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The importance of local economic growth on the elections of Brazilian chief executives of governments

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The motives for choosing the government's chief executive are of vital importance in a democratic society. In this article, evidence is presented of how local economic growth in the last year of government has a positive impact on the percentage of votes obtained by the incumbent in a population sample of Brazilian municipalities, with data of the presidential and municipal elections of 2000 to 2010. Real GDP growth of the city is used as a measure of local economic growth to test the hypothesis that voters in a municipality tend to reward incumbents and their candidates, if they had good economic performance in the last year of their mandate. The hypothesis is based on the economic theory of voting, suggesting that incumbents are more likely to win re-election, or elect their successor, when the economy is good. Panel and Multilevel models are used to detail the effects and the impact of economic growth in the proportion of votes obtained by the incumbent. The multilevel analysis was used in order to better explore existing heterogeneity in the economic voting phenomenon and thereby infer how economic growth effects may vary among parties, the federation units, constituency and other variables.

Keywords: accountability; economic vote; public expenditure.

A importância do crescimento econômico local na escolha do chefe do Executivo no Brasil

A investigação dos fatores que influenciam a escolha do chefe do Executivo no Brasil é uma questão de vital importância. Neste artigo, apresentam-se evidências de que o crescimento econômico local no último ano de governo possui impacto positivo na porcentagem de votos obtidos pelo incumbente em uma amostra da população dos municípios brasileiros, com dados das eleições presidenciais e municipais de 2000 a 2010. Usamos a expansão real do PIB municipal como medida do crescimento econômico local e testamos a hipótese de que os eleitores em um município premiam os incumbentes, ou seus respectivos candidatos, que tiveram bom desempenho econômico no último ano de mandato. A hipótese se baseia na teoria econômica do voto que sugere que os incumbentes têm mais chances de vencerem uma reeleição, ou elegerem o seu sucessor, quando a economia está em um bom momento. Na análise utilizamos as abordagens para dados em painel, além de análise multinível, de modo a melhor explorar a heterogeneidade existente no fenômeno do voto econômico e com isso inferir a existência de efeitos do crescimento econômico na proporção de votos obtidos pelo incumbente e como estes efeitos podem variar em relação a partidos, unidades da federação, circunscrição eleitoral e outras variáveis.

Palavras-chave: accountability; voto econômico; gasto público.

La importancia del crecimiento económico local en la elección del jefe del Ejecutivo en Brasil

La investigación de los factores que influyen en la elección del jefe del Ejecutivo en Brasil es un asunto de vital importancia en la literatura. En este artículo, presentamos evidencia de que el crecimiento económico local en el último año del gobierno tiene un impacto positivo en el porcentaje de votos obtenidos por el incumbente en una muestra de los municipios brasileños, con datos relativos a las elecciones presidenciales y municipales de 2000 a 2010. Utilizamos el crecimiento real del PIB municipal como medida de crecimiento económico local para poner a prueba la hipótesis de que los votantes en una ciudad tienden a recompensar el titular, y sus candidatos, que tuvieron un buen desempeño económico en el último año mandato. La hipótesis se base en la teoría económica de la votación que sugiere que los titulares tienen más probabilidades de ganar la reelección, o elegir a su sucesor, cuando la economía está en un buen momento. En el análisis se utiliza los métodos de datos de panel y el análisis multinivel con el fin de aprovechar mejor la heterogeneidad existente en el fenómeno del voto económico y con ello inferir la existencia de efectos del crecimiento económico sobre la proporción de votos obtenidos por el incumbente y cómo estos efectos pueden variar em relación a partidos, las unidades de la federación, circunscripción electoral y otras variables.

Palabras clave: accountability; voto económico; gasto público.

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1. INTRODUCTION

Voting is an essential mechanism for controlling public administration and is a fundamental condition for democracy. Elections are the main form of vertical accountability, allowing citizens to evaluate the government's performance, as well as the attractiveness of alternative proposals — on the most diverse matters — put forward by incumbent groups or by those in the opposition. The control of elected politicians by voters is a central theme of Political Science (Samuels, 2004). The very idea of democracy is closely related to the ability of voters to impose some kind of control over their elected representatives. The vast literature on economic voting takes as a normative assumption the capacity of the voter to punish or reward political parties and leaders, controlling democratic governments (Anderson, 2007). Not surprisingly, with the sequence of democratic governments after the end of the military dictatorship, the analysis of the determinants of the votes received by incumbent candidates in Brazil started to gain attention (Hunter and Power, 2007; Singer, 2009; Zucco, 2008).

Among the various issues about the public sector, economic management can be considered central in the analysis of government performance. However, most research on economic voting focus on how national conditions, or the individuals' well-being, affect voting decision. Only sparse studies analyze how local economic conditions affect election choice, which raise concerns because the theoretical component of the literature on economic voting considers local economic conditions as relevant. In addition, the estimated response for most of the widely used levels of analysis — the individual or national levels — may be spurious if the response to the local variables is substantial (Elinder, 2010; Ansolabehere, Meredith and Snowberg, 2014).

This article presents evidence that local economic growth positively affects the percentage of votes obtained by the incumbent candidate, taking into account the effects of regional economic growth — measured by the state's GDP growth — and national economic growth. The results are obtained from the analysis of the presidential and municipal elections from 2000 to 2010, in all Brazilian municipalities. The main hypothesis is based on the economic voting theory that suggests that incumbent candidates get the largest share of votes when the economy is good (Anderson and Morgan, 2011; Duch and Stevenson, 2008; Lewis-Beck and Paldam, 2000; Paldam, 1994). In this regard, the study contributes to the literature by exploring how the expansion of the local economy — 'local' defined by the Brazilian municipal division — tends to benefit the incumbent candidate both at the local level (running for mayor) and at the national level (running for president).

The starting point of the study is that local economic factors tend to be perceived by voters in a more intense way than the growth of the economy as a whole. Thus, the Brazilian experience is important because of the large territory and the size of population, where the huge distances make economic expansion a phenomenon necessarily local. For example, the growth of an industrial cluster in the Northeast may be the result of the closure of industrial plants in the South or Southeast. At the national level, the aggregate impact can be positive or negative, but in a disaggregated way, these are very different economic experiences. In summary, this study seeks to explore the economic effects voters feel more intensely.

Thus, in addition to introducing a new database, the study infers whether local economic growth in the last year of government is one of the relevant factors for the candidate representing the government. Moreover, these effects will be analyzed both in the next municipal elections and in the federal

elections, which allows to see whether these effects are different, coinciding with the attributions of each level of power.[1]

The article is structured into six sections, including this brief introduction. The second section describes the economic voting theory, which offers the basis for the analysis. The third section describes the study's approach and methodology, which includes the use of panel data and multilevel analysis. The next section presents the data obtained and the fifth the analysis conducted, followed by the final section with the conclusions.

2. VERTICAL ACCOUNTABILITY PROCESS: DETERMINANTS OF THE VOTE

Attempts to explain the rationale behind individuals' vote decision have stimulated a strong field of studies seeking to understand the motivation and origins of voting throughout the democratized world. In particular, one of the main schools of thought in this field is the economic school, which analyzes voters' behavior from the point of view of rational choice theory. Research on the determinants of voting originates in the first mass surveys conducted by Berelson and partners (1954) and Campbell and partners (1960), but the debate on the relationship between economics and voting gained strength with the seminal studies of Downs (1957), Key (1964, 1966) and Kramer (1971). Downs (1957) introduced the notion that individuals make choices based on comparison of expected utility towards competing parties; citizens would behave as consumers in a political market and compare prospectively the proposals of different parties and candidates as goods to be consumed.

The studies from Kramer (1971), Goodhart and Bhansali (1970) and Mueller (1970) were aimed at testing Downs' hypothesis in the US and UK, inspiring a broad research program. Key (1964, 1966) proposed an alternative perspective on economic voting, which would reflect the analysis of past facts and not expectations about the future. Economic voting would work as a referendum about the incumbent candidate's ability to manage the economy, giving a 'retrospective' characteristic to the vote decision. Fiorina (1981) updated the argument by analyzing how voters rationally act when face information scarcity. The main point is that voters, regardless of their level of information, are sensitive to the impact of government activities aimed at improving their well-being and use their view on these activities in order to guide their vote. Thus, future expectations are, for the most part, extrapolations of current trends.

Economic voting theory suggests that retrospective voting, based on past economic outcomes, allows voters to demand responsiveness of elected politicians in managing the economy. The mechanisms linking economic performance to voting behavior can either be a sanctioning process for poor economic performance (Kramer, 1971; Fair, 1978) or a way to assess how potential partisan competitors can perform in the future (Downs, 1957; Stigler, 1973).

A key assumption of both prospective and retrospective voting theories is that the government has a direct influence on the country's economic performance. Thus, an improvement in economic conditions increases the probability of voting in the party that is perceived as responsible for this

[1] The analysis of votes for state governor was excluded because the state government elections are carried out simultaneously with the presidential ones and, in terms of effects of economic voting, the state government is an intermediary position between the mayor and the president. This condition jeopardizes the strategy of statistical control. For further information regarding the effects of local economic growth in state government elections see Fernandes and Fernandes (2014).

outcome. In addition, a better economic performance tends to indicate a greater administrative capacity, as well as positively affecting the voters who do not identify with any party (Virmani, 2004; Anderson, 1995; Anderson and Morgan, 2011).

The electoral process, therefore, would be related to a calculation made by the voter in accordance with the differences in the expectations towards political parties, comparing what the government in power offers with what would supposedly be obtained if the opposition won the elections. Fair (1978), for example, when analyzing the presidential election in the US, found that electoral behavior largely depends on the economic events of the year before the election. The author's main conclusions are that US presidents tend to be re-elected when there is economic growth, federal spending is controlled and a major war has been avoided. In a later study, Fair (1996a) showed that voters react positively to real GDP growth per capita in the election year.

The literature on economic voting was developed based on the American case study. Three dimensions of the economic evaluation dominated the literature: a) time of reference when it comes to calculate the evaluation (retrospective or prospective vote); b) context of economic policy or the degree of authority the incumbent has to make decisions over policies that affect economic outcomes; and c) whether the object of evaluation is personal or social welfare. The voter who judges the incumbent from national conditions is regarded as a sociotropic voter and the voter who judges from his individual conditions is an egotropic voter (Lewis-Beck and Stegmaier, 2000; Kinder and Kiewiet, 1981).[2]

An important part of the studies on economic voting has focused on analyzing the relationship between economics and politics at the national level. Some of these studies have advanced in the debate about the differences of the economic voting among democratic regimes. Duch and Stevenson (2008) conducted a detailed study of 18 democracies, finding a significant relationship between economic perceptions and voting choices, especially in systems that concentrate the power of political decision-making. Powell and Whitten (1993) observed that models of conventional sanctions by economic voting often explain the variations in the behavior of electoral punishment. This behavior is conditioned by how clear is the attribution of responsibility towards the political incumbents, which may remove the effect of economic variables on election results and stresses the importance of the context as a variable to understanding the relation between economy and politics when it comes to voting. For Powell and Whitten (1993) the context of the vote is given by the 'clarity of responsibility' i.e. to which measure it is possible to say the incumbent politician is responsible for economic conditions. This contribution was crucial to help explaining the reasons why studies such as Paldam's (1991) — who analyzed the relation of interest in developed and democratic countries — did not find (when comparing in a transnational context) similar results to those presented at the national level.

