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Essays in Political Economy

João Pessoa - PB

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Abstract

This dissertation explores two topics in political economy. In the first chapter, we investigate whether dynastic mayors are more or less likely to engage in corruption when compared to non-dynastic mayors. Using data from random government audits conducted in the Brazilian municipalities, we use RDD on close elections to compare municipalities that barely had a dynastic candidate elected as mayor to those that did not. The identification of relatives in politics is based on the matching of their last names. We find that dynastic mayors are more likely to engage in practices of over-invoicing compared to non-dynastic mayors. In the second chapter, we investigate the relationship between political competition and the quality of the candidates, as well as the elected politicians. We use the effective number of candidates for measuring electoral competition, and the level of education for measuring the quality of politicians. By employing an instrumental variable approach, we find that electoral competition improves the quality of the candidates and the elected politicians. At the same time, it decreases the participation and the performance of women in politics.

Keywords: Political Dynasties. Corruption. Political Competition. Political Selection.
JEL Classification: D72. D73. H75. H83.

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1 Political Dynasties and Corruption: Evidence from Brazil

1.1 Introduction

Transfer of power among family members is a common phenomenon throughout human history. Nowadays, even in consolidated democracies that have a competitive electoral system, relatives of elected politicians seem to benefit from an electoral advantage over their non-dynastic opponents. This has been documented by Dal Bó, Dal Bó and Snyder (2009) for the US; Bragança, Ferraz and Rios (2015) for Brazil; Querubin et al. (2016) for Philippines; Rossi (2017) for Argentina and Asako et al. (2012) for Japan. Dynastic politicians might implement non-socially optimal policies in order to monopolize political power. As a result, this elite persistence may result in a society in which the policies implemented disproportionately benefit the ruling elite, as argued by Acemoglu and Robinson (2008). Additionally, it is widely assumed that corruption might be a possible way to maintain the perpetuation of power.

A society in which a certain group of political actors hold a systematic advantage in elections may have a poor quality of representation, since this reduces the chances of other possibly more qualified competitors being elected. The literature shows that this advantage not only exists for dynastic but also for white (Broockman; Soltas, 2020) and male candidates (Anzia; Berry, 2011). In contrast to these results, some studies underline that dynasties may actually be positive for democracy. A paper by Besley and Reynal-Querol (2017) shows that countries with dynastic leaders have better economic performance, but only if executive constraints are weak. Futhermore, political dynasties can increase female representation in politics, as suggested by Folke, Rickne and Smith (2016) and Labonne, Parsa and Querubin (2019).

In this paper, we examine the relationship between political dynasties and corruption, in the setting of the local politics in Brazil. By using data from mayoral elections, we define as dynastic a candidate who, at some point in the past, had a relative as mayor of the same municipality that he is contesting. We identify relatives by matching their last names. By employing a regression discontinuity design (RDD), we compare municipalities that had a dynastic candidate elected as mayor with those that did not, by a narrow margin of votes. We want to know whether a dynastic mayor is more or less

likely to be detected as corrupt by a national anti-corruption program.

The incidence of corruption is a major concern, especially in the developing world. This phenomenon is often considered as one of the main obstacles to the economic and social development of a society. The empirical research on corruption faces a relevant challenge: availability and quality of data. By the very nature of corruption, it is inherently difficult to accurately measure the level of corruption in a certain society. In Brazil, there is an anti-corruption program, implemented by the federal government in 2003, that randomly chooses municipalities to be audited. The reports produced as result of this program are providing a better picture of the levels of corruption in the brazilian public sector, especially at the local level.

Using data from these audit reports, Ferraz and Finan (2011) shows that 58% of the brazilian municipalities have committed fraud in the procurement of public goods and services, and 54% have had diversion of public funds for private gain. Despite these results, the role of properly disciplining public officials through legal institutions is one of the fundamental hallmarks of democracy. Along these lines, Avis, Ferraz and Finan (2018) documented the relevant deterrent effects of this anti-corruption program. They have found that the municipalities that have been audited in the past have 8% lower corruption levels than those that have never been audited. They also show that the audits produce a spillover effect, which reduces corruption in neighboring municipalities. Additionally, the audits affected the political environment, by improving the selection of candidates.

In this paper, we seek to provide a further understanding of the complex phenomenon of corruption in Brazil. There is a general feeling that the brazilian political dynasties engage in corruption to perpetuate themselves in power. We provide novel evidence that could assist policymakers to mitigate this problem. The legislation in Brazil tries to curb the establishment of political dynasties, by forbidding immediate relatives of a mayor or governor to run for office in the upcoming election. Yet, it is still common for this to happen, since the law allows relatives to run if the incumbent politician resigns six months before the election. It may be important to reform this legislation and propose changes that can improve it.

The results from our estimations suggest that dynastic mayors are neither more nor less corrupt than non-dynastic mayors, when considering an overall measure of corruption. However, when we separate corruption into different categories, we find that dynastic mayors are more likely to engage in over-invoicing practices.

This chapter is organized as follows: after the introduction, the subsection 1.2 discusses some important details of the Brazilian political landscape; subsection 1.3 presents the empirical strategy and the data used; subsection 1.4 presents the results, and subsection 1.5 concludes the research.

1.2 Brazilian Political Landscape

Brazil is a federal republic, composed of 26 states and a federal district (Brasilia). The country has 5,568 municipalities, which are the lowest administrative unit of government. Each municipality has it's own legislature and elected mayor, who are elected for a four-year term. The incumbent mayor can be re-elected once, and there are no re-election limits for members of the legislative branch.

Mayoral elections are decided by simple majority rule in municipalities with less than 200,000 registered voters. In the other municipalities, a second round can be held if none of the candidates obtains a majority of the valid votes in the first round. This rule also applies to presidential and gubernatorial elections. Elections are usually held in october, every four years.

The municipal governments in Brazil have a substantial level of autonomy in the allocation of their budgets. They are responsible for several important functions, such as the provision of primary education, public transportation, health care, and street maintenance. The main source of revenue for most municipalities are transfers from the federal government. The mayor is in charge of preparing an annual budget proposal indicating where these funds will be spent, and the legislative branch approves it or recommends adjustments. Given the large number of resources that local governments receive, cases of corruption and mismanagement are common.

Political dynasties in Brazil are ubiquitous. A report produced by *Transparencia Brasil*[1] indicates that 49% of the federal deputies and 60% of the senators elected for the 2015-2018 term were relatives of elected politicians. The three states with the highest proportion of dynastic federal deputies are Rio Grande do Norte (100%), Paraiba (92%), and Piaui (80%). All of them are in the northeastern region of the country. These three states together have 29 seats in the lower house of the national congress, three of which are occupied by women.

Some of the most famous and powerful political dynasties in Brazil are: Sarney

[1] Brazilian NGO. Available at: https://www.transparencia.org.br/publicacoes

Family (Maranhão); Calheiros Family (Alagoas); Magalhães Family (Bahia); Ferreira Gomes Family (Ceará); and Alves Family (Rio Grande do Norte). In some states, there are a number of political dynasties, and corruption scandals involving their names are frequent. Some of these families own the main media outlets in their states. All this may be considerably hindering the entry of new competitors into politics. It is, therefore, necessary to understand what the practical real consequences of this phenomenon are.

1.3 Empirical Strategy

1.3.1 Data sources

This analysis focuses on municipal elections. We use electoral data from five elections that took place between 2000 and 2016, obtained from the Superior Electoral Court (*Tribunal Superior Eleitoral*[2]). This database contains information about the election results and candidate characteristics. We only use races in which one of the candidates is identified as dynastic and the other as non-dynastic, of the top two vote-getters.

