**Re-election Incentives and the Quality of
Education: Evidence from Brazilian Municipalities**

Maria Clara Soares
1710756

Orientador: Arthur Bragança

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[1]   As opiniões expressas neste trabalho são de responsabilidade única e exclusiva do autor.

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1 Introduction

A large body of theoretical work has studied how elections play an important role as a disciplining device to make politicians take costly action to enhance voters' welfare. According to this theory, electoral rules allow citizens to hold governments accountable for their actions and select competent types of politicians based on their performance while in office, solving the problems of moral hazard and adverse selection that exist in a representative democracy [Alt et al., 2011].

The baseline political agency model proposed by [Besley, 2006] considers two time periods. In the first period, a politician is elected and chooses a single action that provides voters a certain payoff. The type of the politician is unobservable, meaning voters don't know whether the politician is of competent or dissonant type. In this sense, voters have to analyze their payoff as a performance measure of the politician to decide between rewarding the incumbent with re-election or punishing him by electing the challenger. In the second period, the elected politician also chooses an action, but he doesn't have to face an election since the game ends after voters receive their payoff.

There is a growing empirical literature documenting the existence of retrospective voting in the field of education. [Dias and Ferraz, 2019] show that the disclosure of a school quality index before the municipal election is associated with an increase in the share of votes received by the incumbent mayor. [Assunção and Estevan, 2019] provide evidence that larger education expenditures lead to a rise in the probability of a mayor being re-elected. Examining the context of the 2015 presidential elections in Argentina, [Ajzenman and Durante, 2019] show that voters assigned to ballot stations located in schools with poorer infrastructure were significantly less likely to vote for the candidate who was the incumbent mayor of the country's capital until then. Nonetheless, it is still not established in the literature whether politicians respond to voters' incentives by changing their actions regarding education delivery. In line with the predictions of the theory on electoral accountability, politicians should be expected to exert more effort to provide better educational outcomes when they face the possibility of re-election.

Exploring the context of local education in Brazil, I study the role of re-election incentives in the provision of this key public good. Brazilian municipalities are a suitable context to empirically test the predictions of the standard political agency model since mayors are directly elected representatives and have the possibility of running for reelection. Furthermore, mayors have considerable discretion over education delivery, which is an important feature for accountability.

I use scores from a national standardized exam, part of an extensive system of

evaluation of the quality of primary education, as a measure of educational outcomes in municipalities. Following the model developed by [Besley and Case, 1995], I estimate the effect of re-election incentives on exam scores using a two-way fixed effects estimator. Contrary to what the political agency theory predicts, I find that municipalities with a term-limited mayor present higher exam scores compared to municipalities where the incumbent face re-election incentives. The effect varies depending on education level and exam subject. However, all estimates are of small magnitude.

1.1 Related Literature

This paper relates to a broad literature that empirically tests political agency models, emphasizing the role of re-election incentives in shaping the behavior of politicians. [Besley and Case, 1995] build a reputation-building model in which incumbents who are willing to get re-elected choose their actions in the hope that it will convince voters about their competence. Their empirical results are consistent with this model: they find that U.S. states with term-limited governors present higher levels of taxes and expenditures because they care less about signaling their efforts to voters.

[List and Sturm, 2006] explore the context of environmental policy to show that electoral incentives influence politicians to change their behavior to attract voters, even concerning secondary policy issues. Using corruption audit reports in Brazil, [Ferraz and Finan, 2011] provide evidence that mayors who face re-election incentives are significantly less corrupt than term-limited mayors. [De Janvry et al., 2012] analyzes the influence of electoral incentives on the performance of a decentralized cash transfer program implemented by Brazilian municipalities. They find that the program's impact was larger in municipalities where mayors were in their first term.

More recently, [Chamon et al., 2019] show that municipalities with higher levels of political competition have better fiscal policy indicators and more increases in school construction. These results are stronger in municipalities where incumbents are in the first term since re-election incentives enhance their response to political competition.

2 Institutional Background

2.1 Municipal Elections

Municipal elections take place every four years, alternating with gubernatorial and national elections. In each municipality, the candidate who receives the majority of votes is elected through direct voting for a four-year term. Since 1997, when Congress approved the 16th Constitutional Amendment, incumbents can run for reelection in the subsequent election and stay in office for another term. After the end of the second term, mayors are obliged to wait for at least one election cycle until they can run for the municipal office again, meaning they face a binding term limit.