2.1 LOCAL ECONOMIC VOTING

Results found in the empirical literature still present several puzzles, especially due to the great divergence between the conclusions obtained in different countries and over time (Lewis-Beck and Paldam, 2000; Dorussen and Taylor, 2002). Nevertheless, the vast majority of studies that investigate the effects of economic voting only observe regional or national data, as well as surveys conducted

[2] For an extended literature review on economic voting see Lewis-Beck and Paldam (2000) and Nannestad and Paldam (1994).

directly with the voter (Brug, Cees and Franklin, 2007). On the other hand, studies using municipal data are generally concerned with the effects of fiscal manipulation and they did not focus on understanding the effects of economic performance.

Sakurai and Menezes (2008), for example, using panel data from more than 2,000 Brazilian municipalities, indicate the existence of a positive influence of public spending on the probability of mayors to be re-elected. Veiga and Veiga (2007), with data from municipalities in Portugal, show that the increase in public spending related to investment, as well as changes in the composition of spending favoring items with greater visibility, are positively associated with the percentage of mayors seeking re-election. Levitt and Snyder (1997) show that the results of the election for the American Lower House are influenced by federal spending in the counties. Jordahl (2002) shows the electoral response in Sweden for national government funds earmarked for specific municipalities. Brender (2003) finds evidence that the fiscal performance of local governments in Israel positively impacts the chances of re-election only in some of the elections. Finally, Drazen and Eslava (2010), examining forms of electoral manipulation of municipal expenditures using data from all Colombian municipalities, verify that national economic growth affects the elections.

Other works show the connection between local economic conditions and the support of the incumbent or opposition. Lindbeck and Weibull (1993) as well as Dixit and Londregan (1996) show that governments redistribute resources to regions with greater potential for attracting votes, while Cox and McCubbins (1986) verify redistribution to regions where there is greater support for the incumbent.

Thus, very few studies test the effect of municipal (or local) economy performance on national elections. Some of the few exceptions found are the studies conducted by Martins and Veiga (2014), Oliver and Ha (2007), Pattie and Johnston (2001) and Elinder (2010). In the first, the researchers found a positive relationship between the local and national effects of economic performance on the percentage of votes obtained by the party of the current mayor in Portugal. Oliver and Ha (2007), using survey data from more than 1,400 voters in 30 different suburban communities in the United States, concluded that better local government performance is positively related to incumbent support.

Pattie and Johnston (2001) analyzed the 1997 general elections in the United Kingdom and showed the importance of the local economy in understanding voters' electoral behavior. Using survey data on individuals' perceptions about the economy, they found evidence that voters are less influenced by perception of changes in national economic prosperity than of changes in local economic prosperity. In addition, they also found evidence that local economic prosperity plays a greater role in choice of vote than the improvement in the individuals' economic well-being. Finally, Elinder (2010) analyzes how local economic conditions — such as economic growth and unemployment — affect the electoral performance of candidates in local counties and regions in Sweden.

3. THEORY AND METHODOLOGY

The discussion proposed here is based on the seminal contributions of the economic theory of voting presented above. This study assumes that individuals are rational and perceive the electoral process as a market in which they seek to make exchanges that increase their well-being, whether due to social or egotropic reasons. In elections, individuals reward political groups that they think are most capable of producing positive economic results. Voters' choice may be motivated by both a retrospective

rationale — they evaluate whether the vote and the past results punish or reward the political party for its previous performance — and a prospective rationale — in which past economic performance is used as a proxy for forecasting future performance.

In addition, assuming that individuals are risk averse, it is natural that they choose to reward an incumbent group that has produced favorable results, since there is a degree of uncertainty regarding the vote for the opposition (unlike the incumbent who is known by all voters, the opposition's capacity is yet unclear). Against this backdrop, it is expected that the best economic performance, including the effects on the local economy, will affect the performance of the incumbent in the different electoral regions.

A fundamental contribution of this research is to prioritize the analysis of local economic conditions. This adds value to findings already disseminated in the literature, which are essentially based on the effects that national economic results or that individual's well-being have on voters decisions. The omission of local variables, however, can produce poorly specified models, leading to biased estimates of the impact of national growth or individual well-being (Elinder, 2010).

When choosing to use municipalities as the basic unit of analysis, this research addresses several fundamental issues in the literature on economic voting. Among these issues is the control for institutional variability, because by always defining the same context in all municipalities (the coalitional presidentialism, in which mayors and presidents compete for the voters' direct preference), influences from the institutional context (clarity of responsibility) are eliminated when it comes to estimate the impact of the economy on elections. The choice of an objective measure of economic performance — such as the growth of municipal GDP — removes problems concerning the economic perception of each individual about their situation and the situation of their region.

In addition, the estimation strategy based on panel data using fixed effects and year dummies, allows controlling general impacts on elections — including national and international economic conditions and other relevant sociopolitical phenomena, such as ideology, president's profile and external conditions. Obviously, this strategy also allows controlling the idiosyncratic characteristics of municipalities. This facilitates the proper estimation of the true effect of the local economy on the electoral performance of the incumbents by reducing the possibility of confounding variables affecting the relation of interest.[3]

On the other hand, the research design establishes some limits to our findings. In choosing the municipality as the unit of analysis, it is not possible to draw any kind of conclusion about the behavior of individuals — which would be a typical case of ecological fallacy — preventing the evaluation of the results regarding the mental frame of the vote decision: prospective or retrospective voting and sociotropic or egotropic voting. Thus, the observed results are analyzed from the perspective of the incumbent candidate, not the voter, since the study works with aggregates and the candidates actually do their electoral calculations, keeping in mind the potential reactions of the voter groups.

[3] Although it is interesting to estimate the effects of the national economy, the few years available in the database (only 6 elections), prevents that these effects are estimated properly. Thus, in order to control the general effects of the national economy, year dummies were included (Wooldridge, 2002). Notwithstanding, two types of macroeconomic variables were included in the analysis and they are crucial for the case defended here: a) the regional and national GDP growth (measured for the states and for the country, respectively); b) the level of states and national real GDP.

Therefore, the study analyzed the effect of local aggregate variables on incumbent electoral performance. Thus, the hypothesis of traditional research on economic voting was reformulated, not from the decision of the voter, but from the logic of the incumbent candidate. The incumbent has a better electoral performance the better are the economic results at the local level.[4]

The research used the incumbent's share of votes as the dependent variable. An alternative way would be to use a variable that captures whether the incumbent won the election or not. However, the first strategy was chosen since the use of a dummy for victory implies not only a good performance, but also a positive result in the elections i.e. electoral success. In this case, the research would be measuring if the economic performance allows exceeding a minimum number of votes, a number that would represent the victory in the election, which is always conditioned at the specifics of each election. Using the share of the votes allow us to have a more sensitive 'thermometer', able to better capture the impact of economic performance, which may or may not have been enough to give the incumbent the victory at the polls.

In addition, by using a dichotomous variable, much variation is lost, which is costly from the statistical point of view. Therefore, the use of the fraction of the votes is more advantageous from a methodological and theoretical point of view, eliminating probable confounding factors that affect the likelihood of electoral victory.[5]

The study of the incumbent electoral performance was conducted in two stages. In the first, we analyzed the economic vote through panel data, which allows to control for unobservable idiosyncrasies (c_i) of the municipalities, for exogenous shocks, as well as it increases the estimates precision (Hsio, 1986). The relationship is estimated through panel data techniques that allow analyzing whether unobservable idiosyncrasies affect or not the estimation. For this, we used the three traditional static panel models: polled panel data, random effects (RE) and fixed effects (FE). It is worth remembering that the fixed effects analysis (FE) assumes that the specific effect is treated as a parameter to be estimated and, thus, the c_i can be correlated with the other regressors.[6]

After analyzing the main relation of interest in the panel study, the second stage was to relax the hypothesis of the absence of heterogeneity in the impact of the several variables on the incumbent share of votes. For example, one option was to estimate separately panel models for municipal and presidential elections. However, even considering the existence of a different impact, if assumed that there is a correlation between both elections, the information of the dataset is better managed by estimating the regressions through multilevel models (Gelman and Hill, 2007). That is, the effect of economic growth on incumbent voting through the multiple-level approach allows estimating and

[4] Tucker (2006) used the same research strategy in his analysis about the effects of the local economic aggregates during the post-communist transition in Eastern European countries and in Russian national elections. However, both in Tucker as in this study, the theoretical justification for economic voting is elaborated from the assumption of the voter rationality and the strategic action of the politician seeking this rational voter's support.

[5] Victory is defined here as the incumbent's election or when the incumbent wins a position in the runoff, since the study used data from the results of the first round of municipal and presidential elections. Considering this definition, the models were estimated only for municipal elections, because there is no variation in the dependent variable for the presidential elections — in the three elections, the incumbent candidate was elected in the runoff. However, despite all the caveats made above, the variable 'victory' was tested in linear models and using logistic regression. Results were irrelevant in all models regarding local economic growth, and negative and irrelevant in the fixed effects models for regional growth. Results were negative and meaningful for national economic growth. These findings are available in the appendix 2.

[6] After the estimations, the Breush-Pagan test was conducted in order to verify the presence of specific heterogeneity. In addition, the Hausman (1978) test was applied to verify the correlation between eventual specific heterogeneity and the regressors.

thereby testing coefficients for federation unit, political party, election year and election type. This approach allows to explore in depth the data, because makes it possible to study the variation of the economic effects along these different dimensions. Categories defined by the size of economic growth and the size of municipal GDP were included. Ten categories were established in each of these variables, according to each decile of the distribution of growth and the size of GDP in each specific year.

Thus, it is possible to understand how different groups respond differently to economic effects and how economic voting can operate differently within the same socioeconomic and institutional reality. The inclusion of the analysis of heterogeneous effects relativizes the essentially economistic view portrayed in the literature on economic voting, allowing to identify more clearly the conditions through which economics and politics are mutually dependent. This leads to answering a fundamental question of the research: is the effect of economic growth stronger for the municipal or federal incumbent?

For multilevel estimation, six separate models are created and each one of them present the levels mentioned above. The models presenting the most relevant results from the statistical point of view were identified. It is important to say that the multilevel models used here have random intercept and slope.