The search for dynastic candidates starts in the 2004 election. In that year, 13.4% of the top two mayoral candidates were dynastic, taking the 2000 election as a baseline. In the 2008 election, 12.9% of the candidates were dynastic, using the 2004 and 2000 elections as a baseline. In the 2012 and 2016 elections, 22.5% and 29.2% of the candidates, respectively, were dynastic, taking all of the previous elections as a baseline. Over the period from 2004 to 2016, there were 8487 races in which the two most voted candidates were composed by one dynastic and one non-dynastic.

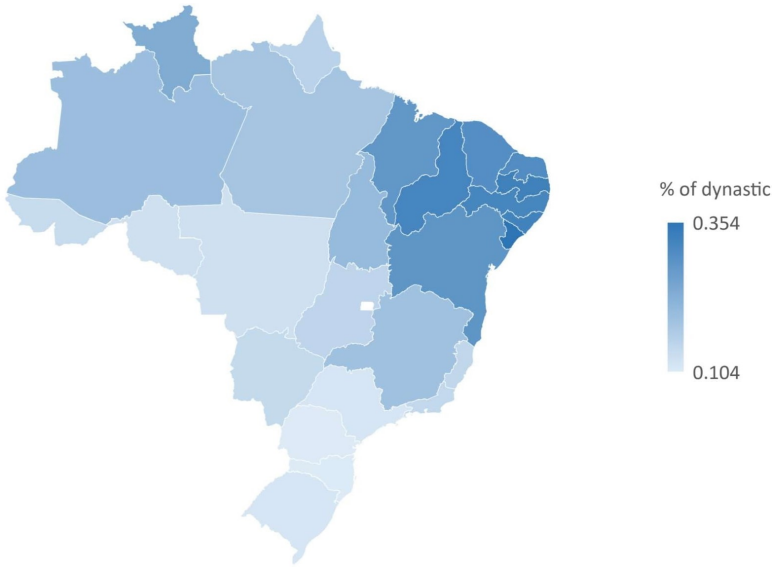
In figure 1, we can see the percentage for each state of mayoral candidates who are dynastic, taking into account only the two most voted in each election. These numbers are the averages for the entire period. The northeastern states have by far the highest percentage of dynastic candidates – 31% – followed by the northern, the southeastern, the midwestern, and the southern states, which have 18%, 15%, 14% and 11% of dynastic mayoral candidates, respectively.

Data on corruption and mismanagement come from an anti-corruption program[3] implemented in 2003 by the federal government, through the Office of the Comptroller General (*Controladoria Geral da União - CGU*). This program randomly chooses mu-

[2] Brazil's electoral authority. http://www.tse.jus.br

[3] For more details about this anti-corruption program, see Ferraz and Finan (2011).

Figure 1 – Share of dynastic mayoral candidates for each state



Source: Superior Electoral Court (*Tribunal Superior Eleitoral)*; 2004-2016.

nicipalities to be audited. Auditors are sent to these municipalities to analyze the use of funds received via federal transfers. At the end, an audit report is published, which is used in this paper to construct the outcome variables. We will estimate whether the probability of an audit finding evidence of corruption differ for a municipality governed by a dynastic mayor compared to a municipality governed by a non-dynastic mayor. In our sample, 629 municipalities were audited at some point between 2004 and 2016. Thus, this will be the main sample for estimating the RDD.

Table 1 shows the variables used as outcomes and as covariates. The variable *corruption* is created in accordance with Ferraz and Finan (2011), and Brollo and Troiano (2016). This variable is a dummy that indicates when at least one of the following corruption practices is reported during the four-year term: 1) *over-invoicing*, which occurs when there is evidence that goods and services have been purchased at prices above the prevailing market prices; 2) *illegal procurement practices*, which occur when there is a limitation of competition, or simulation in the bidding process; 3) *fraud*, occuring when there is overall evidence of any type of fraud; and 4) *diversion of funds*, which occurs when there has been payment for goods and services that were never provided. We have created dummies for each of these four non-mutually exclusive types of corruption, as detailed further below.

In each audit report, the auditors summarize what was found. We designed an algorithm to search for specific words in this summary. For creating the dummy variable

Table 1 – Outcome variables and municipal characteristics

Variable	Mean	Mean dynastic	Mean non-dynastic	Difference	Obs
Corruption	0.374	0.428	0.324	0.104***	629
	(0.484)	(0.495)	(0.468)	(0.038)	
Over-invoicing	0.254	0.291	0.221	0.070**	629
	(0.436)	(0.455)	(0.416)	(0.034)	
Illegal procurement practices	0.157	0.170	0.145	0.025	629
	(0.364)	(0.376)	(0.353)	(0.029)	
Fraud	0.054	0.057	0.051	0.005	629
	(0.226)	(0.232)	(0.221)	(0.018)	
Diversion of funds	0.013	0.020	0.006	0.014	629
	(0.112)	(0.140)	(0.077)	(0.008)	
Severe mismanagement	7.468	7.913	7.066	0.846	629
	(10.506)	(11.341)	(9.688)	(0.838)	
Medium mismanagement	29.901	29.829	29.966	-0.137	629
	(27.103)	(25.74)	(28.320)	(2.165)	
Formal mismanagement	0.453	0.525	0.387	0.138	629
	(1.390)	(1.524)	(1.255)	(0.111)	
Total amount audited	16.495	17.729	15.376	2.353	624
/ 1,000,000	(60.014)	(77.929)	(37.034)	(4.794)	
Municipal population	43.443	44.914	42.111	2.803	629
/ 1,000	(100.713)	(120.892)	(78.229)	(8.047)	
Montly per capita income	344.35	339.20	349.02	-9.82	629
	(208.13)	(207.34)	(209.04)	(16.62)	
% rural households	36.287	36.855	35.775	1.080	625
	(22.120)	(21.17)	(22.95)	(1.773)	

Notes: The data on corruption comes from the Office of the Comptroller General (Controladoria Geral da União; 2004-2018). The unit of observation is at the municipality-mandate level. The first five variables are dummies indicating whether corruption was detected during the entire term. The variables on mismanagement and the total amount audited are the sums for the entire term. The municipal population are the averages for the term, and comes from the Federal Court of Accounts (Tribunal de contas da União; 2014-2016). Finllay, the monthly per capita income and the percentace of rural households comes from the Brazilian censuses, which are conducted by the Brazilian Institute of Geography and Statistics (IBGE; 2000, and 2010)

over-invoicing, the algorithm assigns the value of one if at least one of the following terms is detected: *superfaturamento* (overbilling); or *sobrepreço* (overpricing). For constructing the variable *illegal procurement practices*, the algorithm searches for the terms: *restrição da competição* (restriction of competition); *direcionamento* (targeting); *favorecimento na contratação* (favoritism in the procurement); *conluio* (collusion); and *simulação de licitação* (bid rigging). For the variable *fraud*, the word *fraude* (fraud) was searched. Lastly, for the variable *diversion of funds*, the terms *desvio de recursos* (diversion of funds), and *ausência de comprovação de despesas* (inexistence of proof of expenses) were searched.

We are aware that this approach to determining what is corruption may contain errors. These terms do not always appear in every report that reveals corrupt practices. Ideally, we should read each of the reports individually to better decide which are and which are not corrupt practices. This will be done in a future version.

In addition to the variables on corruption, three more variables on mismanagement practices are also used. Every mismanagement practice is classified by the auditors as formal, moderate, or severe. Therefore, the variables *severe mismanagement*, *medium mismanagement* and *formal mismanagement* represent the number of management errors that were found and defined by the auditors as being severe, moderate and formal, respectively. Since the variables are at the municipality-mandate level, then these numbers are the totals for the entire term. The last four variables are covariates that will be used in the validity tests.