The government system in Brazil is divided between the Executive, Legislative, and Judicial branches, and mayors are the chief of the local Executive branch. If a final-term mayor desires to run for another office- either at the state or federal levels within the Executive branch or all three levels within the Legislative branch- he is not required to commit to the one-term hiatus. In addition, the term limit does not apply to political parties, implying that the possibility of an incumbent being succeeded by another politician from the same party exists.

2.2 Education performance in Brazil

Due to public service decentralization imposed by the Constitution of 1988, mayors play an important role in the provision of key public services in several areas, including education. The law on National Education Guidelines (L9394) designates municipal governments as responsible for providing Early Childhood and Primary Education, sharing education delivery with state and federal governments, which are assigned to offer higher levels of education, such as high school and college. Mayors are in charge of guaranteeing access to education for all children in the municipality, maintaining schools' infrastructure, providing meals, and offering commuting to school[1].

Educational spending by municipalities is funded through both tax revenue and federal transfers, and the latter is distributed based on the number of enrolled students in preschools and primary schools provided by the School Census, conducted annually by the Ministry of Education.

Since 2005, the quality of education provided by municipalities has been evaluated through a large-scale, standardized exam called Prova Brasil, administered by the

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[1] See [Arretche, 1999] for further details on the process of decentralization of public services in Brazil.

National Institute for Research on Education (Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira, INEP). The assessment aims to test students' knowledge of Portuguese and Mathematics and is taken every two years by all fourth and eighth-graders enrolled in classes with a minimum of 20 students. Results from Prova Brasil are made available at the school, student, and municipal levels to inform school personnel and local governments about the quality of education, facilitate goal-setting for improvement, and guide resource management. Given that every public school located in an urban area has to undertake the exam, it is possible to analyze how educational outcomes evolve over the years and compare them between municipalities.

Furthermore, average test scores from the Prova Brasil exam, along with the average pass rate in municipal schools as presented by the annual School Census, constitute a quality index for primary education called IDEB (Índice de Desenvolvimento da Educação Básica). In this way, Prova Brasil and IDEB are the principal means of measurement of the quality of education in municipalities, based on which mayors can be held accountable by voters.

3 Data

The dataset used is obtained from a variety of sources. Electoral data is provided by Tribunal Superior Eleitoral (TSE), Brazil's electoral authority responsible for overseeing all elections in the country. Variables include results from mayoral elections held in 2004, 2008, and 2012 at the municipal level, the number of votes each candidate received, and candidate characteristics such as gender, age, party affiliation, and level of education. I focus my analysis on municipalities where regular elections occurred. Since electoral rules vary in the second round of municipal elections, and to ease the identification of the elected mayor in each election year, I also restrict the sample to municipalities that only hold first round elections, which is the case for those with less than 200,000 registered voters.

Education data comes from *Instituto Nacional de Estudos e Pesquisas Educacionais* (INEP), which administered *Prova Brasil*, a low-stakes standardized exam applied nationwide for every two years. The aim of *Prova Brasil* is to evaluate fourth and eighth-graders from urban public schools with more than 20 enrolled students in each grade. I use the average *Prova Brasil* scores at the municipal level for the years of 2007, 2011, and 2015. As the timeline in Figure 1 shows, these scores are interpreted as a measure of the quality of public education three years after the incumbent mayor has been in power in a given municipality. To ease interpretation of *Prova Brasil*'s Math and Portuguese scores, I transform both into z-scores for each year in the sample.

Figure 1: Timeline of the Electoral Cycle and Data Collection

2004	2005		2007	2008
Municipal	Elected		*Prova*	Municipal
Elections	mayor		*Brasil*	elections
	begins			
	term			

Notes: This timeline shows shows the timing of Brazil's municipal elections and *Prova Brasil* exam. I use *Prova Brasil* scores to measure the quality of education in municipalities. Therefore, exam scores should be thought of as evaluations of local education provision 2 years a mayor begins term.

Electoral and education data is complemented by characteristics of municipalities contained in the 2000 population census, conducted by the *Instituto Brasileiro de Geografia e Estatística* (IBGE). These characteristics are aggregated at the municipal level and include population size, share of urban population, the Gini index, life expectancy, illiteracy rate, infant mortality, and years of schooling.

Table 1 provides summary statistics comparing the means of characteristics between municipalities with a first-term and a second-term mayor. As it is demonstrated, second-term mayors had a significant larger margin of victory in the 2004 elections. This difference in means is expected since second-term mayors have more political experience.