3.1 MODEL OF ECONOMIC VOTING IN BRAZIL

The sample analyzed in this article covers 5,565 Brazilian municipalities and the elections happened between 2000 and 2010.[7] As described below, the database included five types of variables: political, economic, fiscal, demographic and geographic. The last three are used as controls in the estimation. The basic equation to be estimated is:

$$fracaovotos_{it} = \alpha + c_i + \beta_1 cresc_{it} + \beta_3 control\ variables_{it} + \lambda_1 dummies_{it} + \varepsilon_{it}; \quad (1)$$

where *i* refers to the municipality, *t* to the year and α, ci and ε_{it} are, respectively, the constant, the municipal fixed effect and the idiosyncratic error; *cresc* is the independent variable of interest and *fracaovotos* the dependent variable. The variable *fracaovotos* indicates the percentage of valid votes (total votes minus null and blank votes) that the incumbent candidate obtained. The regressor *cresc* is the growth rate of real municipal GDP that, according to the theoretical-methodological framework adopted, is used to measure the economic growth during the year of the presidential and municipal elections. As for the multilevel models, the basic equation estimated is slightly different, including dummies for the levels:

$$fracaovotos_i = \alpha_{i[j]} + \beta_{1(j)} cresc_{i[j]} + \beta_2 control\ variables_i + \lambda_1 dummies_i + \varepsilon_{it[j]}; \quad (2)$$

where *i* refers to the municipality, $\alpha_{i[j]}$ and $\beta_{1[j]}$ are, respectively, the intercept and the random coefficient of interest, and $_{[j]}$ is the group subscript indicative. Finally, $\varepsilon_{it[j]}$ is the idiosyncratic error.

[7] The selection of the municipalities was conducted based on availability of the data for the variables established. The research aimed to work with the complete population of Brazilian municipalities (5,570).

4. DATA

Electoral data was obtained from the Superior Electoral Tribunal (TSE), covering information for 5,565 Brazilian municipalities, referring to the municipal elections of 2000, 2004 and 2008 and to the presidential elections of 2002, 2006 and 2010. The last year analyzed is 2010 because the main independent variable — municipal economic growth — is available from the Brazilian Institute of Geography and Statistics (IBGE) only until 2011. Consequently, it is impossible to estimate the relation of interest in the municipal elections of 2012 and in the 2014 presidential elections.

For the presidential election in the years 2002, 2006 and 2010, it was possible to clearly define the incumbent candidates in all municipalities (obviously, the incumbent candidates for all municipalities were those running for presidency in each of the years). In 2002, the incumbent was José Serra, from PSDB; in 2006, Luiz Inácio da Silva (PT); and in 2010, Dilma Rousseff (PT). As for the municipal elections, identifying the incumbent candidates presented a challenge that was dealt by assuming that the incumbent was the candidate that had the same name as the current mayor at the year of the election, or is the candidate from the same party. When there were two candidates fitting the two conditions, the first was considered the incumbent. The number of municipalities with incumbent candidates in the sample per year was as follows: in the year 2000 there were 4,423 municipalities with incumbent candidates; In the year 2002, 5,563 municipalities; In the year 2004, 3776 municipalities; In the year 2006 were 5,565; In the year of 2008, 4,123; And, finally, in the year 2010, 5,495 municipalities. In this way, the sample analyzed was composed of more than 5,000 Brazilian municipalities in six subsequent electoral periods, constituting an unbalanced panel, but quite abundant in information.

This strategy of incumbent identification generates a measurement error by not identifying the candidate for the succession of a mayor who does not run for reelection and has changed party and/or has launched a successor from another party. We preferred to adopt a more conservative metric of incumbent identification, understanding that this difference does not compromise the findings, as there is no link in literature connecting politicians changing parties with local economic performance. More importantly, when incumbent candidate in a municipality is not a politician running for reelection and is a politician belonging to another party (different from the current mayor's party), but representing a party coalition that is currently in government, the municipality was excluded of the analysis in that year. This explains why there are fewer cases analyzed in years of municipal elections

Control variables regarding politics, economy, geography and municipal public spending were considered. Economic and demographic variables were obtained from IBGE, including the population of the municipality and the real municipal GDP. The variables that measure municipal expenditures were obtained from the National Treasury Secretariat, and Datasus offered data on the percentage of municipal budget applied in health in all Brazilian municipalities.

Some economic control variables were selected in other levels of regional aggregation, with both economic and political implications in terms of separating the effects of the different features of economic growth. In addition to the variables of level and growth of real municipal GDP, we also included variables of level and growth of both state GDP and national GDP. Other aggregate macroeconomic factors were controlled through the inclusion of year dummies.

In addition to fiscal, demographic and economic information, the study explored the potential role played by the mayor-president relationship in the election. To this end, we built a binary variable that indicates whether the mayor had political connections with the president. In years of presidential election, we observed if the mayor belonged to any party in the electoral coalition formed around the incumbent candidate to presidency. In years of municipal election, the research observed if the incumbent candidate's party was in the political coalition ruling the federal government. The choice to use electoral coalition in years of presidential elections was made because the coalition indicates more clearly the coordination of electoral efforts between the parties that are capable of affecting the political-economic dynamics analyzed here. As for the years of municipal election, the study used the government's political coalition data elaborated by Figueiredo (2007). The electoral and political coalitions are as follows: 2000 — PSDB, PFL, PMDB, PPB; 2002 — PSDB, PMDB; 2004 — PT, PMDB, PL, PPS, PSB, PCdoB, PTB, PV; 2006 — PT and PCdoB; 2008 — PT, PMDB, PL, PP, PSB, PCdoB, PTB. Thus, for the analysis of political connections between mayor and president, the research was based on the party's alliances at the federal level. Data on the mayor's party was collected from the municipal elections result, immediately preceding the presidential election.

CHART 1 DESCRIPTION OF VARIABLES

fracaovotos	proportion of valid votes obtained by the incumbent (0-100)
cresc	real municipal GDP's growth rate
lpibreal	log of real municipal GDP
crescuf	real state GDP's growth rate
lpibuf	log of real state GDP
crescbr	real national GDP's growth rate
lpibbr	log of real national GDP
prefeitobase	dummy related to mayor belonging to the electoral coalition of the incumbent candidate to presidency (1-belongs; 0-does not belong)
persaude	percentage of the budget spent in health (%)
lpop	log of the municipality's population
ldesporc	log of the municipal budget spending in electoral year (R$)
linvest	log of the municipal spending on investment in electoral year (R$)
ldespcor	log of the municipal current spending in electoral year (R$)
laseps	log of the municipal spending on social services and social security in electoral year (R$)
leec	log of the municipal spending on education and culture in electoral year (R$)

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lheu	log of the municipal spending on housing and urban development in electoral year (R$)
lses	log of the municipal spending on health and sanitation in electoral year (R$)
ldespes	log of the municipal spending on personnel in electoral year (R$)
municipal	dummy related to the type of election (1-municipal; 0-presidential)
-	federal units dummies
-	candidate's political party dummies
a2000-a2010	year dummies
deciscresc	deciles of the municipalities' real economic growth
decispib	deciles of log of the real municipal GDP

Source: Elaborated by the authors.

In addition, possible macroeconomic shocks were controlled by year dummies and dummies indicating the federation units, the incumbent's political parties and the type of election (presidential or municipal). Group variables were created, indicating the levels that will be used in the second step of the analysis. There are six levels: party of the candidate; federation unity; type of election; election year; real municipal GDP; and decile of the municipalities' real economic growth. The description of the variables is shown in chart 1 and their respective descriptive statistics in tables 1 and 2.

5. RESULTS

This section presents the main results obtained with the application of panel and multilevel methods. The results of the estimations using panel data techniques are presented in table 3. The estimates obtained with the multilevel model were analyzed in order to verify if the results of the coefficients of interest were significant (the intercept and the estimated slope of the *cresc* variable), when analyzed at the six different levels.

TABLE 1 DESCRIPTIVE STATISTICS OF CONTINUOUS VARIABLES

Continuous Variables	Average	Median	Standard Deviation	Minimum	Maximum	Observations
fracaovotos	48.54	48.19	18.95	0.00	100.00	28942
cresc	0.09	0.07	0.17	-0.79	6.84	28935
lpibreal	10.83	10.58	1.47	7.28	19.91	28894
crescuf	6.88	6.30	4.52	-8.8	25.9	28945
lpibuf	25.17	25.26	1.27	21.71	27.62	28945
crescbr	5.97	7.00	2.96	0.90	9.90	28945

Continue

Continuous Variables	Average	Median	Standard Deviation	Minimum	Maximum	Observations
lpibbr	28.44	28.46	0.19	28.20	28.72	28495
persaude	14.20	16.06	8.97	-73.35	161.38	28627
lpop	9.39	9.28	1.15	6.68	16.24	28941
ldesporc	14.95	14.78	1.12	4.48	22.60	28049
linvest	13.57	13.53	1.56	4.14	21.98	27541
ldespcor	14.61	14.45	1.23	5.50	22.44	28014
laseps	13.13	13.04	1.35	4.68	22.10	27901
Leec	16.22	16.02	1.11	10.21	24.03	28000
Lheu	15.99	15.78	1.08	10.11	23.77	27612
Lses	13.96	13.86	1.30	5.89	21.72	27466
Ldespes	15.35	15.18	1.17	4.01	22.73	27605

Source: Elaborated by the authors.

TABLE 2 DESCRIPTIVE STATISTICS OF CATEGORICAL VARIABLES

Binary and Categorical Variables	0	1								
Prefeitobase	16,138	12,791								
Municipal	16,623	12,322								
	2000	2002	2004	2006	2008	2010				
Year	4423	5563	3776	5565	4123	5495				
Categories of income and municipal growth	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Deciscresc	2893	2892	2898	2895	2886	2887	2891	2905	2898	2900
Decispib	2883	2885	2887	2892	2889	2882	2898	2901	2885	2943
Other Categorical Variables										
Federal unit	dummies for each state and variables for all the states									
dummies of candidate's political party	dummies for each political party and variables for all the parties									

Source: Elaborated by the authors.

5.1 RESULTS OF PANEL DATA ANALYSIS

Table 3, in addition to the independent variable of interest, includes all the continuous control variables and the political variable that captures the political connection between the mayor and the

president. As expected, the Hausman Specification Test (1978) indicates that the fixed effects model is preferable.[8] In addition to the year dummies, in columns 4 to 6, the variable on the type of election, presidential or municipal, is included.

The main conclusion points to the existence of a positive relationship between municipal economic growth and the vote obtained by the incumbent in the municipality, since in all models, statistical significance cannot be rejected with the inclusion of additional controls. In fact, the six columns of coefficients in table 3 indicate that the growth in the real GDP of the municipality (*cresc*) has a positive and significant relation with the percentage of votes obtained by the incumbent. The results of columns 04 to 06 bring further evidence in favor of the hypothesis of the existence of an economic vote, since in the three models analyzed here the growth coefficient is positive and statistically significant. This is true even after including innumerable control variables that are capable of capturing a good part of the temporal variation of the sample (year dummies and the type of election), as well as the variables that capture the variation and the level of state and national GDPs. In the model with all controls the ratio between the 1% growth of real local product increases between 1.01 and 1.15 percentage points in the fraction of votes obtained by the incumbent candidate.

As expected, the coefficients of the estimates with more controls are slightly smaller and have less statistical significance than the coefficients of the estimates of the reduced models. However, the empirical analysis clearly shows that one cannot reject the local economic vote in the Brazilian presidential and municipal elections. The results show that the incumbent tends to be rewarded in the elections when the local economy presents economic growth, being punished otherwise. The investigation of the non-linearity of the effects of the economy on the proportion of votes obtained by the incumbent is shown in the next section.