The first column of Table 1 shows the mean value for each variable for the full sample. Column 2 and 3 show the means for the subsets of municipalities governed by dynastic and non-dynastic mayors, respectively. Column 4 shows the difference in means between columns 2 and 3. The mean value of the variable corruption indicates that some form of corruption was detected in 37.4% of all the municipalities in our sample. Analyzing the different groups of municipalities, it can be seen that those governed by dynastic mayors have a higher chance of having corruption detected by 10.4 p.p. (percentage points). Looking more precisely at the specific corruption practices, only the variable *over-invoicing* differs statistically between the different groups of municipalities.

As can be seen, we have two outcome variables – *corruption* and *over-invoicing* – indicating that municipalities governed by dynastic mayors are more corrupt, on average. But this, in itself, is not causal evidence that dynastic mayors are more corrupt. Even though the covariates do not point to differences between these groups of municipalities,

we do not assume that they are comparable. We only assume that they are comparable at the threshold of the vote margin that decided the election. This is because the outcome of a very close election is considered to be a statistical fluke, and as such, we will further exploit the data of these elections by using a Regression Discontinuity Design.

1.3.2 Identification: regression discontinuity design

To identify the effect of political dynasties on corruption, we exploit the intrinsic quasi-random nature of close elections. Because municipalities that have a dynastic mayor are certainly different from those that have a non-dynastic mayor, it's not appropriate to make a direct comparison between these two groups of municipalities, as it would imply a biased estimate. Nevertheless, we also test this hypothesis by comparing these municipalities on observable characteristics.

A RDD approach is employed to compare the outcome in municipalities where a dynastic candidate won the election to municipalities where the dynastic candidate lost, by a narrow margin of votes. Assuming that the outcome of a close election is a statistical fluke, this allows us to control for observable and unobservable characteristics at the municipality level. Therefore, we assume that municipalities where the dynastic candidates have lost the election by a small margin are a good counterfactual for the municipalities where they have won.

Define $y_{mt}(1)$ as the probability of a municipality m during the electoral term t having evidences of corruption detected in the audit reports if the mayor is dynastic, and $y_{mt}(0)$ is the same probability but when the mayor is non-dynastic. We want to estimate the difference in these probabilities in an election where, from the top two most voted candidates, one of them is dynastic and the other is non-dynastic, i.e. $E(y_{mt}(1) - y_{mt}(0)|m \in \Omega)$. Elections that had no dynastic candidate, or where both were dynastic will not be included in the estimations, as well as the municipalities that have never been audited.

To assess the local average treatment effect (LATE) of having a dynastic mayor on corruption, we follow Imbens and Lemieux (2008) and estimate a local linear regression:

$$y_{mt} = \alpha + \gamma D_{mt} + \beta MV_{mt} + \mu D_{mt} \cdot MV_{mt} + \lambda_t + \epsilon_{mt} \tag{1.1}$$

where y_{mt} is the outcome of municipality m during the electoral term t, D_{mt} is a dummy that indicates if the mayor is dynastic, MV_{mt} is the margin of votes for the

dynastic candidate. In other words, MV_{mt} is the share of the votes for the dynastic candidate minus the share of the votes for the non-dynastic candidate. Hence, when $MV_{mt} > 0, D_{mt} = 1$ and when $MV_{mt} < 0, D_{mt} = 0$. λ_t is a mandate fixed-effect, and ϵ_{mt} is an error term. Equation 1.1 is estimated using a sample of observations defined in an interval $MV_{mt} \in [-h, +h]$, where the optimal *bandwith* h is computed using the MSERD algorithm proposed by Calonico, Cattaneo and Titiunik (2014). The parameter of interest γ identifies the LATE at the treshold $MV_{mt} = 0$

Equation 1.1 is estimated using the electoral data from the period of 2000 to 2016, while the corruption data comes from the audits conducted between 2004 and 2018. The main outcomes variables are dummies that indicates whether the municipalities have had evidence of corruption detected during the electoral term. In addition, the impact of political dynasties on the prevalence of mismanagement practices will also be estimated.

The dummy variable that indicates whether the candidate is dynastic is created by analyzing the surname structure of the candidates. Following Bragança, Ferraz and Rios (2015) and Querubin et al. (2016), we assume two politicians to be relatives if they have at least one last name in common. Although this is not a strict rule, most Brazilians have two last names in their surname – one is the father's last name and the other is the mother's last name. If a mayoral candidate for a given municipality has at least one last name in common with any mayor who has governed that same municipality in the past, he will be considered a dynastic candidate. We are aware that this approach may contain errors, but this is the only feasible alternative, since there is no official information that would allow this identification.

It is worth noting that this strategy has limitations regarding the external validity of its results, since we are estimating a LATE with observations of close elections where the political landscape is competitive. A dynastic mayor facing a strong opposition may govern differently from those who win the election by higher vote margins. Nevertheless, we also investigate whether the sample of municipalities used in this estimation differs from the overall Brazilian municipalities, on a set of observable characteristics.

1.4 Results

1.4.1 The impact of political dynasties on corruption and mismanagement

The main results are presented in Table 2. Panel A shows the estimates that were performed using the optimal bandwidth computed according to Calonico, Cattaneo

and Titiunik (2014). Panel B and C show the estimates that were performed using half and double, respectively, of the optimal bandwidths. The first column shows the results for a broader measure of corruption. This variable is a dummy indicating if any of the four different corruption practices were found during an electoral term. These different corruption practices are shown in columns 2,3,4 and 5, which are also dummies. The last three columns represent the total number of mismanagement practices that were found in the municipalities during this same period. These errors are intuitively classified as severe, medium and formal.

As can be seen in the first column of panel A in Table 2, there is no effect of political dynasties on the variable representing overall corruption. It's coefficient indicates that the chance of detecting corruption is 9.8 p.p. higher in municipalities ruled by dynastic mayors, but this result is not statistically significant. Repeating the estimations using half of the optimal bandwidth (panel B) the coefficient increases to 17.3 p.p., but it is still not statistically significant. Finally, the coefficient in panel C is also positive and not significant.

Looking at the more specific measures of corruption (columns 2-5), we find a positive and statistically significant result for the variable over-invoicing. The coefficient indicates that the chance of detecting over-invoicing practices is 22.9 p.p. higher in municipalities governed by dynastic mayors compared to municipalities governed by non-dynastic mayors. Regarding the remaining outcome variables, none of them presented statistically significant coefficients.

Figure 2 shows the visual analysis of these estimates. In these graphs, the outcome variables (y-axis) are averages computed within defined intervals of the margin of votes for the dynastic candidate (x-axis). When this margin of votes is positive, the plotted data of the outcome variables represents municipalities governed by dynastic mayors. When it is negative, it represents municipalities governed by non-dynastic mayors. Most of the plots show a positive discontinuity at the threshold, but only the second plot – over-invoicing – is statistically significant. Thus, this supports the results shown in the estimations.

Generally speaking, we interpret these results as a reasonable indication that dynastic mayors engage in practices of over-invoicing more frequently than non-dynastic mayors. However, taking into account the challenges in the methods used to create the corruption variables, as well as to perform the identification of relatives, we believe that this evidence must be interpreted with caution.

Table 2 – The impact of political dynasties on corruption and mismanagement.