Table 2 compares Math and Portuguese scores from *Prova Brasil*, for both fourth and eighth grades, between municipalities with and without a term-limited incumbent. None of the difference in exam score means between first term and second term municipalities is significant.

Table 1: Summary Statistics - Characteristics of Mayors and Municipalities

	First Term Mayor (1)	Second Term Mayor (2)	Difference (3)	P-Value (4)
Mayor Characteristics				
Male	0.918	0.951	-0.033	0
Age	47.109	49.158	-2.049	0
Has a primary education	0.076	0.077	-0.001	0.94
Has a high school level education	0.267	0.274	-0.007	0.654
Has a college education	0.408	0.395	0.013	0.442
Margin of victory in 2004 elections	0.132	0.163	-0.031	0
Municipal Characteristics				
Population	18546.73	19325.51	-778.78	0.452
Urban Population (%)	58.129	58.489	-0.36	0.662
Log GDP Per Capita	8.547	8.602	-0.055	0.042
Gini Coefficient	0.547	0.542	0.005	0.085
Illiteracy Rate	23.502	23.153	0.349	0.467
Number of Municipalities	3247	1072		

Notes: Notes: This table presents a comparison of the mean mayor and socio-economic characteristics of the municipalities between first and second-term mayors. Column 1 reports the means for the 3247 municipalities with a first term mayor. Column 2 reports the mean for the 1072 municipalities with second-term mayors. Column 3 reports the difference in means. Column 4 reports the P-value of the Two Sample t-test.

Table 2: Summary Statistics of Education by First and Second Term Mayors

	First-Term Mayor (1)	Second-Term Mayor (2)	P-Value (3)
4th grade Math test score	-0.56	-0.53	0.37
4th grade Portuguese test score	-0.65	-0.63	0.33
8th grade Math test score	-0.28	-0.17	0.02
8th grade Portuguese test score	-0.5	-0.43	0.07
Number of Municipalities	3247	1072	

Notes: This table presents a comparison of the mean *Prova Brasil* standardized scores of the municipalities between first and second-term mayors. Column 1 reports the means for the 3247 municipalities with a first term mayor. Column 2 reports the mean for the 1072 municipalities with second-term mayors. Column 3 reports the P-value of the Two Sample t-test.

4 Empirical Strategy

To estimate the effect of re-election incentives on education quality, I compare education outcomes of municipalities with a first-term mayor to those with a term-limited mayor. If the predictions of the standard political agency model apply to the context of education, incumbents who face the possibility of holding office for a second term should exert more effort in education provision and deliver better outcomes, on average. By doing so, they might convince voters about their competence and get rewarded with re-election ([Besley, 2006]).

Since estimates are based on a municipality-by-year panel for three time periods, I employ a two-way fixed effects estimation. In this manner, it is possible to account for potential bias from unobserved time-invariant variables that are correlated with the treatment variable, and might confound the causal effect [Cunningham, 2021]. Following the model developed by [Besley and Case, 1995], I would like to estimate:

$$Y_{it} = \delta_i + \phi_t + \beta T_{it} + \alpha X_{it} + \epsilon_{it} \tag{4.1}$$

Where Y_{it} is a *Prova Brasil* score in a municipality i at year t, measured three years after the election, δ_i is a municipality fixed effect, ϕ_t is a year effect, and T_{it} is a dummy variable equal to one if the incumbent of a municipality i is in his second term at year t. Z is a vector of other variables, which include mayor and municipal characteristics, and ϵ_{it} is the unobserved determinants of exam scores that are assumed to be uncorrelated with a mayor of a municipality i being term-limited at year t. The main coefficient of interest is β. If the theory correctly predicts the behavior of incumbents toward education provision, then β is expected to be negative.

Furthermore, controlling for municipal-level fixed effects allows the effect of reelection incentives to be identified exclusively from the differences in educational outcomes between municipalities where the mayor is term-limited and where the mayor is in the first term. In addition, the inclusion of year-specific effects avoids that exam scores in municipalities with a term-limited mayor are disturbed by particular aspects from a given year.

5 Results and Discussion

5.1 Electoral Incentives and Education Outcomes

Tables 3, 4, 5, and 6 present the results for the estimations of Equation 4.1, using the standardized Math and Portuguese scores from *Prova Brasil* as the dependent variable. I estimate this equation separately for 4th and 8th grades since only the larger municipalities offer both education levels. Therefore, not all municipalities in the sample have exam scores for the 8th grade .