In addition to the evidence on the relationship between local economic growth and the votes obtained by the incumbent, table 4 presents a number of relevant implications. Among them, it is important to notice that in almost all models the coefficient of real GDP (lpibreal) influences in terms of difficulties for the candidates in municipalities of larger economy, indicating that the greater the wealth of the municipality, the worse the incumbent's electoral conditions are. The number of inhabitants (lpop) was also relevant, pointing to the strengthening of the opposition vote in cities with a larger population, despite the signs reversed in the models of random and polled effects of columns (1) and (2). However, in the fixed effects model and with all the controls, the hypothesis of a negative relation is not rejected. As expected, electoral competition seems to be more intense in the largest cities in the country, whereas, in smaller localities, the incumbent tends to receive more votes.

As for the pattern of public spending, it was observed that the expenditure on education and culture (leec) positively affects the number of votes achieved by the incumbent. This conclusion verified in all models tested and with substantive effects, indicates the importance given by voters to this type of expense, and can be considered a basic need to be met in the locality. The models indicate that the growth of 1% of public spending in this sector tends to increase the proportion of votes obtained by

[8] $\chi^2 = 897.68$, probability > $\chi^2 = 0.0000$.

the incumbent from 1.5 to 6.5 percentage points, of which 1.54 percentage points in the fixed effect model with controls.

Regarding the other sectors of public administration, some results are surprising. Social services and social security (laseps) expenditures are always positive, although not statistically significant in the models with fixed effects with all controls. Indeed, spending on aid to people in sensitive social situations and retirees seems to reward the incumbent.

As for the electoral effects of spending on health and sanitation (lses) are unstable. In the random effects models with all controls, the findings are positive and significant, while in the fixed effect model it is always negative, although insignificant after inserting the year dummies. This is not surprising, given that health and sanitation are two categories of expenditure of a distinct nature, despite being grouped in the same function. Sanitation, for example, is a medium and long-term public expenditure, while spending on health can be immediately tangible as a vaccination policy or less visible as the deepening of the Family Health Program. When looking only at the percentage spent on health (persaude), the signal is positive and statistically significant in all models.

In any case, the trinomial composed of health, education and social services seems to be positively related to the incumbent's vote, even though the findings on health and sanitation (lses) are more uncertain. As a result, the Brazilian electoral system seems to work in the direction of stimulating greater efforts in social policies at the local level.

The other municipal fiscal variables aggregated, had different effects, altering the signal of the respective coefficient, with the addition of larger controls. In the fixed-effects model, spending on personnel and investments were positively related to the votes obtained by the incumbent. On the other hand, spending on housing and urban development (leu) was quite unstable, and always significant, positive in random and polled models and negative in fixed effect models, an outcome that does not allow securely argue about the effects. This result for housing and urban development, considering that further investigation is needed, is not surprising given that this area receives investments from different levels of government, which could justify the hypothesis of less identification of the voter with the person in charge of spending.

An example of the difficulty of voter identification is the existence of programs related to housing and urban development from different levels of government (federal, state and municipalities), coexisting under the management of the municipal authorities. As an example, municipalities of the state of São Paulo are benefited with a program conducted by the State Secretariat of Housing, through the state owned company CDHU. Moreover, the cities are benefited by initiatives from the federal government such as *Minha Casa Minha Vida* program (housing program to stimulate low-income first time buyers). Despite happening in the municipalities, these programs from different government levels are not easily connected by voters with a specific politician or group in government. An extreme case is the capital of the state, São Paulo city, where there are federal (*Minha Casa Minha Vida*), state (CDHU), and municipal (Cohab) housing programs (Marques and Rodrigues, 2013). In any case, further investigation is needed on this issue.

TABLE 3 PANEL ANALYSIS OF ECONOMIC VOTES IN BRAZILIAN MUNICIPALITIES

Fracaovotos	POLS	RE	FF	POLS	RE	FF
Cresc	**1.59**	**1.545**	**1.761**	**1.136**	**1.09**	**1.148**
	(0.614)* **	**(0.609)** **	**(0.627)*** **	**(0.603)***	**(0.600)***	**(0.624)***
crescuf	**0.099**	**0.105**	**-0.016**	**0.08**	**0.086**	**-0.058**
	(0.029)***	(0.029)***	(0.034)	(0.029)***	(0.029)***	(0.034)*
crescbr	3.842	3.881	4.546	3.857	3.927	2.278
	(0.078)* **	**(0.077)*** **	**(0.085)*** **	**(0.076)*** **	**(0.201)*** **	**(0.593)*** **
lpibreal	-0.469	-0.459	-0.157	-0.487	-0.478	-0.186
	(0.070)***	(0.069)***	(0.095)	(0.069)***	(0.069)***	(0.095)*
Lpibuf	-1.818	-1.854	40.269	-1.946	-1.992	44.867
	(0.105)***	(0.106)***	(2.670)***	(0.105)***	(0.105)***	(2.691)***
lpibbrasil	-1.617	-3.321	-77.35	--	4.128	-56.683
	-1.535	(1.541)**	(3.628)***	--	(0.133)***	(5.666)***
prefeitobase	**1.455**	**1.547**	**2.091**	**0.649**	**0.75**	**1.289**
	(0.199)* **	**(0.200)*** **	**(0.227)*** **	**(0.213)*** **	**(0.213)*** **	**(0.241)*** **
persaude	0.05	0.051	-0.035	0.121	0.121	0.044
	(0.013)***	(0.013)***	(0.017)**	(0.021)***	(0.020)***	(0.025)*
Lpop	0.469	0.328	-4.13	-0.206	-0.451	-6.037
	(0.278)*	(0.277)	(1.312)***	(0.287)	(0.285)	(1.358)***
Leec	**6.557**	**6.067**	**1.222**	**6.843**	**6.405**	**1.543**
	(0.540)* **	**(0.541)*** **	**(0.511)** **	**(0.614)*** **	**(0.623)*** **	**(0.544)*** **
Lheu	0.306	0.228	-0.579	0.373	0.305	-0.416
	(0.108)***	(0.109)**	(0.157)***	(0.110)***	(0.111)***	(0.155)***
Lses	0.163	-0.074	-1.803	0.988	0.827	-0.269
	(0.290)	(0.287)	(0.352)***	(0.335)***	(0.329)**	(0.353)
laseps	0.504	0.475	0.363	0.464	0.439	0.326
	(0.147)***	(0.147)***	(0.207)*	(0.151)***	(0.152)***	(0.208)
ldesporc	-9.542	-8.484	5.756	-9.954	-8.91	7.717
	(0.761)***	(0.767)***	(1.005)***	(0.867)***	(0.882)***	(1.179)***
ldespcor	-0.905	-1.735	-4.685	-1.228	-2.139	-5.334
	(0.584)	(0.587)***	(0.806)***	(0.621)**	(0.631)***	(0.962)***

Continue

Fracaovotos	POLS	RE	FF	POLS	RE	FF
linvest	**2.219**	**2.202**	**1.906**	**2.005**	**1.977**	**1.43**
	(0.140)* **	**(0.139)*** **	**(0.160)*** **	**(0.143)*** **	**(0.142)*** **	**(0.168)*** **
ldespes	-1.69	-0.875	2.182	-1.133	-0.233	3.304
	(0.538)***	(0.541)	(0.763)***	(0.565)**	(0.577)	(0.911)***
municipal				1.797	1.235	-1.093
				(0.451)***	(0.451)***	(0.369)***
a2000				4.937	5.444	9.412
				(0.812)***	(0.802)***	(0.611)***
a2002				5.749	3.355	-5.477
				(1.297)***	(1.308)**	(2.739)**
a2004				-2.632	-1.944	--
				(0.551)***	(0.545)***	--
_cons	27.542	17.815	-138.809	115.832	--	446.511
	2.902***	2.960***	12.655***	(3.687)***	--	(140.218)***
N	26352	26352	26352	26352	26352	26352
Municipalities	5549	5549	5549		5549	5549
r2	0.120		0.210	0.330		0.370
Breusch-Pagan's test:			$\chi^2 =$ 107.15 probability > $\chi^2 = 0.0000$			
Hausman's specification test:			$\chi^2 = 897.68$, probability > $\chi^2 = 0.0000$.			
Note: significance: *< 0,1 / **< 0,05 / *** <0,01						

Source: Elaborated by the authors.

In the case that the mayor's party participates in the political coalition ruling at the federal government, there is positive and statistically significance in all models, suggesting that this kind of alliance brings relevant impact on the elections. This is an extremely interesting result given that, despite the importance of involuntary transfers in the municipal budget, which are automatic and unrelated to political relations, electoral proximity is, at least potentially, more relevant between the president and the mayor. In this sense, despite the fact that the economic growth variable is local, it cannot be denied that there is an identification with the president and a recognition of the federal government's responsibility in growth policies.

Finally, the dummies incorporated in the model were mostly significant and with high coefficients. It is noted that the president seems to receive a greater amount of votes when incumbent than the mayor. The coefficient of municipal elections indicates, in the fixed effect model, that the incumbent president has an average of 1.1 percentage points more than the incumbent mayor. In fact, with the exception of 2002, in elections covered in the study the president's successor was voted in.

5.2 RESULTS OF MULTILEVEL ANALYSIS

The model chosen to perform the multilevel modeling includes all variables of the models presented in the first three columns of table 3, since the variables included in columns (4), (5) and (6) — municipal (indicator of the type of election) and years — area analyzed at different levels. In addition, for parsimony, it is assumed that only the coefficient of interest (*cresc*) is random, in addition to the intercept. All others are modeled as fixed coefficients. Six models are proposed, each with a different type of level.

The first level analyzed is composed of the 10 groups of the economic growth band, formed from the division of the distribution of the variable *cresc* in 10 distinct deciles in each year. That is, the size of economic growth was separated into 10 distinct groups in each election year.

The results are presented in table 4 and in graph 1, where the variation of βj [i] is shown with its respective confidence interval over the 10 groups sorted in ascending order. In table 4, the left side shows the result of the fixed coefficients and the right side the random coefficients. Fixed coefficients corroborate the previous analysis, showing a positive and significant effect of local economic growth (*cresc*), alliance between mayor and president (*prefeitobase*) and some of the expenses, while finding negative and significant effect of municipal GDP size and positive effect of population. The right side of table 4 shows the random coefficients for both the intercept and the effect of economic growth.[9]

Graph 1 presents the results demonstrating more clearly the information found in the estimation of the random coefficients.[10] This graph indicates the existence of an inverted U-shaped relationship between the effect of economic growth on incumbent voting and growth bands.

Hence, a probable non-linearity of the effects of the economy on the proportion of votes obtained by the incumbent, as anticipated in the previous section, is pointed out, which shows the importance of the use of methodologies sensitive to the identification of heterogeneous effects. There is an intensification of the growth effect that peaks in the fourth decile, gradually losing strength. Thus, the bands that are in the first and last deciles, presented a smaller achievement of the economic growth on the incumbent's vote, becoming negative in the 10th decile. Moreover, with the exception of the negative coefficients of the 10th decile, almost all others are positive and statistically different from zero, which corroborates the previous analysis and expose potential heterogeneities of the effects not specified in the literature on economic voting.[11]

[9] In this model, the independent variable real national GDP was eliminated because there is not enough freedom to assure the estimator convergence. The same happened with the model with deciles of real GDP (graph 2 — Income Band), when the national macroeconomic variables (economic growth and real national GDP) were eliminated. In the other multilevel models, all variables listed in table 4 were used.