	Corruption	Over-invocing	Illegal procurement practices	Fraud	Diversion of funds	Serious mismana-gement	Moderate mismana-gement	Formal mismana-gement
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:								
Optimal Bandwidth								
Dynastic	0.097	0.229***	0.025	-0.010	0.026	2.362	0.410	0.202
	(0.086)	(0.086)	(0.065)	(0.052)	(0.022)	(2.104)	(5.162)	(0.289)
Bandwidth	0.225	0.125	0.130	0.163	0.224	0.160	0.226	0.146
Observations	510	385	394	447	510	443	511	424
Panel B:								
Optimal Bandwidth / 2								
Dynastic	0.173	0.222*	0.028	0.025	0.024	2.685	-1.044	0.246
	(0.094)	(0.122)	(0.079)	(0.089)	(0.018)	(3.617)	(7.365)	(0.527)
Observations	352	214	222	267	350	262	352	247
Panel C:								
Optimal Bandwidth * 2								
Dynastic	0.076	0.214*	0.018	-0.017	0.022	2.090	0.236	0.251
	(0.082)	(0.083)	(0.061)	(0.048)	(0.021)	(1.975)	(4.959)	(0.266)
Observations	591	527	534	569	591	564	591	549

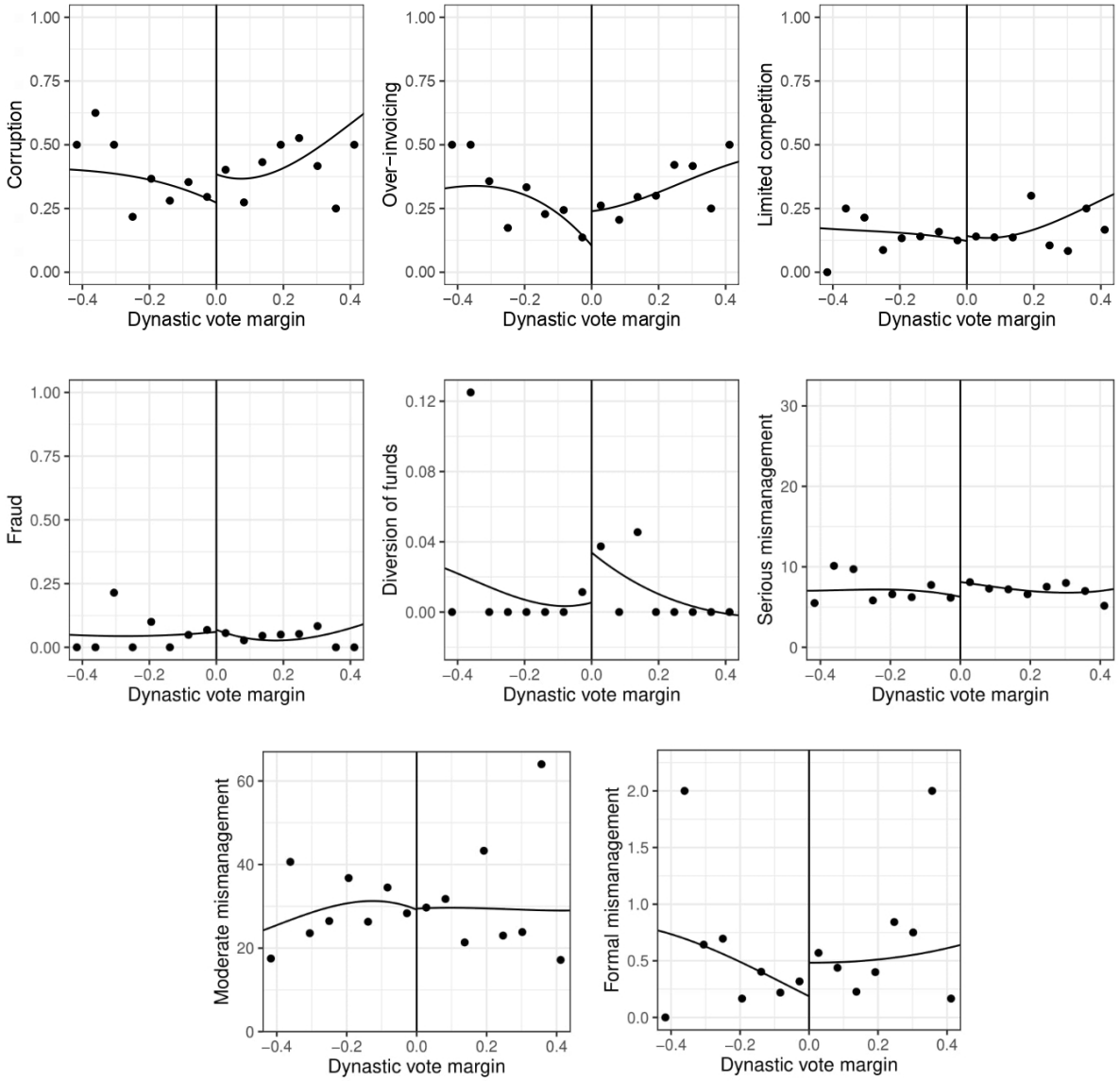
Notes: These results show RDD estimates with local linear regressions following equation 1.1. Robust standard errors clustered at the municipality level are in parentesis. The optimal bandwidth is calculated according to Calonico, Cattaneo and Titiunik (2014). Panels B and C show bandwidths that are half and double, respectively, of the optimal as a robustness test. See table 1 for a detailed definition of the variables.

* Statistically significant at the 10% level.

** Statistically significant at the 5% level.

*** Statistically significant at the 1% level.

Figure 2 – Political dynasties, corruption and mismanagement.



Note: Dots are local averages of the outcome variable, calculated within intervals defined by quantiles of the running variable. The curves are predicted values from the estimation of a third-order polynomial.

1.4.2 Internal and external validity tests

The credibility of these estimates relies on the assumption that there is no sorting around the discontinuity threshold. This means that the candidates do not have the ability to precisely manipulate the results of close elections, i. e. selection into treatment. To address this, we check whether there is a jump in the density around the threshold of the running variable, using a test proposed by McCrary (2008). As can be seen in figure A1, the test finds no evidence of a discontinuity in the density of the margin of votes for the dynastic candidates. Consequentely, this suggests that there are no systematic differences in the probabilities of a dynastic candidate losing or winning a very close election.

Another important assumption in this econometric framework is that there should be no differences in municipal characteristics between the treated and control groups, around the threshold. These balance tests were performed for the following variables: total value of audited resources; municipal population; monthly per capita income; and percentage of households in rural areas. Table A1 reports these results and shows that there are no significant discontinuities around the threshold. This is important because if there were differences between these covariates, this could confound the results of the main estimations, causing them to be biased.

In a future version of this paper, we will test a larger number of covariates to improve the robustness of these internal validity tests. Additionally, it will also be tested if there is a difference in covariates between the sample used in the main estimations and the universe of the Brazilian municipalities. These will be seen as external validity tests.

1.5 Concluding remarks

This paper has proposed to investigate a widely debated issue in politics - the relationship between political dynasties and corruption. To the best of our knowledge, there are no published empirical studies investigating this association. Using the context of the local politics in Brazil as a laboratory, we use a RDD approach to compare municipalities governed by dynastic mayors with those governed by non-dynastic mayors. We have found that there are no differences in the probability of detecting corruption between these groups of municipalities, when considering an overall measure of corruption. However, when we disentangle corruption into different categories, we find that dynastic mayors are more likely to engage in over-invoicing practices.

In a paper investigating the relationship between political dynasties and the quality of government, Bragança, Ferraz and Rios (2015) finds that dynastic mayors tend to spend more. However, this greater spending does not translate into better provision of public goods. One possible mechanism for why this happens is that they are getting more involved in corruption. More precisely, they are paying higher prices in the procurement of goods and services. Therefore, this paper provides an additional piece of evidence to the incipient literature that seeks to understand the consequences of political dynasties for society.

It is worth noticing that this paper has methodological limitations. First, the approach that we have used to find relatives is not perfect, since it relies on matching the surnames of the politicians. As a result, misidentification might occur. Second, because we did not have time to read each audit report, the identification of corruption was done based on a search for phrases related to corruption. Hence, errors can also occur.

The findings of this paper raise important questions for future research. Since the data used in the estimations comes from close elections, our results pertain to what happens in competitive electoral environments. The way political dynasties are related to corruption in less competitive environments may be very different from what we have found in this paper. For that reason, it is necessary to understand how political competition might be related to both corruption and the prevalence of political dynasties.