In each table, Column 1 presents the unadjusted relationship between whether the mayor is in his second term and the standardized exam score. The remaining columns correspond to specifications that include additional sets of controls. Column 2 accounts for mayor characteristics, including gender, education, age, and share of votes received in the municipal election. Column 3 includes, in addition to the other controls, demographic characteristics of the municipality, including population expressed in logarithms, percentage of the population that lives in the urban area, Gini coefficient, percentage of illiterate population, and the log GDP per capita in each year in the panel. All specifications include year and municipality fixed effects, and all standard errors are clustered by municipality.

Effect on 4th Grade Scores.

Column (1) from Table 3 shows that municipalities with a term-limited mayor present Portuguese scores on *Prova Brasil* that are 0.017 standard deviations higher than in municipalities with a mayor in the first term. However, Columns (2) and (3) indicate this estimate is non-significant after the addition of additional controls.

Table 4 indicates a slightly higher effect on Math scores. The specification with only fixed effects presented in Column (1) shows that second-term mayors are associated with an increase of 0.024 standard deviations. The inclusion of controls of mayor and municipality characteristics results in similar and significant results.

Effect on 8th Grade Scores.

Table 5 reports the effects of re-election incentives on Eighth grade Portuguese scores. The estimated effect of re-election incentives from the specification with fixed effects only shows that second-term mayors are associated with a 0.033 standard deviations higher score on the Portuguese exam. As displayed by the subsequent columns, this effect holds and remains significant after the inclusion of the set of controls.

The same pattern is seen for Math scores. Eighth grade Math scores are higher in municipalities with a term-limited mayor compared to municipalities where the mayor faces

re-election incentives. Column (1) in Table 6 shows that Math scores are 0.03 standard deviation units higher, and the estimates for the other two specifications with the set of controls are similar and also significant.

5.2   Discussion

Overall, the results suggest that term-limited mayors are associated with higher scores on the *Prova Brasil* exam. According to the benchmarks suggested by [Kraft, 2020], effect-sizes of less than 0.05 standard deviations are considered Small, 0.05 to less than 0.20 standard deviations is Medium, and 0.20 standard deviations or higher is Large. Although this benchmarks are related to effects of education interventions focused on student achievement, they are useful to put the results presented above into perspective. Contrary to what the political agency theory predicts, I find that municipalities with a mayor in the second term who doesn't face re-election incentives are associated with better education outcomes. However, the magnitude of this effect is considered to be small.

One possible interpretation of my results is that the effect of political turnover on education outcomes is higher than the effect of re-elections incentives. Using a regression discontinuity design for close elections, [Akhtari et al., 2017] find that political party turnover in Brazilian municipalities leads to a 0.05-0.08 standard deviation reduction in terms of the individual-level distribution of *Prova Brasil* scores. They show that the main mechanism that drives this effect is politically caused replacement of school personnel and disruptions in the municipal education bureaucracy, induced by party turnover.

The evidence of the political turnover effect on education outcomes indicates that the perpetuation of a municipal government is an important factor for the quality of local education. When a mayor gets re-elected, he stays in power for a continuous eight-year period, avoiding disruptive changes in education delivery. Therefore, in contexts where the education bureaucracy is not shielded from the political process, like in Brazil, it might be the case that term-limited incumbents are associated with better education outcomes, and re-election incentives don't play an important role.

Table 3: Effects of Re-Election Incentives on Municipal 4$^{\text{th}}$ Grade Portuguese Score

Dependent Variable:	Municipal 4$^{\text{th}}$ Grade Portuguese Scores		
	(1)	(2)	(3)
Mayor in second term	0.017*	0.013	0.014
	(0.010)	(0.010)	(0.010)
Municipality fixed-effect	Yes	Yes	Yes
Year fixed-effect	Yes	Yes	Yes
Municipal characteristics	No	No	Yes
Mayor characteristics	No	Yes	Yes
Observations	11,978	11,953	11,953
R^2	0.86869	0.86877	0.87168
Within R^2	0.00036	0.00174	0.00173

Standard errors clustered at Municipality level in parentheses
Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

Notes: Municipal characteristics include: population expressed in logarithms, percentage of the population that lives in the urban area, Gini coefficient, percentage of illiterate population, and log GDP per capita. Mayor characteristics include: gender, education, age, and share of votes received in the municipal election.