[10] Large part of the multilevel analysis repeated the findings of the previous section, therefore, we are not discussing in the next paragraphs the information related to the fixed coefficient estimations. We will only analyze graphically the variation of the random coefficients of growth. In case the reader is interested in checking the details of the multilevel analysis, the findings on fixed and random effects of each one of the models estimated in the research are available in the appendix.

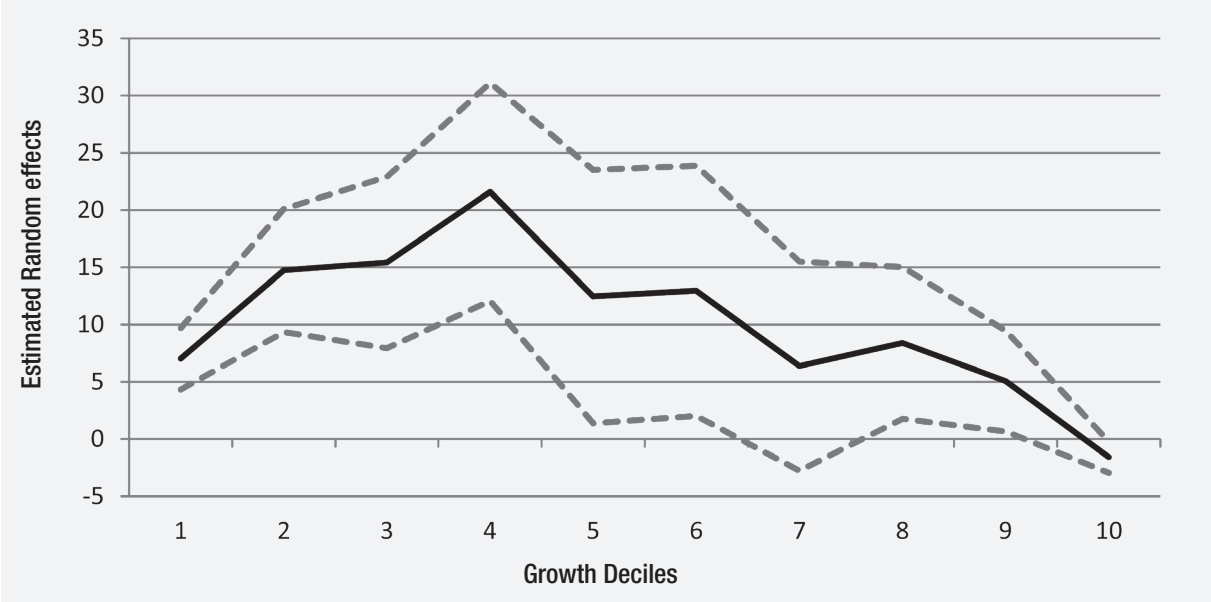
[11] The other exception is decile 7, which has a positive but insignificant effect.

TABLE 4 ESTIMATION BY ECONOMIC GROWTH BANDS

Fixed Effects				Random Effects Growth Bands					Confidence Interval of β (95% confidence)	
fracaovotos		Standard Error	t-value	Group	$\alpha_{j[i]}$	Standard Error	$\beta\ j[i]$	Standard Error	$\beta_{j[i]\ min}$	$\beta_{j[i]\ max}$
intercepto	124.21***	2.82	44.12	1	124.4	0.09	7.02***	1.37	4.34	9.71
Cresc	10.24***	2.93	3.49	2	123.90	0.19	14.7***	2.75	9.36	20.12
lpibreal	-0.47***	0.07	-6.57	3	123.86	0.26	15.4***	3.82	7.95	22.90
crescuf	0.07***	0.03	2.67	4	123.44	0.33	21.6***	4.86	12.07	31.12
crescbr	3.75***	0.05	71.89	5	124.06	0.38	12.5**	5.64	1.39	23.52
lpibuf	-1.78***	0.09	-20.98	6	124.02	0.38	13.0**	5.58	2.03	23.88
lpibbrasil	-	-	-	7	124.47	0.32	6.37	4.66	-2.76	15.51
persaude	0.06***	0.01	4.44	8	124.33	0.23	8.40**	3.38	1.78	15.02
Lpop	0.59***	0.23	2.57	9	124.56	0.15	5.07**	2.25	0.66	9.47
Leec	6.58***	0.34	19.16	10	125.01	0.05	-1.58**	0.70	-2.95	-0.21
Lheu	0.31***	0.10	2.96							
Lses	0.09	0.26	0.34							
laseps	0.50***	0.13								
ldesporc	-9.70***	0.49								
ldespcor	-0.31	0.52								
linvest	2.19***	0.14	16.13							
ldespes	-2.25***	0.47	-4.83							
prefeitobase	1.48***	0.20								

Source: Elaborated by the authors.
Note1: Significance: *< 0,1 / **< 0,05 / *** <0,01

GRAPH 1 CI OF GROWTH EFFECT($\beta_{J[I]}$) PER GROWTH BANDS (95%)



Source: Elaborated by the authors.

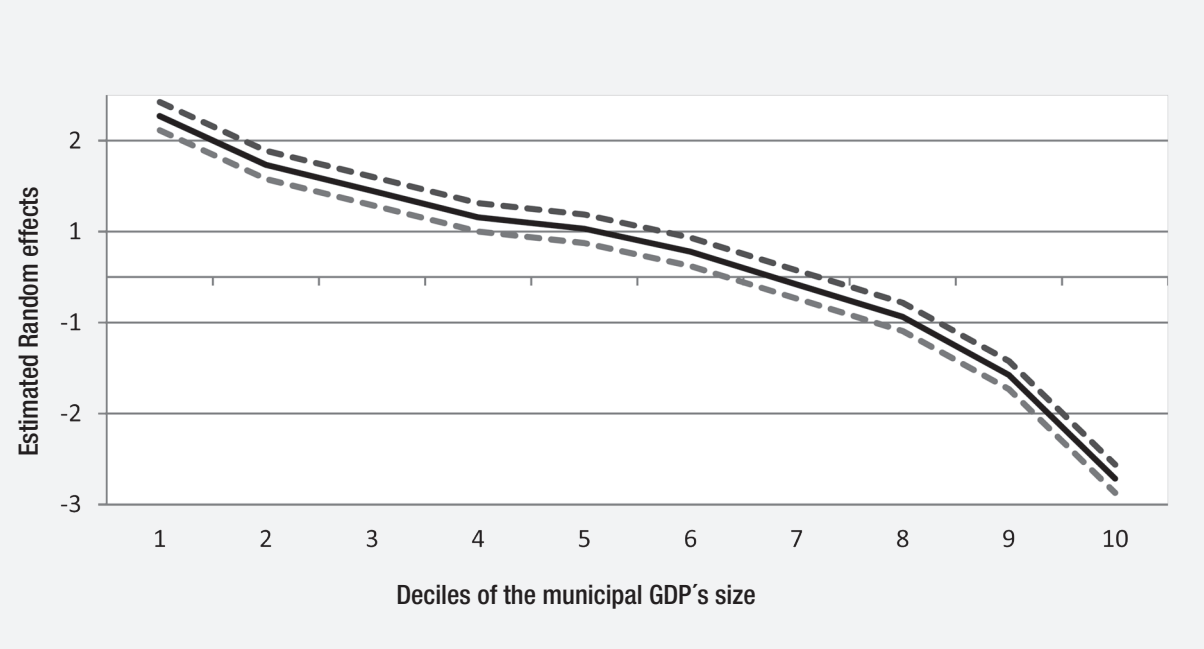
Graph 2 presents the results when the municipalities are divided into ten groups, according to the deciles of the distribution of the logarithm of municipal real GDP, (*lpibreal*), in each year. Estimates indicate that there is a negative relationship between the size of the random growth effect and the logarithm of real GDP,[12] as the effect on the expected voting continuously decreases as one moves to a decile of higher real GDP. That is, the effect of growth on incumbent voting is greater in municipalities with smaller economy. That said, the larger the municipality — which is the case of large metropolises and capital cities in Brazil — the smaller the effect of the economy on the choice of vote. In addition, from the 7th decile there is a reversal of the effects, and economic growth negatively affects the number of votes for the incumbent, a result that needs more research to be clarified. One possible explanation is that accelerated growth is usually accompanied by widening inequality, in a process known in regional economics literature as Williamson's curve (1965) and when applied on people's individual income, known as Kuznets's (1955) curve. Thus, the negative effect may be due to the growth of inequality, a point that deserves further empirical investigation.

The third level is an exercise to check which election is more affected by the economic vote. At this level, analysis discovers whether the slope of $\boldsymbol{\beta}_{j[i]}$ is different in presidential and municipal elections, that is, whether there is greater sensitivity to the effects of the economy on incumbent voting. The previous section found that incumbent mayor candidates on average tend to have fewer votes than incumbent president candidates. In the fixed-effect model[13] there is information showing that

[12] The fixed coefficient results are presented in the appendix.
[13] Result of the fixed effect model with all the control (table 4, 6th column of results).

incumbent candidates in municipalities have on average 1.1 percentage points less than president candidates. In this exercise, it is identified whether there is a difference in how the economy affects policy for incumbent candidates running for mayor or the presidency.

GRAPH 2 CI OF GROWTH EFFECT ($\beta_{J[l]}$]) PER INCOME BAND (95%)

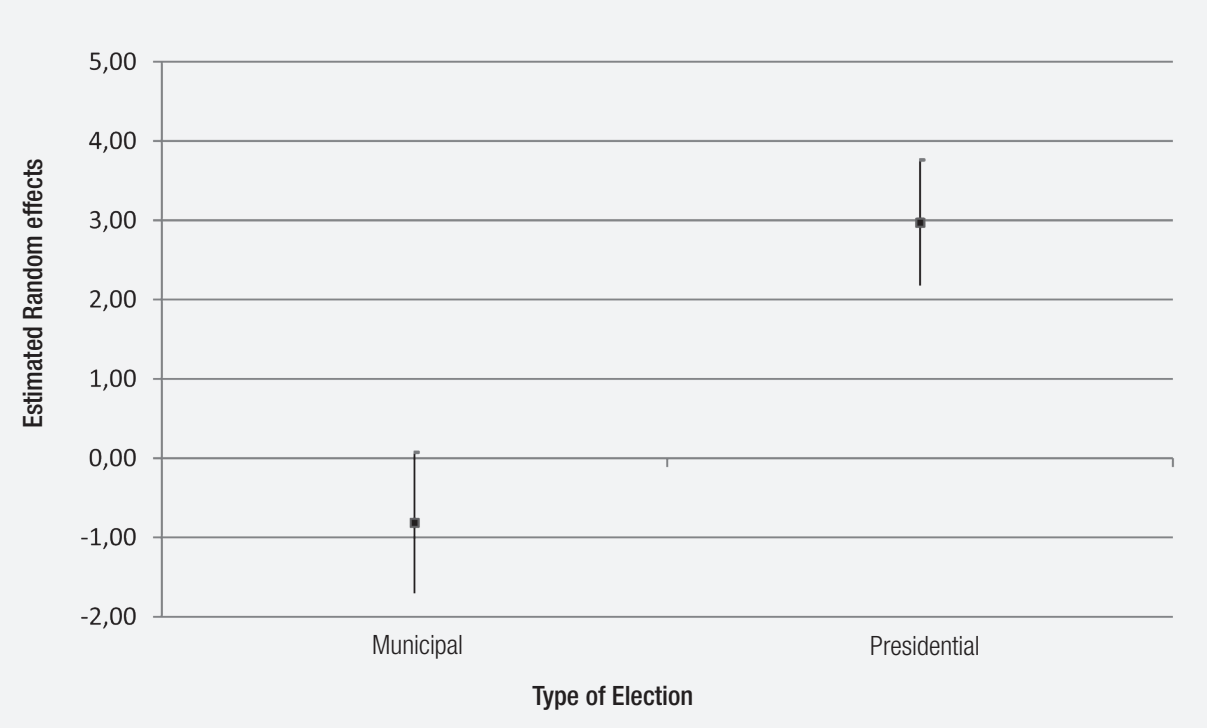


Source: Elaborated by the authors.