2 Political Competition and Candidate Selection in Brazilian Municipalities

2.1 Introduction

The statement that market competition improves consumer welfare is one of the most important principles of microeconomic theory. In recent years, there has been growing interest in understanding whether this also extends to the political environment. Tradicional models of political economy predict that electoral competition increases political accountability. According to Stigler (1972), political competition can potentially be as beneficial as economic competition, especially in terms of provision of public goods. One of the underlying mechanisms supporting this reasoning is that it increases the average quality of candidates and elected politicians, as argued by Besley, Persson and Sturm (2010). They also show that political competition tends to enhance the electoral relevance of swing voters, who are primarily concerned by the actual performance of politicians rather than ideological issues.

Regarding the empirical literature, there are mixed results. In a paper focusing on Flemish municipalities, Ashworth et al. (2006) finds that electoral competition has a positive effect on the efficiency of municipal policy. Similar findings have been documented for Italy (Galasso; Nannicini, 2011) and for Germany (Becker; Peichl; Rincke, 2009). However, Cleary (2007) finds no relationship between electoral competition and the provision of public goods in Mexican municipalities. Instead, he shows actually that voter turnout improves the quality of local governments. In a study of Peruvian local politics, Pique (2019) shows that higher mayoral wages enhances political competition by increasing the number of candidates, thus having a negative impact on government performance. He demonstrates that this result is driven by increased fragmentation, opposition, and turnover.

Elections are one of the fundamental tools of a democracy. Despite this, elections alone may not be sufficient for the progress of a society. It is a fact that its benefits are limited by existing obstacles, such as clientelism and corruption. The effectiveness of elections varies according to the institutional framework; therefore, it is also necessary to establish political institutions that enforce a system of checks and balances in order to

ensure its legitimacy.

In Brazil, previous research indicates that political competition, at the municipality level, is associated with positive results. Arvate (2013) finds that an increase in the effective number of mayoral candidates improves the provision of public goods, namely the number of student enrollments, teachers, and free immunizations. In a paper that focuses particularly on the impact on fiscal spending, Chamon et al. (2019) argues that competition induces more investment and decreases current expenditures.

Besides the contradictory results in the literature, the evidence suggests that in Brazil political competition can be beneficial. We investigate whether political competition improves the quality of the candidates and the elected officials, given that this is one of the most crucial mechanisms behind the reported results. Politician quality is measured in terms of level of education. Since the level of competition in elections can also be influenced by the quality of the candidates, this endogeneity problem is addressed by employing an instrumental variable approach. To construct the instruments, we use the population rule that establishes the number of seats for municipal councilors. A larger number of seats implies a larger number of parties competing in the elections. Consequently, there is a larger number of mayoral candidates, implying greater competition.

This research is particularly relevant because much effort has been made in trying to understand whether increased competition improves the quality of government. Furthermore, we add to the literature by exploring a specific mechanism that underlies this association. Increased competition can be beneficial to a society in at least two ways: (*i*) it motivates the incumbent politician to perform better since he/she does not want to leave office, and (*ii*) it improves the quality of candidates since parties will have to choose their candidates better in a more competitive environment in order to succeed. We focus on the latter.

The results indicate that political competition positively affects the quality of candidates. Greater competition increases the proportion of elected mayors, mayoral candidates, elected councilors and council candidates that are college educated. We also find that increased competition reduces the participation and the performance of women in politics: they are less likely to run for office as well as to win elections. This result is consistent with a recent literature on gender and competition, which points to a tendency of men to have a better response to greater competition. For a review of this literature, see Niederle and Vesterlund (2011).

Along the same lines, Paola and Scoppa (2011) investigated whether political

competition improves the quality of elected officials at the level of local governments in Italy. By using different measures of political competition they have found positive results. Gavoille and Verschelde (2017) show that French deputies elected in more competitive districts exhibit greater productivity. Therefore, as documented by Jones and Olken (2005) individuals certainly matter for economic development, and that is why we need to elect the best ones.

This chapter is organized as follows: after the introduction, subsection 2.2 describes the empirical strategy and the data used; subsection 2.3 presents the results, and subsection 2.4 concludes the research.

2.2 Empirical Strategy

2.2.1 Data Sources

We use the electoral data from five municipal elections held in 2000 to 2016. Information on the elections results and candidate characteristics come from the Superior Electoral Court (*Superior Tribunal Eleitoral*); municipal controls come from the Brazilian censuses conducted by the Brazilian Institute of Geography and Statistics (*IBGE*). For both the elections held in 2000 and 2004, we use municipal controls from the 2000 census, while the data from the 2010 census is used for the 2008, 2012, and 2016 elections. The control variables used are: *per capita* montly income, percentage of population with secondary-level of education, municipal unemployment rate, and the percentage of males within the population. We use regional fixed-effects dummies to capture unobserved regional heterogeneity, with the southeast designated as the baseline. We also use election fixed-effects (not reported) to control for possible trend changes of the outcome variables over time.

It is not an easy task to find variables that accurately represent what it means to be a quality politician in practical terms. It is known that the level of education is a key determinant of productivity in the labor market, as extensively documented in the economic literature. Assuming that political skills are related to labor market skills, we use the level of education as a proxy for evaluating the quality of politicians. [1]

Table 3 shows some descriptive statistics for the variables used in this paper. The effective number of candidates, which is the measure of political competition that we

[1] Other studies also consider education as a proxy for the quality of politicians, such as Ferraz and Finan (2009), Paola and Scoppa (2011), and Baltrunaite et al. (2014)

Table 3 – Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max	Obs.
Effective number of candidates	2.181	0.567	1.000	7.748	24416
College educated elected mayor	0.447	0.288	0	1	24416
College educated mayoral candidates	0.438	0.341	0	1	24416
College educated elected councilors	0.186	0.166	0	1	24416
College educated council candidates	0.132	0.088	0	0.611	24416
Male mayors	0.909	0.288	0	1	24416
Male mayoral candidates	0.893	0.195	0	1	24416
Male councilors	0.871	0.111	0.222	1	24416
Male council candidates	0.753	0.086	0.481	1	24416
Male population	0.506	0.015	0.454	0.811	24416
Per capita monthly income	704.356	402.024	76.501	6197.673	24416
Population with secondary school	0.398	0.100	0.111	0.784	24416
Unemployment rate	0.086	0.055	0.001	0.580	24416
North	0.081	0.273	0	1	24416
Northeast	0.312	0.463	0	1	24416
Midwest	0.084	0.277	0	1	24416
Southeast	0.312	0.463	0	1	24416
South	0.210	0.408	0	1	24416

Sources: Superior Electoral Court (Superior Tribunal Eleitoral; 2000, 2004, 2008, 2012, and 2016). Brazilian censuses from the Brazilian Institute of Geography and Statistics (IBGE; 2000, and 2010).

have chosen, is computed by using the following formula: $N = 1/\sum_{i=1}^{n} c_i^2$ where n is the number of candidates and c_i^2 is the square of each candidate's share of the votes. The idea behind this measure is to count the number of candidates while considering their relative strength in the election.

The main four outcome variables used for measuring the quality of politicians are: *college educated elected mayor*, which is a dummy variable that assumes a value of one if the elected mayor in that municipality has at least a college degree; *college educated mayoral candidates*; *college educated elected councilors*; and *college educated council candidates*, which are the share of mayoral candidates, the share of elected councilors for the municipal legislative branch, and the share of council candidates that have a college degree, respectively.

In addition to these measures of the politicians' level of education, we will also

test whether political competition affects women's participation in politics. We created a dummy variable, *elected mayor is a man*, which indicates whether the mayor elected in that municipality is a man. The variable *mayoral candidates that are men* is the share of male mayoral candidates; *elected councilors that are men* is the share of elected councilors that are male; and *council candidates that are men* is the share of male council candidates. As can be seen from the descriptive statistics, women are notably underrepresented in Brazilian politics — about 91% of the mayors in Brazil are male.

