PONTIFÍCIA UNIVERSIDADE CATÓLICA DO RIO DE JANEIRO

DEPARTAMENTO DE ECONOMIA

MONOGRAFIA DE FINAL DE CURSO

Runoff Elections:

Regression Discontinuity Evidence from Brazil

Renata Carreiro Avila

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Orientadora: Maína Celidônio de Campos

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”Declaro que o presente trabalho é de minha autoria e que não recorri para realizá-lo a nenhuma forma de ajuda externa, exceto quanto autorizado pelo professor tutor.”

Renata Carreiro Avila

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

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1 Introduction

The quality of government and policy-making are fundamental determinants of economic development, and it is well established in the economic literature that institutions can provide strong incentives for government performance and explain significant variation in quality of government (Acemoglu et al 2001; 2002; Ferraz and Finan 2011, Dell 2010). In democratic countries, the rules that regulate the political process are important examples of institutions.

The literature on electoral laws and their consequences to the political process is vast but predominantly theoretical. The estimation of the rules' effect on electoral outcomes and public policy choices poses an empirical challenge, since the endogeneity of electoral rules is often a threat to empirical identification. Such lack of exogeneity may hinder the unbiased estimation of the effects of said rules over political competition and the quality of government.

An important example of electoral institutions are voting systems, among which common examples are single-ballot (first-past-the-post) and dual-ballot (two-round) rules. The existence of dual-ballot voting, or runoff elections, is a common arrangement in democratic governments. There is a large body of political economy literature on runoff elections and their consequences to political competition. Duverger (1954) predicts that the simple majority, single-ballot rule stimulates a pattern of strategic voting in which parties and voters tend to rally behind the top two candidates and vote for their preferred choice amongst them, maximizing their chances of being pivotal voters in the election. The dual-ballot plurality rule, on the other hand, does not create such an incentive, since voters could still find it worthwhile to cast a sincere vote in first round elections and help their preferred choice to qualify for the runoff.

Several papers in game-theoretic literature have formalized Duverger's hypothesis in models of voting and performed its empirical testing (Cox 1997; Clark and Golder 2006; Engstrom and Engstrom 2008; Bouton 2013). Results have been mixed with regard to support for the hypothesis. In many of these studies, nevertheless, the endogenous

nature of electoral rules is an obstacle to causal interpretation of their effects over political competition, as argued in Fujiwara (2011).

In some contexts, however, the presence of runoff elections is determined by quasi-natural experimental settings. This is the case of runoff elections in Brazilian municipalities. The Brazilian Federal Constitution determines that municipalities with over 200,000 voters are eligible to having second-round elections, provided that no candidate receives more than 50% of votes in the first round[1]. This two hundred thousand threshold creates a discontinuous design: it determines an exogenous change in political rules for municipalities just below and just above the threshold.

Fujiwara (2011) exploits this strategy and finds that municipalities that are eligible to runoff elections exhibit higher levels of political competition throughout the 1996-2008 electoral cycles. At the same time, there is no observable discontinuity in party affiliation or candidate quality as proxied by level of schooling and occupational skill. In Chamon et al (2019), the authors perform a similar analysis and find that these municipalities also have better fiscal policy indicators, displaying a lower share of payroll expenditures and a higher share of investment expenditures, as well as bigger increases in school construction. Given the underprovision and frequently poor quality of public goods and services in Brazil, these results are interpreted as welfare-enhancing by the authors.

These authors discuss political competition as the main channel driving the results of better policy outcomes. The possibility of a runoff is viewed as a stimulus to sincere rather than strategic voting, thus increasing political competition, in consistence with Duverger's hypothesis. They argue that the two-round system reduces voters' incentives to consolidate support around the top two most likely candidates. In the 1996-2004 sample of Brazilian municipal elections, the authors indeed find that, in cities where runoff elections are a possibility, there were higher levels of political competition in the first round.

We highlight, however, that this is an ongoing debate in the political economy literature. The two-round system can also present incentives to strategic voting in several contexts, in fact providing multiple ways in which voters can behave strategically (Bouton

[1] Article 29, II; redaction given in *Emenda Constitucional* nº 16, June 1997

and Gratton 2015, Blais et al 2016, Weitz-Shapiro and Winters 2019). For the Brazilian presidential election in 2018, in particular, patterns of strategic voting have been found at a rate similar to single-round elections in other countries (Weitz-Shapiro et al 2020). In this way, the possibility of a runoff election may not induce sincere voting behavior.

A further interesting aspect of the analysis in Fujiwara (2011) and Chamon et al (2019) is that most effects are only statistically significant for the sub-sample of races where a current mayor was running for reelection. This pattern is viewed as consistent with the hypothesis that reelection provides incentive to performance (Ferraz and Finan 2008; 2011).