In graph 3 it is clear that the slope coefficient is substantially larger in the presidential elections, given the huge difference between the respective confidence intervals. The economic vote seems to be much more important in the presidential elections, which indicates a greater degree of responsibility attributed by voters to the president than to the mayors. The effect found in the municipal elections has negative but insignificant coefficient.

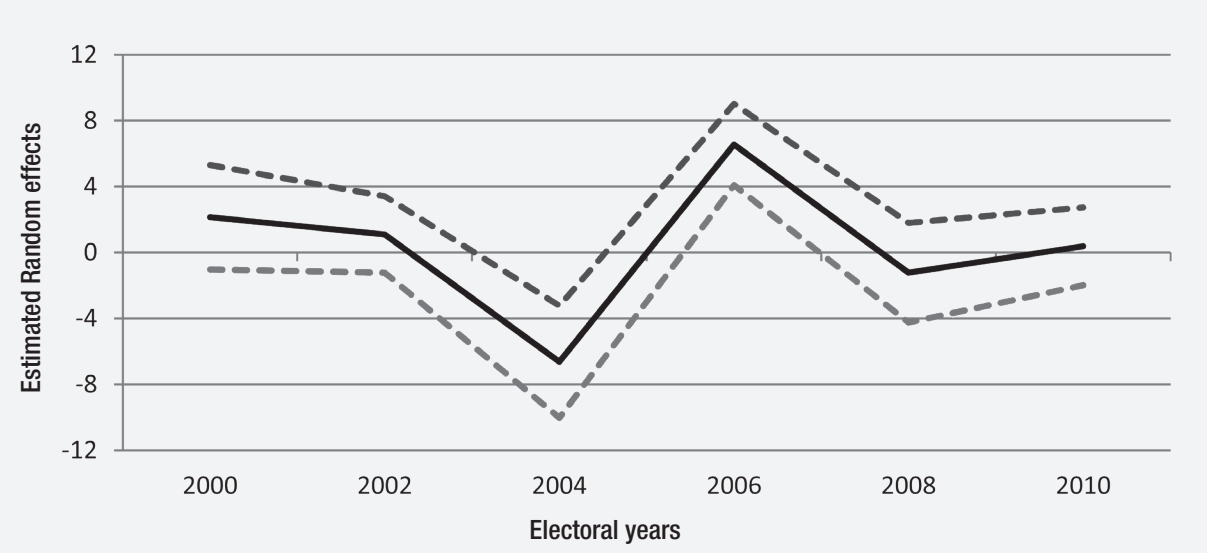
The fourth level analyzed repeats the estimation done in columns 4 to 6 of table 3 using a new strategy. While in that estimation (columns 4 to 6) we introduced the year dummies in the panel models, here the years are included as a level, and each electoral year between 2000 and 2010 form a group. Graph 4 presents the random growth coefficients and the respective confidence intervals of the estimates made for each year. As for the variation in the coefficient of interest i.e. the impact of economic growth, graph 4 shows that the economic effect cannot be distinguished statistically from zero for all years except 2004 and 2006, when the effects are significant. However, in 2004 the effect is negative and in 2006 it is positive. Such variation demands more research with a focus on heterogeneous effects to understand the dynamics of the economic vote, which presented great variance in each year.

GRAPH 3 CI OF GROWTH EFFECT($\beta_{J[I]}$) PER ELECTION TYPE (95%)



Source: Elaborated by the authors.

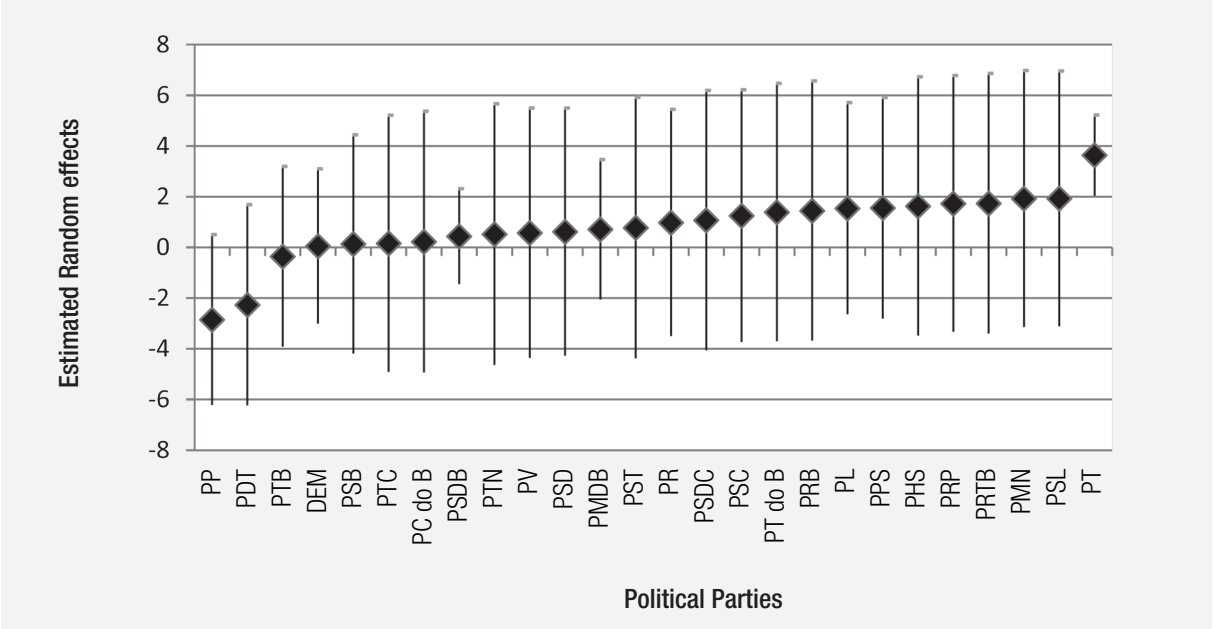
GRAPH 4 CI OF GROWTH EFFECT($\beta_{J[I]}$) PER ELECTORAL YEAR (95%)



Source: Elaborated by the authors.

In the fifth level, we analyze the model with the inclusion of the level incumbent candidates' political parties. As the sample has 26 parties that presented incumbent candidates, graph 5 presents only the confidence intervals of the estimated $\beta_{j[i]}$, aiming for clearer exposure. The horizontal axis is ordered in a crescent in order to provide a clear view of which parties are more efficient at turning economic growth into votes.

GRAPH 5 CI OF GROWTH EFFECT ($\beta_{J[I]}$) PER POLITICAL PARTY (95%)



Source: Elaborated by the authors.

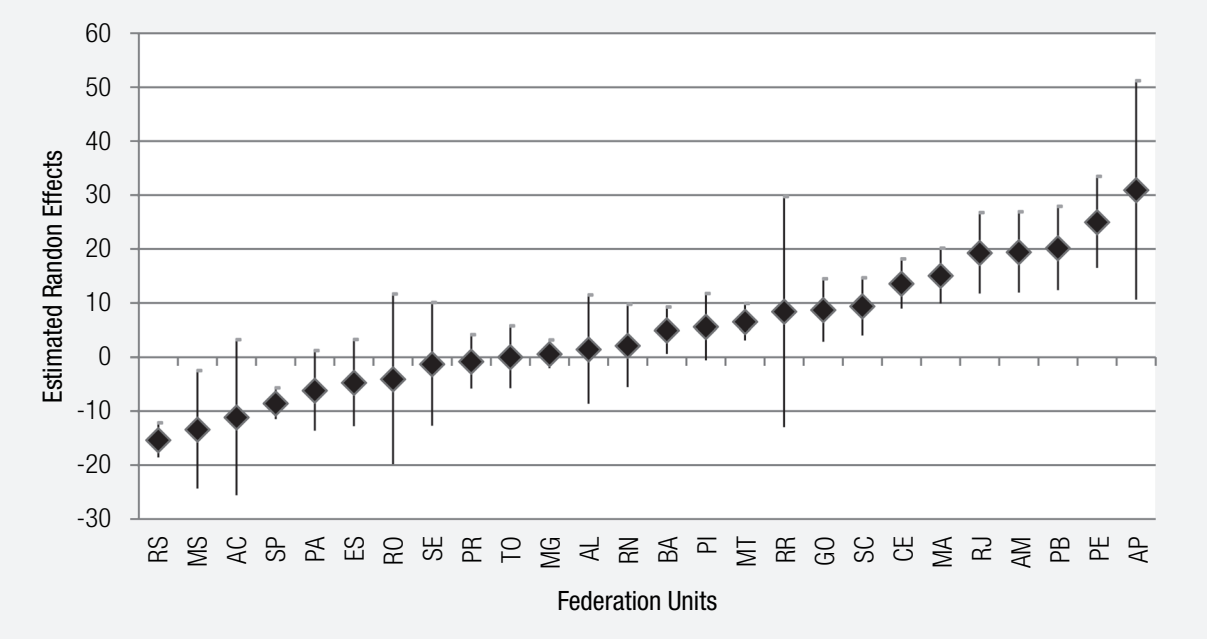
In graph 5 it is clear that the parties that present the least relevance are PP and PDT, but their confidence intervals are large, which makes the results meaningless. The most accurate findings are the results of PSDB and PT. The effect of economic growth is apparently zero for PSDB, since the estimated value is very close to zero. On the other hand, PT has a consistently positive effect of growth on the incumbent's vote. Moreover, there seems to be no clear ideological ordering of these effects, since we find left-wing parties with negative and positive effects (PDT and PT, respectively). On the other hand, the big parties in the center and Brazilian right wing do not indicate that they are efficient in transforming economic growth into votes, since they are concentrated in the negative part (or very close to zero effect) of the graph. The parties winning the economic vote are, in addition to PT itself, the small parties with a tendency towards systematic political adhesion in coalitions.