2.2.2 Identification: instrumental variables

We want to assess the impact of electoral competition on the quality of the candidates and elected politicians. To this end, we implement the following two-stage least squares (TSLS) model:

$$Competition_{it} = \gamma_0 + \gamma_1 Z_{it} + X'_{it}\zeta + \mu_t + \eta_r + \epsilon_{1it} \tag{2.1}$$

$$Q_{it} = \beta_0 + \beta_1 Competition_{it} + X'_{it}\lambda + \mu_t + \eta_r + \epsilon_{2it} \tag{2.2}$$

where Q_{it} is the outcome of interest in the politicians of a municipality i for the election t. Here, we use the level of education and gender for the candidates and elected politicians. $Competition_{it}$ is the effective number of candidates, which is the inverse of the Herfindal-Hischman Index (HHI). X'_{it} is a vector of municipal characteristics, Z_{it} is the instrumental variable, μ_t is a vector of election fixed-effects dummies, η_r is a vector of regional fixed-effects dummies, and ϵ_{1it} and ϵ_{2it} are the error terms for equations 1 and 2, respectively. β_1 is the coefficient of interest. All of these variables are more precisely defined in the previous subsection.

We adopt an instrumental variables framework because the relationship between candidate quality and political competition is certainly endogenous. Just as political competition can determine the quality of candidates, the quality of candidates can affect, at least in part, the degree of competition. This approach can also correct for possible omitted variable bias.

For creating an IV candidate, we exploit the rule that establishes the number of seats in the municipal legislative branch, which is based on the size of the municipal population[2]. In accordance with Arvate (2013), we build two dummy variables. The first,

[2] Article 29, paragraph IV of the federal constitution.

medium municipality, has a value equal to one if the municipality has between 11 and 30 councilor seats, and the second, *larger municipality*, has a value equal to one if the municipality has 31 or more councilor seats. The idea behind this choice of instrument is as follows: the greater the number of seats in the municipal legislative, the greater the number of parties competing in the elections. In addition, the office of mayor is the natural career progression for a councilor, thus a larger number of councilors implies more competition for the mayor's seat.

For an instrument to be considered valid, it must satisfy two traditional criteria: relevance and exclusion restriction. The former requires that the instrument has an effect on the competition variable. The latter requires that the instrument has an influence on the variable of interest (politician quality) only through its effect on the competition variable, after controling for municipal característics (i.e., $E(Z_{it}\epsilon_{it}|X'_{it}) = 0$). As will be discussed in the following section, we are confident that these criteria have been met.

2.3 Results

2.3.1 OLS estimates

First, we use a simple OLS model to analyze whether political competition is related to the quality of candidates and elected politicians. The following model is estimated:

$$Q_{it} = \beta_0 + \beta_1 Competition_{it} + X'_{it}\lambda + \mu_t + \eta_r + \epsilon_{it} \tag{2.3}$$

where Q_{it} is the quality of candidates or elected politicians in the municipality i at the election t, $Competition_{it}$ is the effective number of candidates, X'_{it} is a vector of control variables at the local level, μ_t is a vector of election fixed-effects dummies, η_r is a vector of region fixed-effects dummies, and ϵ_{it} is an error term.

From table 4, we can see that political competition, as measured by the effective number of candidates, is unrelated to the probability of having an elected mayor that has a college degree. However, the share of mayoral candidates, elected councilors, and council candidates that have college degree are positively related to political competition. The coefficients are statistically significant, but rather small in magnitude. An increase of one effective candidate (which is quite a substantial increase in competition) increases by 1.0, 1.1, and 0.2 percentage points the share of mayoral candidates, councilors, and

Table 4 – OLS estimates: political competition and education of politicians.

Education	Mayor	Mayoral candidates	Councilors	Council candidates
	(1)	(2)	(3)	(4)
Competition	0.005	0.010***	0.011***	0.002***
	(0.006)	(0.004)	(0.002)	(0.001)
% pop. with secondary education	0.860***	0.767***	0.563***	0.327***
	(0.056)	(0.039)	(0.020)	(0.011)
% rural population	-0.141***	-0.131***	-0.097***	-0.038***
	(0.020)	(0.014)	(0.006)	(0.003)
Per capita montly income/100	0.007***	0.006***	0.007***	0.004***
	(0.002)	(0.001)	(0.001)	(0.000)
Region fixed effects	yes	yes	yes	yes
Election fixed effects	yes	yes	yes	yes
Observations	24,164	24,164	24,164	24,164
R-squared	0.063	0.106	0.286	0.354

Notes: the first dependent variable is a dummy indicating if the mayor has a college degree. The other three are the share of mayoral candidates, councilors and council candidates that have a college degree, respectively. Standard erros (corrected for heteroscedasticity and clusterized at the municipality level) are reported in parenteses. The symbols *, **, *** indicate, respectively, 1, 5, and 10% the statistical significance level.

council candidates that have a college degree, respectively. These results are negligible in terms of practicality.

Regarding the control variables, we can see that the quality of politicians increases with the education and income of the population, and decreases with the share of the population living in rural areas. Regional fixed-effects are statistically significant; futhermore, the results (not reported) show that politicians' education is higher both in the Northeast and Southeast, than it is in the South, Midwest, and North. Election fixed-effects shows a positive trend of the level of politicians' education over time.

In testing for robustsness, we have estimated alternative methods to OLS. To account for the fact that the variable in column 1 is binary, we have used a Probit model in contrast to the Linear Probability model presented in table 4. Additionaly, we have estimated a Beta Regression model[3] to adress the fact that the variables 2, 3 and 4 are proportions. These results, as can be seen in table A2, are similar to the OLS results.

[3] For more details, see Ferrari and Cribari-Neto (2004)

Table 5 – OLS estimates: political competition and politicians' gender.

Gender	Male mayor	Male mayoral candidates	Male concilors	Male council candidates
	(1)	(2)	(3)	(4)
Competition	-0.015***	-0.015***	0.003**	-0.006***
	(0.003)	(0.002)	(0.001)	(0.001)
% pop. with secondary education	0.034	-0.022	0.022*	-0.045***
	(0.036)	(0.022)	(0.013)	(0.006)
% rural population	0.049***	0.036***	0.018***	0.018***
	(0.013)	(0.009)	(0.005)	(0.002)
Per capita montly income/100	0.001	0.001**	-0.001***	-0.001***
	(0.001)	(0.001)	(0.000)	(0.000)
% male population	-0.419***	-0.379***	-0.217***	-0.067***
	(0.141)	(0.101)	(0.056)	(0.026)
Region fixed effects	yes	yes	yes	yes
Election fixed effects	yes	yes	yes	yes
Observations	24,164	24,164	24,164	24,164
R-squared	0.019	0.038	0.026	0.624

Notes: the first dependent variable is a dummy indicating whether the mayor is a man. The other three are, respectively, the share of mayoral candidates, councilors and council candidates that are men. Standard erros (corrected for heteroscedasticity and clusterized at the municipality level) are reported in parenteses. The symbols *, **, *** indicate, respectively, 1, 5, and 10% the statistical significance level.

Table 5 presents the results from OLS estimations investigating the relationship between political competition and the politicians' gender. Increasing the level of competition by one effective candidate reduces by 1.5 percentage points, both the chance of electing a male mayor and the proportion of male mayoral candidates. The results for councilors (column 3) and council candidates (column 4) are opposite: the former is positive and the latter is negative. All these coefficients are quite small in magnitude and thus negligible in practical terms.