Table 4: Effects of Re-Election Incentives on Municipal 4th Grade Math Score

Dependent Variable:	Municipal 4th Grade Math Scores		
	(1)	(2)	(3)
Mayor in second term	0.024**	0.022**	0.023**
	(0.011)	(0.011)	(0.011)
Municipality fixed-effect	Yes	Yes	Yes
Year fixed-effect	Yes	Yes	Yes
Municipal characteristics	No	No	Yes
Mayor characteristics	No	Yes	Yes
Observations	11,978	11,953	11,953
R^2	0.84931	0.84948	0.85478
Within R^2	0.00061	0.00193	0.00195

Standard errors clustered at Municipality level in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: Municipal characteristics include: population expressed in logarithms, percentage of the population that lives in the urban area, Gini coefficient, percentage of illiterate population, and log GDP per capita. Mayor characteristics include: gender, education, age, and share of votes received in the municipal election.

Table 5: Effects of Re-Election Incentives on Municipal 8$^{\text{th}}$ Grade Portuguese Score

Dependent Variable:	Municipal 8$^{\text{th}}$ Grade Portuguese Scores		
	(1)	(2)	(3)
Mayor in second term	0.033**	0.027*	0.030**
	(0.013)	(0.014)	(0.014)
Municipality fixed-effect	Yes	Yes	Yes
Year fixed-effect	Yes	Yes	Yes
Municipal characteristics	No	No	Yes
Mayor characteristics	No	Yes	Yes
Observations	7,108	7,093	7,093
R^2	0.86011	0.86050	0.86252
Within R^2	0.00124	0.00392	0.00559

Standard errors clustered at Municipality level in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: Municipal characteristics include: population expressed in logarithms, percentage of the population that lives in the urban area, Gini coefficient, percentage of illiterate population, and log GDP per capita. Mayor characteristics include: gender, education, age, and share of votes received in the municipal election.

Table 6: Effects of Re-Election Incentives on Municipal 8th Grade Math Score

Dependent Variable:	Municipal 8th Grade Math Scores		
	(1)	(2)	(3)
Mayor in second term	0.030**	0.025*	0.028**
	(0.013)	(0.014)	(0.014)
Municipality fixed-effect	Yes	Yes	Yes
Year fixed-effect	Yes	Yes	Yes
Municipal characteristics	No	No	Yes
Mayor characteristics	No	Yes	Yes
Observations	7,108	7,093	7,093
R²	0.86100	0.86139	0.86647
Within R²	0.00102	0.00365	0.00538

Standard errors clustered at Municipality level in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: Municipal characteristics include: population expressed in logarithms, percentage of the population that lives in the urban area, Gini coefficient, percentage of illiterate population, and log GDP per capita. Mayor characteristics include: gender, education, age, and share of votes received in the municipal election.

6 Conclusions

This paper relies on a two-way fixed effects estimator to analyze the effects of re-election incentives on the quality of education provided by municipal governments. According to the standard electoral accountability framework, first term mayors should change their behavior by exerting more effort to deliver better education outcomes and, as a consequence, get rewarded by voters with re-election.

As opposed to what the theory predicts, I find that term-limited mayors are associated with better education outcomes, measured by municipal-level scores from a national standardized exam. Results show that municipalities with a mayor in the second term present Math scores that are 0.023 standard deviations higher for the 4th grade, and 0.028 standard deviations higher for the 8th grade. Additionally, term-limited incumbents are associated with a 0.03 standard deviations higher Portuguese score for the 8th grade, and with a 0.014 higher score for the 4th grade, although this estimate is not significant. In spite of contradicting theory, the magnitude of the results is considered small.

I interpret these findings as the effect of political party turnover on education outcomes being higher than the effect of re-elections incentives. In contexts where the education bureaucracy is not shielded from the political process, like in Brazil, it might be the case that term-limited incumbents are associated with better education outcomes because they stay in power for a longer and continuous period, avoiding disruptions in education bureaucracy. If this is the case, then re-election incentives' role might be unimportant, and the political agency framework might not apply to the field of education. Additionally, the contradiction of the theory, and the relation between party turnover and term limit effects, creates an interesting perspective for research. Future studies should address these issues, and also empirically test if the predictions of the political agency framework are applicable to other types of public goods.

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