Finally, in the sixth and last level, the study analyzes the model with the inclusion Brazilian states. The states present a varied sensitivity to the economic vote. While some have confidence intervals with upper limits approaching 50.0, others have lower limits approaching -20.0. The Brazilian states

with the greatest impact of the economic vote are Pernambuco and Amapá, and those with the lowest impact are Rio Grande do Sul and Mato Grosso do Sul. The horizontal axis is presented in a crescent order, according to the degree of electoral "economism" observed in the elections of 2000 to 2010 in each state. On one hand, in Rio Grande do Sul and São Paulo, states with very diversified economy, the effect of local economic growth is smaller, negative and significant, while the estimated effect for Paraná is negative, but not different from zero. In Minas Gerais, the estimated effect was positive, but not significant. Of the five largest Brazilian states, only Rio de Janeiro presented a positive, relevant and significant coefficient of economic vote.[14]

In regions with greater economic complexity, the limits of economic expansion tend to exceed municipal boundaries, weakening its effect. Other issues may be connected, such as environmental conditions and unplanned growth, which may explain this result. However, further studies are needed. The states that have positive and significant effects are Mato Grosso, Goiás, Santa Catarina, Ceará, Maranhão, Rio de Janeiro, Amazonas, Paraíba, Pernambuco and Amapá.

GRAPH 6 CI ($\beta_{J[I]}$) OF GROWTH EFFECT PER FEDERAL UNIT (95%)



Source: Elaborated by the authors.

The results in multilevel models clearly show the need for studies seeking to better understand the factors associated with the effects of economic growth on incumbent voting. Programmatic is-

[14] Such differentiation can be explained by the peculiarity of Rio de Janeiro's economy, centered on the oil industry and federal government spending.

sues, the complexity of the regional economy, the absence of regional governments, for example, are some of the factors that require further investigation. Therefore, studies that use models centered on averages tend to lose the diversity present in the dynamics of the economic vote, a diverse that is captured when using flexible models such as the multilevel approach. Future research should deepen the analysis of the existing heterogeneity of the economic vote in Brazil.

6. CONCLUSION

The objective of this study was to verify the impact of local economic growth on the percentage of votes obtained by the incumbent in a sample of the Brazilian municipalities using econometric techniques for panel and multilevel data in presidential and municipal elections from 2000 to 2010. In order to measure local economic growth, the real GDP growth rate was used. In addition, other variables of interest related to relations between mayors and presidents, demographics, fiscal, timing and macroeconomic variables that measure GDP and economic growth in other geographic circumscriptions of the nation (states and union) were also analyzed.

The main results confirm evidence that there is a strong relationship between local economic growth and the vote obtained by the incumbent in all panel estimated models. In addition, municipal spending on health, education and culture, in addition to the volume of investments, were also positively associated with a greater proportion of incumbent votes. Another important finding was that the connection between the political parties of mayors and presidents has a positive effect on incumbent performance.

Moreover, in panel models strong evidence suggested that municipalities with greater economic potential and larger population tend to be less likely to vote for the government, since the variable that measured the wealth of the municipality was negatively associated with the votes obtained by the incumbent. Even in the multilevel models, the effect of the wealth of the municipality was always negatively associated with the vote of the incumbent, repeating this pattern in the multilevel models with groups, being the deciles the income bands and the federal units.[15] Evidence has also been found showing a greater responsiveness to the effects of the economy on the voting of incumbent candidates in the federal executive power than in the local executive branch.

The research has provided evidence favorable to the hypothesis of the economic vote in the Brazilian presidential and municipal elections, indicating a positive and significant impact between local economic growth and the vote obtained by the incumbent. Obviously, the methodology adopted does not allow an interpretation in terms of causality. However, it is clear that the hypothesis of the economic vote cannot be rejected. In view of the positive impact found, new questions arise opening perspectives for research. For example, in the face of the positive relationship of economic growth, it is important to investigate the nature of this expansion of local wealth. Would growth with more equality generate greater returns than expansion worsening economic inequality in the municipality?

[15] More detailed estimation results are presented in the appendix.

On the other hand, in terms of public policies the unfolding is explicit. In states with a higher level of development, also in larger municipalities, the relationship between economic growth and the incumbent voting is weakened. This indicates that less responsibility is attributed from voters to the elected political agent, whether president or mayor. In this sense, local development policies are also weakened, because there is a confusion over the responsibility among the different levels of government. Although new research is necessary to verify if there is responsibility on the part of the state government, it is evident that this vacuum is worrisome, especially, in the great metropolitan regions of Brazil, in which there is a great necessity for employment and new economic opportunities.

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APPENDIX

COMPLETE RESULTS OF THE MULTILEVEL MODELS. FIXED AND RANDOM EFFECTS

TABLE 5 MODEL 1: LEVELS — GROWTH DECIS (CRESC)

Estimate for Economic Growth Band										
Fixed Effects				Random effects Growth band				Confidence interval of β (95% confidence)		
fracao	votos	Standard Error	t-value	Group	$\alpha_{j[i]}$	Standard Error	$\beta_{j[i]}$	Standard Error	$\beta_{j[i]\ min}$	$\beta_{j[i]\ max}$
intercepto	124.21***	2.82	44.12	1	124.43	0.09	7.02***	1.37	4.34	9.71
cresc	10.24***	2.93	3.49	2	123.90	0.19	14.7***	2.75	9.36	20.12
lpibreal	-0.47***	0.07	-6.57	3	123.86	0.26	15.4***	3.82	7.95	22.90
crescuf	0.07***	0.03	2.67	4	123.44	0.33	21.6***	4.86	12.07	31.12
crescbr	3.75***	0.05	71.89	5	124.06	0.38	12.5**	5.64	1.39	23.52
lpibuf	-1.78***	0.09	-20.98	6	124.02	0.38	13.0**	5.58	2.03	23.88
lpibbrasil	-	-	-	7	124.47	0.32	6.37	4.66	-2.76	15.51
persaude	0.06***	0.01	4.44	8	124.33	0.23	8.40**	3.38	1.78	15.02
lpop	0.59***	0.23	2.57	9	124.56	0.15	5.07**	2.25	0.66	9.47
leec	6.58***	0.34	19.16	10	125.01	0.05	-1.58**	0.70	-2.95	-0.21
lheu	0.31***	0.10	2.96							
lses	0.09	0.26	0.34							
laseps	0.50***	0.13	3.78							
ldesporc	-9.70***	0.49	-19.73							
ldespcor	-0.31	0.52	-0.60							
linvest	2.19***	0.14	16.13							
ldespes	-2.25***	0.47	-4.83							
prefeitobase	1.48***	0.20	7.49							

Source: Elaborated by the authors.
Note1: significance: *< 0,1 / **< 0,05 / *** <0,01

TABLE 6 MODEL 2: LEVELS: DECILES FOR MUNICIPAL ECONOMIC SIZE (LPIBREAL)

Estimate for income bands										
Fixed Effects				Random Effects Income Bands					Confidence Interval of β (95% confidence)	
fracao	votos	SE	t-value	Group	$\alpha_{j[i]}$	EP	β j[i]	EP	$\beta_{j[i]\ min}$	$\beta_{j[i]\ max}$
intercepto	32.58	4.21	7.73	1	39.16	0.32	1.77	0.08	1.62	1.92
cresc	0.16	0.76	0.21	2	36.97	0.32	1.23	0.08	1.08	1.39
lpibreal	2.79	0.26	10.78	3	35.80	0.33	0.95	0.08	0.79	1.10
crescuf	0.92	0.03	35.14	4	34.61	0.33	0.66	0.08	0.50	0.81
crescbr	-	-	-	5	34.10	0.33	0.53	0.08	0.38	0.69
lpibuf	-1.86	0.09	-20.02	6	33.06	0.33	0.28	0.08	0.12	0.44
lpibbrasil	-	-	-	7	31.59	0.32	-0.08	0.08	-0.24	0.08
persaude	-0.02	0.02	-1.33	8	30.13	0.32	-0.44	0.08	-0.59	-0.28
lpop	-6.90	0.22	-31.13	9	27.51	0.32	-1.08	0.08	-1.23	-0.92
leec	9.18	0.37	24.55	10	22.85	0.32	-2.22	0.08	-2.37	-2.06
lheu	0.02	0.11	0.15							
lses	1.20	0.28	4.20							
laseps	0.16	0.14	1.12							
ldesporc	-3.93	0.53	-7.39							
ldespcor	-2.96	0.57	-5.19							
linvest	0.28	0.15	1.91							
ldespes	2.68	0.51	5.28							
prefeitobase	1.28	0.22	5.88							

Source: Elaborated by the authors.

TABLE 7 MODEL 3: LEVELS — TYPES OF ELECTION

Estimation by Types of Election										
Fixed Effects				Random Effects Types of election					Confidence Interval of β (95% confidence)	
fracao	votos	SE	t-value	Group	$\alpha_{j[i]}$	EP	β j[i]	EP	$\beta_{j[i]\ min}$	$\beta_{j[i]\ max}$
intercepto	93.26	43.01	2.17	Municipal	93.93	0.16	-0.81	0.45	-1.70	0.08
cresc	1.08	2.03	0.53	Presidential	92.59	0.14	2.97	0.40	2.18	3.76
lpibreal	-0.46	0.07	-6.49							
crescuf	0.10	0.03	3.67							
crescbr	3.64	0.09	41.76							
lpibuf	-1.85	0.09	-21.45							
lpibbrasil	1.14	1.55	0.73							
persaude	0.04	0.01	3.13							
lpop	0.32	0.26	1.23							
leec	6.85	0.35	19.55							
lheu	0.33	0.10	3.18							
lses	0.42	0.27	1.58							
laseps	0.55	0.13	4.13							
ldesporc	-10.01	0.54	-18.71							
ldespcor	-1.16	0.54	-2.13							
linvest	2.25	0.14	16.49							
ldespes	-1.46	0.49	-2.98							
prefeitobase	1.22	0.20	5.95							

Source: Elaborated by the authors.

TABLE 8 MODEL 4: LEVELS — ELECTORAL YEARS

Estimation by Electoral Years										
Fixed Effects				Random Effects Electoral Years					Confidence Interval of β (95% confidence)	
fracao	votos	SE	t-value	Group	$\alpha_{j[i]}$	EP	$\beta_{j[i]}$	EP	$\beta_{j[i]\ min}$	$\beta_{j[i]\ max}$
intercepto	169.31	347.84	0.49	2000	172.33	0.26	2.15	1.62	-1.02	5.31
cresc	0.39	1.97	0.20	2002	169.09	0.23	1.10	1.18	-1.23	3.42
lpibreal	-0.49	0.07	-6.83	2004	166.47	0.28	-6.62	1.73	-10.02	-3.22
crescuf	0.09	0.03	3.28	2006	167.31	0.24	6.56	1.26	4.09	9.02
crescbr	3.82	0.83	4.59	2008	170.43	0.30	-1.22	1.54	-4.24	1.81
lpibuf	-1.96	0.09	-22.69	2010	170.22	0.29	0.38	1.20	-1.97	2.74
lpibbrasil	-1.66	12.39	-0.13							
persaude	0.12	0.02	6.40							
lpop	-0.18	0.26	-0.71							
leec	6.78	0.36	18.74							
lheu	0.39	0.10	3.74							
lses	0.98	0.28	3.52							
laseps	0.46	0.13	3.48							
ldesporc	-9.90	0.56	-17.83							
ldespcor	-1.22	0.57	-2.14							
linvest	2.01	0.14	14.65							
ldespes	-1.14	0.52	-2.21							
prefeitobase	0.66	0.21	3.13							

Source: Elaborated by the authors.