Once again, we have used alternative methods to OLS as robustness tests. For the binary outcome (column 1) we have estimated Probit models. For all the others, which are proportions, we have estimated Beta Regression models. As shown in Table A3, the results are essentially the same, except for the variable in column 3, which in this table is not statistically significant. However, the coefficient is almost zero in both tables.

The correlations shown in tables 4 and 5 are most lileky biased. Our independent variable representing political competition is not exogenously determined. Let's suppose that in a given municipality there is already a high-quality candidate running for mayor; this may discourage potential competitors and, as a result, reduce the level of competition in the race. This generates a downward bias in the relationship between political competition and the quality of candidates, since the quality of candidates reduces competition. In the next section, we propose a strategy in order to overcome this concerns.

2.3.2 TSLS estimates

An instrumental variables approach is employed to overcome the endogeneity problem in the relationship between political competition and the quality of candidates. The two-equation model represented by equations 2.1 and 2.2 is used to estimate the results presented in tables 6 and 7.

The results in Table 6 refer to the effect of competition on politicians' level of education. Panel B shows the results from the first-stage regressions, where both the instruments used significantly affect political competition. The F-statistic of 251.36 is considerably above the minimum threshold of 10 suggested by Staiger and Stock (1994), as well as the threshold of 104.7 recommended by Lee et al. (2021). This suggests that the relevance critera is satisfied, due to the fact that the instruments are strongly correlated with the political competition variable. We are also confident that the exclusion restriction criterion is satisfied, because there is no apparent reason to suspect that the instruments directly affect the quality of elected politicians. In other words, only increasing the number of councilor seats in the legislative branch does not directly affect the quality of politicians.

Panel A shows the results from the second-stage regressions. A one unit increase in the effective number of candidates increases the chance that a municipality elects a college educated mayor by 64 percentage points. Similar effects are observed as well in the other three outcome variables, which represent the proportions of mayoral candidates, elected councilors, and council candidates that have a college degree, respectively. These results support our earlier assumption that the OLS estimates are downward biased, since the coefficients of the TSLS estimates are much larger.

In Table 7 the effect of electoral competition on politicians' gender is presented. We find a significant effect of political competition increasing the probability of electing a male mayor, as well as the proportions of male mayoral candidates, elected councilors,

and council candidates. Increasing competition by one effective candidate increases the chance of electing a male mayor by almost 6 p.p.; the fraction of male mayoral candidates by almost 7 p.p.; the fraction of male councilors by 11 p.p.; and the fraction of male council candidates by only 1.2 p.p.

Taking into account that the variables in columns (1) of tables 6 and 7 are dummies, we have also used an IV-Probit estimator as robustness tests. The results (not reported) do not change our main conclusions.

2.4 Concluding remarks

One of the most studied questions in political economy and science is what are the consequences of political competition for society. Some studies have documented that more competition implies a better quality of government. This paper analyzes one of the possible mechanisms behind this relationship. By exploiting the context of Brazilian local politics, we investigate whether greater political competition improves the quality of candidates and elected officials.

The data was gathered from five municipal elections that took place between 2000 and 2016. Political competition was measured by the effective number of candidates in mayoral elections. The quality of politician was measured in terms of level of education. To disentangle the direction of causality in this relationship, we employed a Two-Stage Least Squares estimator. The instruments used were derived from the population rule that determines the number of councilor seats in the municipal legislative branch.

First, we showed estimates using OLS, suggesting that there is a positive but rather small correlation between political competition and the quality of politicians. However, the bias-corrected results obtained using TSLS estimates, show a strong and positive effect of political competition on the quality of candidates and elected officials. A comparison of these results indicates that there is a downward bias in this relationship, as expected.

Additionally, this paper also documents that political competition reduces the participation as well as the performance of women in politics. Increased political competition reduces the number of female candidates and female elected politicians officials. Previous studies have shown that women cosnsistenlty perform worse than men in competitive environments. This is attributed to differences in overconfidence, among other things.

It is not possible to know whether our results are driven by the voters' perception

of the candidates, or by the candidates' reaction to increased competition. Nevertheless, this research contributes to the literature by providing evidence that there are benefits of competition, since it improves the quality of politicians. This is perhaps one of the main mechanisms of why political competition has been associated with a higher quality of government. On the other hand, it increases the existing gender gap in Brazilian politics.

Finally, we expect future research to address two main questions raised in this paper: are politicians with higher levels of education in fact better politicians? Why do women tend to participate less the more competitive the elections? Clarifying these issues is fundamental in order to have a greater understanding of how these mechanisms actually work.

Table 6 – TSLS estimates: political competition and education of politicians.

Education	Mayor	Mayoral candidates	Councilors	Council candidates
	(1)	(2)	(3)	(4)
Panel A:TSLS				
Competition	0.643***	0.575***	0.404***	0.204***
	(0.000)	(0.000)	(0.000)	(0.000)
% pop. with	0.437***	0.393***	0.303***	0.327***
secondary education	(0.000)	(0.000)	(0.000)	(0.000)
% rural population	-0.027	-0.029	-0.026**	-0.038***
	(0.309)	(0.142)	(0.020)	(0.000)
Per capita montly	0.006***	0.005***	0.006***	0.004***
income/100	(0.003)	(0.003)	(0.000)	(0.000)
Region fixed effects	yes	yes	yes	yes
Election fixed effects	yes	yes	yes	yes
Observations	24,164	24,164	24,164	24,164
Panel B: first stage				
	Competition			
Medium size municipality	0.179***			
	(0.042)			
Larger size municipality	0.265***			
	(0.008)			
% pop. with	0.446***			
secondary education	(0.073)			
% rural population	-0.099***			
	(0.024)			
Per capita montly	-0.002			
income/100	(0.002)			
Region fixed effects	yes			
Election fixed effects	yes			
F-statistic	251.36			
(p-value)	(0.000)			
R-squared	0.020			

Notes: in Panel A, the first dependent variable is a dummy indicating if the mayor has college degree. The other three are, respectively, the share of mayoral candidates, councilors and council candidates that have college degree. Standard erros (corrected for heteroscedasticity and clusterized at the municipality level) are reported in parenteses. The symbols *, **, *** indicate, respectively, 1, 5, and 10% the statistical significance level.

Table 7 – TSLS estimates: political competition and politicians' gender.

Gender	Male mayor	Male mayoral candidates	Male councilors	Male council candidates
	(1)	(2)	(3)	(4)
Panel A:TSLS				
Competition	0.059**	0.068***	0.110***	0.012***
	(0.025)	(0.016)	(0.010)	(0.004)
% pop. with	-0.015	-0.021	0.022*	-0.057***
secondary education	(0.040)	(0.022)	(0.012)	(0.007)
% rural population	0.061***	0.036***	0.018***	0.032***
	(0.014)	(0.008)	(0.005)	(0.002)
Per capita montly	0.001	0.001**	-0.001***	-0.001***
income/100	(0.001)	(0.000)	(0.000)	(0.000)
% male population	-0.363**	-0.378***	-0.217***	-0.053**
	(0.143)	(0.101)	(0.000)	(0.027)
Region fixed effects	yes	yes	yes	yes
Election fixed effects	yes	yes	yes	yes
Observations	24,164	24,164	24,164	24,164
Panel B: first stage				
	Competition			
Medium size municipality	0.182***			
	(0.000)			
Larger size municipality	0.273***			
	(0.000)			
% pop. with	0.453***			
secondary education	(0.064)			
% rural population	-0.110***			
	(0.024)			
Per capita montly	-0.001			
income/100	(0.001)			
% male population	0.566*			
	(0.289)			
Region fixed effects	yes			
Election fixed effects	yes			
F-statistic	249.83			
(p-value)	(0.000)			
R-squared	0.020			

Notes: in Panel A, the first dependent variable is a dummy indicating if the mayor is male. The other three are, respectively, the share of mayoral candidates, councilors and council candidates that are male. Standard erros (corrected for heteroscedasticity and clusterized at the municipality level) are reported in parenteses. The symbols *, **, *** indicate, respectively, 1, 5, and 10% the statistical significance level.

