Pop	3.52e-07	7.97e-08	4.42	0.000	1.96e-07	5.09e-07
_cons	-1.135.692	1.237.374	-9.18	0.000	-1.378.213	-8.931.713
/sigma_u	1.387.181	.0672769	20.62	0.000	125.532	1.519.041
/sigma_e	2.794.163	.0263655	105.98	0.000	2.742.488	2.845.839
rho	.1977339	.0158661			.1681292	.2302869

Source: Survey data

This estimation model, represented in equation 6, analyzes the behavior of the loan variable (LnEmprst) in the election period. This model assumes the degree of safety of the results indicated in 99% of statistical significance, with 84% of explanation of the behavior of the variables, represented in equation (6).

Regarding the results, based on this estimation model, the loan variable (LnEmprst) suffered a positive impact in the election period to the analyzed period, increasing on average by 68%. This result confirms **H₃**, the loan cap increases substantially during the election period. The analysis of the data also provided the identification that the increase in investment (LnInv) and in revenue by State transfer (LnRecEst) reflect positively on the loan variable (LnEmprst).

The positive impact occurred in the variables loan (LnEmprst), investment (LnInv) and liabilities to be paid (Lnrpp and Lnrnp), verified through the results presented in Tables 4, 6 and 8, as a result of the estimated models provided in equations (5) and (6), in the electoral period, it is evident that **H₄** is not confirmed, that is, Brazilian municipal governments do not comply with legal norms regarding the use of budgetary resources in the electoral period, since local governments use budgetary resources in election period.

Committed expenses did not increase in election year, even in years before and after the election. Even in a scenario of party equality between governments, and in elections with two rounds. This result corroborates with Beender (2003), Mendes (2004), Sakurai and Menezes Filho (2008) and Sakurai (2009). But it does not confirm the statements of Blais and Nadeau (1992), Galli and Rossi (2002), Aklmedov and Zhuravskaya (2004), Sjahrir et al. (2013), Aidt and Mooney (2014), and Chortareas et al. (2016) when they affirm that there are positive changes in expenditures in the electoral period, as well as the conclusive results of the study by Queiroz (2013) when affirming that the expenses with personnel and costs increase on average 12% and 18% respectively.

Investment spending showed positive changes (increasing) by an average of 9% during election periods in municipal governments. This increase is also a reflection of partisan equality (municipal and / or state government), as well as transfers of revenue from the Union. These results partially corroborate Cavalcante's (2016) allusion when suggesting that municipal governments concentrate more spending on public works in election period. It is possible that the increase with investment in the election period, influences the voter in the choice of his vote, as affirmed Downs (1957), Key Jr. (1966) and Nordhaus (1975).

Loan capitation grew by an average of 68% in local governments during the electoral period. Candidates for reelection tend to resort to this credit line, especially when the income from transfers and investment expenditures signal growth. Perhaps, these actions contribute to the growth of the deficit and the lack of public funds available, as stated by Aquino and Azevedo (2017).

5 Final Considerations

The objective of the study was to verify influences on committed expenses, investment and loans in the electoral period, as well as legal compliance by local governments, regarding the use of public resources to pay off electoral expenses. To verify these influences and legal compliance, an analysis was carried out in 353 municipalities with a population equal to or greater than 50 thousand inhabitants in the period from 2000 to 2016.

The results presented in this study, using an estimated tobit regression model in a data panel, are robust and complete to support the hypotheses and proposed objectives. Through the descriptive analyzes in Tables 3, 5 and 7, it is possible to deduce that the municipalities are dependent on the revenues transferred by the Union and the State, under penalty of financial

collapse. Perhaps, this dependence is linked to the collection model (centralization in the Union and the State) of federal and state taxes generated in the municipalities, such as corporate income tax (SCIT) and tax for the circulation of goods and services (TCGS).

The three estimation models used to test the hypotheses about (i) committed expenses (LnDemp), (ii) investments (LnInv), (iii) loan (LnEmprst) and (iv) compliance with legal rules suggest that expenses (i), do not undergo positive changes in the election period. Investment (ii) and loan (iii) are strongly impacted in the election year. Finally, compliance with legal rules (iv), regarding the use of budgetary resources in the electoral period, are not complied with by municipal governments.

Given the above, the study concludes that municipal governments with a population of more than 50 thousand inhabitants, unlike some surveys, do not increase their expenditures committed before, during and after the electoral period. And that investment spending and loan capitulation undergo positive changes in election year, and it is more intense when there is party equality and a candidate for reelection. Local governments do not comply with legal requirements regarding the use of budgetary resources to pay for electoral expenses.

These results contribute to the strengthening of the literature on consensus on the subject, as well as fostering discussion regarding the behavior of revenues, impacting expenses, investments and loans in election year, as demonstrated. It is suggested, for the purpose of future research, to apply these estimation models in municipalities with a population of less than 50 thousand inhabitants, as well as to compare them with studies already carried out to assess their efficiencies.

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