TABLE 9 MODEL 5: LEVELS — POLITICAL PARTIES

Estimation by Political Parties										
Fixed Effects				Random Effects Candidate's Party					Confidence Interval of β (95% confidence)	
fracao	votos	SE	t-value	Group	$\alpha_{j[i]}$	EP	$\beta_{j[i]}$	EP	$\beta_{j[i]\ min}$	$\beta_{j[i]\ max}$
intercepto	176.65	43.13	4.10	DEM	177.41	0.38	0.04	1.56	-3.01	3.09
cresc	0.78	1.18	0.67	PC do B	177.07	1.05	0.22	2.63	-4.93	5.37
lpibreal	-0.48	0.07	-6.74	PDT	178.49	0.62	-2.27	2.02	-6.23	1.69
crescuf	0.10	0.03	3.70	PHS	176.16	1.04	1.62	2.60	-3.48	6.73
crescbr	3.99	0.10	38.70	PL	176.01	0.70	1.54	2.13	-2.64	5.71
lpibuf	-1.85	0.09	-21.39	PMDB	176.45	0.32	0.70	1.41	-2.06	3.46
lpibbrasil	-1.89	1.56	-1.21	PMN	175.96	1.02	1.92	2.58	-3.14	6.97
persaude	0.05	0.01	3.92	PP	177.90	0.45	-2.86	1.71	-6.22	0.50
lpop	0.39	0.26	1.53	PPS	176.26	0.77	1.55	2.22	-2.81	5.91
leec	6.70	0.35	19.05	PR	176.89	0.79	0.97	2.28	-3.50	5.44
lheu	0.34	0.11	3.20	PRB	176.20	1.04	1.44	2.61	-3.68	6.56
lses	0.32	0.27	1.18	PRP	176.23	1.02	1.72	2.58	-3.33	6.78
laseps	0.53	0.13	4.00	PRTB	176.20	1.05	1.73	2.62	-3.40	6.86
ldesporc	-9.83	0.54	-18.26	PSB	176.77	0.72	0.13	2.20	-4.19	4.44
ldespcor	-0.93	0.54	-1.72	PSC	176.29	0.99	1.24	2.54	-3.73	6.22
linvest	2.22	0.14	16.27	PSD	176.64	0.96	0.61	2.49	-4.27	5.49
ldespes	-1.64	0.49	-3.34	PSDB	177.46	0.19	0.43	0.96	-1.45	2.31
prefeitobase	1.46	0.21	6.84	PSDC	176.46	1.05	1.06	2.61	-4.06	6.19
				PSL	176.14	1.02	1.92	2.57	-3.11	6.96
				PST	176.66	1.06	0.77	2.63	-4.38	5.92
				PT	175.86	0.18	3.63	0.81	2.04	5.22
				PT do B	176.26	1.04	1.38	2.59	-3.70	6.47
				PTB	176.60	0.52	-0.36	1.81	-3.91	3.19
				PTC	176.86	1.05	0.15	2.58	-4.91	5.21
				PTN	176.84	1.06	0.52	2.63	-4.64	5.67
				PV	176.81	0.99	0.57	2.51	-4.36	5.49

Source: Elaborated by the authors.

TABLE 10 MODEL 6: LEVELS — FEDERATION UNITS

Estimation by States										
Fixed Effects				Random Effects State					Confidence Interval of β (95% confidence)	
fracao	votos	SE	t-value	Group	$\alpha_{j[i]}$	EP	$\beta_{j[i]}$	EP	$\beta_{j[i]\ min}$	$\beta_{j[i]\ max}$
intercepto	820.59	43.08	19.05	AC	877.65	1.54	-11.17	7.35	-25.59	3.24
cresc	4.81	2.74	1.75	AL	853.50	0.75	1.43	5.13	-8.62	11.47
lpibreal	-0.11	0.07	-1.63	AM	826.01	1.12	19.42	3.81	11.94	26.89
crescuf	-0.01	0.03	-0.29	AP	878.47	2.19	30.89	10.35	10.62	51.17
crescbr	4.31	0.07	58.03	BA	795.50	0.38	4.93	2.20	0.61	9.25
lpibuf	32.68	2.11	15.48	CE	818.52	0.55	13.56	2.35	8.95	18.17
lpibbrasil	-55.40	2.72	-20.39	ES	808.29	0.86	-4.75	4.10	-12.78	3.29
persaude	-0.03	0.01	-2.29	GO	801.14	0.54	8.67	2.96	2.86	14.47
lpop	-2.64	0.26	-10.05	MA	837.49	0.61	15.03	2.61	9.91	20.15
leec	2.22	0.35	6.30	MG	763.37	0.26	0.57	1.33	-2.03	3.17
lheu	-0.32	0.11	-2.97	MS	830.72	0.87	-13.42	5.58	-24.35	-2.49
lses	-0.75	0.25	-2.96	MT	813.53	0.65	6.51	1.74	3.10	9.91
laseps	0.32	0.13	2.43	PA	817.24	0.73	-6.19	3.78	-13.60	1.22
ldesporc	-0.12	0.56	-0.21	PB	847.97	0.54	20.14	3.95	12.39	27.89
ldespcor	-1.84	0.52	-3.52	PE	818.09	0.59	24.97	4.32	16.50	33.45
linvest	2.22	0.13	16.77	PI	864.89	0.50	5.58	3.14	-0.57	11.73
ldespes	-0.77	0.48	-1.62	PR	774.65	0.39	-0.83	2.54	-5.81	4.16
prefeitobase	1.69	0.19	8.96	RJ	751.08	0.77	19.25	3.82	11.76	26.74
				RN	848.47	0.65	2.11	3.90	-5.52	9.75
				RO	843.18	1.25	-4.08	8.03	-19.82	11.65
				RR	881.85	2.21	8.38	10.88	-12.95	29.71
				RS	769.29	0.32	-15.37	1.63	-18.57	-12.17
				SC	782.77	0.43	9.35	2.71	4.05	14.65
				SE	849.36	0.99	-1.31	5.81	-12.70	10.07
				SP	714.90	0.29	-8.58	1.47	-11.47	-5.70
				TO	867.28	0.62	0.00	2.93	-5.74	5.74

Source: Elaborated by the authors.

RESULTS IN LINEAR AND LOGISTC MODELS FOR THE VARIABLE 'VICTORY'

The variable 'victory' was obtained from data from the Federal Supreme Court, made available through the Cepespdata database.[16]

For this study, the incumbent candidate obtained victory when elected in the first round or when they got enough votes to dispute a runoff. Candidates were considered to have lost if they were classified as "non-elected" by the Superior Electoral Court (TSE). The results "record denied" or "renunciation/death" were considered as 'missing information', because in these cases 'non-victory' was not due to a defeat in the electoral process. Table 11 below shows the descriptive statistics per year, where it is clear that there is only variation in the dependent variable in the elections for mayor. Table 12 shows the results in linear models and in logistic regression.

TABLE 11 DESCRIPTIVE STATISTICS — YEAR AND VICTORY

VICTORY	2000	2002	2004	2006	2008	2010	Total
Elected	1,764	0	1,717	0	1,486	0	4,967
Non elected	2,261	5,563	1,934	5,565	2,632	5,495	23,450

Source: Elaborated by the authors.

TABLE 12 VARIABLE DEPENDENT RESULTS — VICTORY

	Linear Models			Logistic Model		
Victory	Polled Model	Random Effects	Fixed Effects	Polled Model	Random Effects	Fixed Effects
Cresc	-0.013	-0.013	-0.071	-0.057	-0.057	-0.317
	0.033	0.033	0.049	0.144	0.145	0.211
crescuf	**-0.007**	**-0.007**	0.000	**-0.032**	**-0.032**	0.000
	0.001* **	**0.001*** **	0.003	**0.006*** **	**0.006*** **	0.012
crescbr	**-0.167**	**-0.167**	**-0.121**	**-0.708**	**-0.708**	**-0.461**
	0.025* **	**0.025*** **	**0.034*** **	**0.106*** **	**0.102*** **	**0.133*** **
lpibreal	0.001	0.001	-0.002	0.005	0.005	-0.011
	0.003	0.003	0.007	0.014	0.014	0.028
Lpibuf	**-0.046**	**-0.046**	**-0.334**	**-0.199**	**-0.199**	**-1.401**
	0.004* **	**0.004*** **	**0.150** **	**0.019*** **	**0.019*** **	**0.641** **

Continue

[16] Available at: <http://cepesp.fgv.br/pt-br/nossos-bancos>.

	Linear Models			Logistic Model		
Victory	Polled Model	Random Effects	Fixed Effects	Polled Model	Random Effects	Fixed Effects
lpibbrasil	**1.430**	**1.430**	**1.272**	**6.078**	**6.077**	**4.888**
	0.187* **	**0.187*** **	**0.280*** **	**0.803*** **	**0.766*** **	**1.076*** **
prefeitobase	-0.015	-0.015	0.008	-0.065	-0.065	0.044
	0.010	0.010	0.014	0.042	0.042	0.059
persaude	0.001	0.001	0.002	0.007	0.007	0.009
	0.001*	0.001*	0.001	0.004*	0.004*	0.006
Lpop	-0.076	-0.076	0.112	-0.335	-0.335	0.597
	0.013***	0.013***	0.099	0.056***	0.055***	0.456
Leec	0.064	0.064	-0.013	0.289	0.289	-0.045
	0.023***	0.023***	0.045	0.101***	0.087***	0.146
lheu	0.014	0.014	-0.001	0.061	0.061	0.003
	0.005***	0.005***	-0.010	0.022***	0.022***	0.038
lses	**0.045**	**0.045**	**0.071**	**0.199**	**0.199**	**0.257**
	0.015* **	**0.015*** **	**0.023*** **	**0.066*** **	**0.057*** **	**0.091*** **
laseps	0.000	0.000	-0.007	0.004	0.004	-0.04
	0.006	0.006	0.012	0.028	0.027	0.048
ldesporc	-0.143	-0.143	-0.089	-0.479	-0.479	-0.331
	0.104	0.104	0.177	0.491	0.483	0.739
ldespcor	0.046	0.046	-0.070	0.073	0.074	-0.379
	0.098	0.098	0.165	0.464	0.454	0.692
linvest	**0.083**	**0.083**	**0.103**	**0.341**	**0.341**	**0.411**
	0.012* **	**0.012*** **	**0.019*** **	**0.055*** **	**0.054*** **	**0.082*** **
ldespes	-0.034	-0.034	0.057	-0.159	-0.159	0.356
	0.019*	0.019*	0.032*	0.096*	0.101	0.172**
_cons	-37.937	-37.937	-27.909	-163.328	-163.319	
	5.162***	5.162***	6.914***	22.127***	21.087***	
N	10,528	10,528	10,528	10,528	10,528	5,810
Municipals	5193	5193	5193	5193	5193	2340
r2	0.04		0.04			

Source: Elaborated by the authors.