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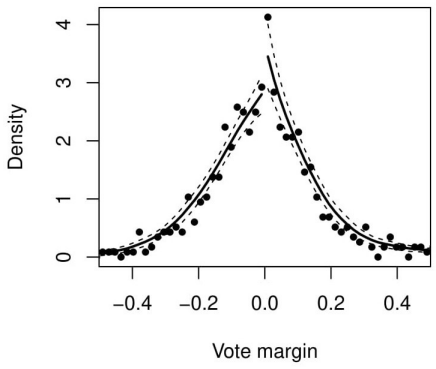
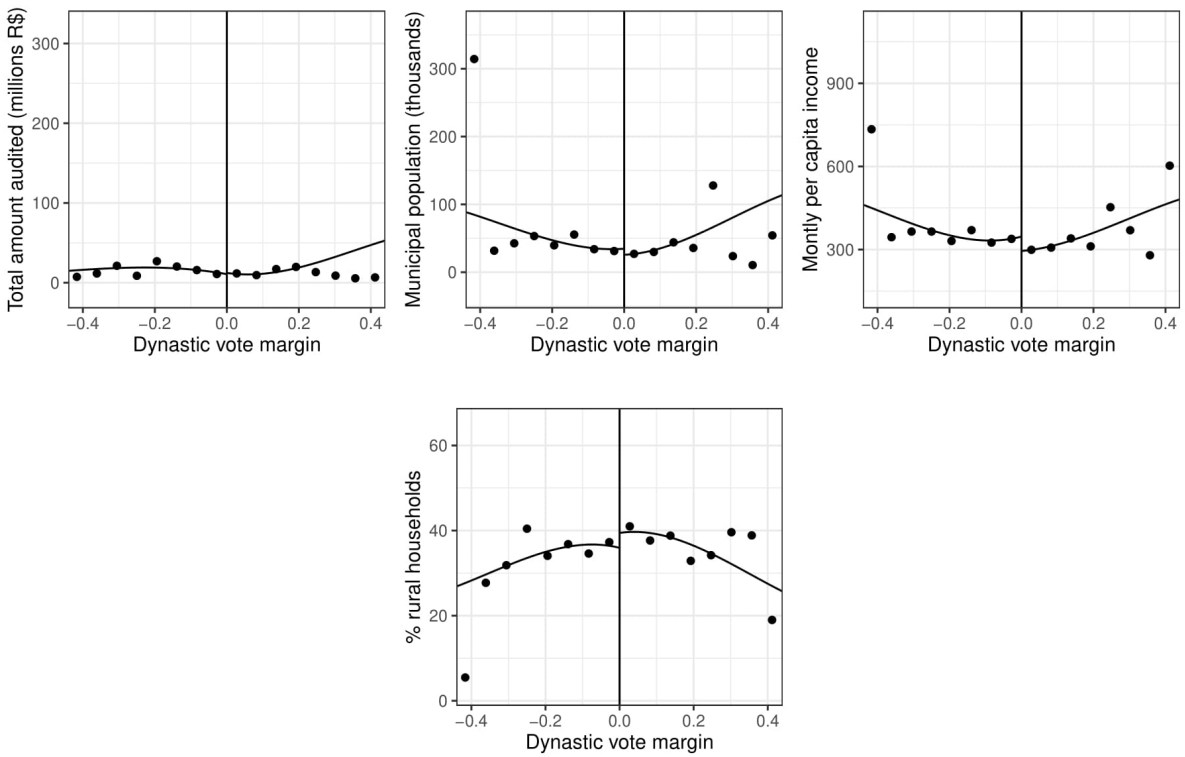
APPENDIX

Figure A1 – McCrary test



Notes: The null hypothesis of the McCrary (2008) test is of continuity of the vote margin at the threshold. At a 95% confidence interval, the p-value (0.141) does not reject the null hypothesis.

Figure A2 – Covariate tests



Notes as in figure 2.

Table A1 – Covariate tests

	Total amount audited	Municipal population	Montly per capita income	% rural houlseholds
	(1)	(2)	(3)	(4)
Panel A:				
Optimal Bandwidth				
Dynastic	1.805	-8.723	-24.436	4.021
	(4.877)	(9.180)	(38.906)	(4.855)
Bandwidth	0.127	0.105	0.143	0.149
Observations	389	339	442	426
Panel B:				
Optimal Bandwidth / 2				
Dynastic	1.750	0.932	1.984	4.410
	(5.442)	(10.171)	(52.766)	(6.697)
Observations	216	187	243	250
Panel C:				
Optimal Bandwidth * 2				
Dynastic	2.187	-6.607	-24.052	3.354
	(4.718)	(9.109)	(37.514)	(4.510)
Observations	529	496	546	549

Notes as in Table 2.

Table A2 – Probit and Beta Regression estimates: political competition and education of politicians

Education	Mayor	Mayoral candidates	Councilors	Council candidates
	(1)	(2)	(3)	(4)
Competition	0.013	0.103***	0.090***	0.109***
	(0.015)	(0.016)	(0.012)	(0.009)
% pop. with	2.287***	2.747***	3.996***	3.581***
secondary education	(0.153)	(0.155)	(0.122)	(0.093)
% rural population	-0.372***	-0.525***	-0.756***	-0.822***
	(0.054)	(0.057)	(0.044)	(0.035)
Per capita montly	0.019***	0.023***	0.034***	0.002
income/100	(0.004)	(0.004)	(0.003)	(0.002)
Region fixed effects	yes	yes	yes	yes
Election fixed effects	yes	yes	yes	yes
Observations	24,164	24,164	24,164	24,164
R-squared	0.057	0.092	0.182	0.190

Notes: the first dependent variable is a dummy indicating if the mayor has a college degree. The other three are, the share of mayoral candidates, councilors and council candidates that have college degree, respectively. Colum 1 shows a Probit model result, and columns 2, 3, and 4 show the Beta Regression model results. Standard erros (corrected for heteroscedasticity and clusterized at the municipality level) are reported in parenteses. The symbols *, **, *** indicate, respectively, 1, 5, and 10% the statistical significance level.

Table A3 – Probit and Beta Regression estimates: political competition and politicians' gender.

Gender	Male mayor	Male mayoral candidates	Male concilors	Male council candidates
	(1)	(2)	(3)	(4)
Competition	-0.091***	-0.169***	-0.002	-0.056***
	(0.019)	(0.013)	(0.012)	(0.004)
% pop. with secondary education	0.263	-0.189	-0.060	-0.332***
	(0.229)	(0.128)	(0.121)	(0.044)
% rural population	0.319***	0.112**	0.226***	0.247***
	(0.079)	(0.048)	(0.046)	(0.016)
Per capita montly income/100	0.005	0.003	-0.018***	-0.002
	(0.008)	(0.003)	(0.003)	(0.001)
% male population	-2.339***	-0.920	-0.517	-0.447**
	(0.763)	(0.575)	(0.543)	(0.194)
Region fixed effects	yes	yes	yes	yes
Election fixed effects	yes	yes	yes	yes
Observations	24,164	24,164	24,164	24,164
R-squared	0.043	0.056	0.020	0.310

Notes: the first dependent variable is a dummy indicating if the mayor is male. The other three are, respectively, the share of mayoral candidates, councilors and council candidates that are male. Colum 1 shows a Probit model result and columns 2, 3, and 4 show Beta Regression model results. Standard erros (corrected for heteroscedasticity and clusterized at the municipality level) are reported in parenteses. The symbols *, **, *** indicate, respectively, 1, 5, and 10% the statistical significance level.