In this paper, we exploit the discontinuous design for runoff elections as an empirical strategy and extend the analysis to more recent election years - the municipal electoral cycles from 2005 to 2016. Therefore, our analysis assesses whether there are differences in political competition and fiscal policy outcomes associated to the discontinuous runoff election rule. In particular, we are interested in analyzing whether effects previously found by the aforementioned authors are persistent over time.

The rest of this paper is organized as follows. Section 2 discusses the main institutional framework concerning elections and municipal fiscal spending in Brazil; Section 3 shows data sources and descriptive statistics; Section 4 explains the empirical strategy used in the regressions; Section 5 presents the results, robustness checks and discussion of findings, and Section 6 displays the concluding remarks.

2 Institutional Background

The Federal Constitution of 1988 introduced runoff elections and the overall structure of the Brazilian electoral system. Voting is mandatory in Brazil for all citizens aged 18 through 64. The electoral authority is exercised by the *Tribunal Superior Eleitoral* (TSE) and its regional branches, the *Tribunais Regionais Eleitorais* (TRE), the electoral authorities at the state level. The TREs are responsible for the registration of voters, the regulation of candidacies and for the conduction of the actual elections.

Since voter registration is performed at the state level, the manipulation of a municipal constituency would require systematic and large-scale tampering of the registration process. In recent years, there is no evidence to support such an occurrence, and therefore the 200,000 voter threshold for runoff elections can be seen as a plausible exogenous mechanism that institutes changes in the political rules. Furthermore, because voter registration is compulsory, political participation and abstention rates do not influence the size of the electorate in each municipality.

Municipalities in Brazil are governed by democratically elected mayors that serve in office for four years. Since 1997, one-time serving mayors are also eligible to reelection[2]. The Constitution of 1988 introduced the 200,000 threshold rule for mayoral elections, establishing the two-round system for the municipalities above this cutoff, as discussed in the previous section. In 2012 and 2016, respectively, 83 and 92 municipalities exceeded this threshold.

Brazil is a highly decentralized country in terms of administrative duties. The promulgation of the Federal Constitution of 1988 was characterized by a transfer of authority and several spending responsibilities to states and municipal governments, with both being considered sub-national entities of the Federation.

Municipalities have their own tax collection system and also receive transfers from the federal and state governments. The most relevant municipal taxes are the *IPTU*, an urban property tax, and the *ISS*, a tax on goods and services. The size of total municipal spending is largely dependent on Federal transfers, which themselves are determined by

[2]Constitutional Amendment nº 16/1997

the total population in the municipality. Most of municipal spending is financed through these transfers; local governments, however, have significant autonomy over the allocation of said resources.[3] Investments in health and education, for instance, are part of the composition of municipal expenditures, being the joint responsibility of municipalities, states and the federal government (Article 30, Brazilian Constitution 1988).

Since 2000, the Brazilian Fiscal Responsibility Law[4] requires municipalities to disclose their full accounts to the federal government, which are consolidated into the Finbra/Siconfi system from the *Secretaria do Tesouro Nacional* (STN), the Brazilian National Treasury. Municipalities that fail to disclose spending information or to comply with their obligations may have their federal share of transfers temporarily suspended, or received only under restrictions.

The role and size of municipal governments have been growing in the last decades. Since the promulgation of the Constitution in 1988, the expansion of public sector jobs was largely concentrated at the municipal level: the number of municipal employment contracts grew 217% between 1986 and 2017 (Ipea 2020). According to the same study, the municipal level represents 57% of total public employment, as opposed to 34% three decades ago, a movement that followed the decentralization of public spending and also the creation of new municipalities across the country. The growing participation of municipalities in fiscal spending and public policy sheds light on the importance of the municipal electoral process and of understanding how democratic elections can influence political competition and policy outcomes.

[3] See Ferraz and Finan (2011) for more details on the politics of municipal governments and agenda-setting.

[4] Complementary Law nº 101/2000

3 Data

3.1 Data sources

The dataset used in this paper aggregates electoral data and fiscal policy variables. The *Tribunal Superior Eleitoral* (TSE), Brazil's electoral authority, provides data on the number of registered voters per city, mayor candidates and their vote share, mayor characteristics, party affiliation, candidates' campaign expenses and assets. The data used in this analysis is aggregated at the municipal level, and contains observations from the 2008, 2012 and 2016 municipal elections. I will focus my analysis on municipalities lying within the bandwidth of 100.000-300.000 in terms of number of voters.

In line with the Chamon et al (2019), we use as dependent variables for political competition are the number of effective candidates and the share of votes attributed to third and lower-placed candidates. The number of effective candidates, commonly used in the political economy literature, is the inverse of the Herfindahl Hirschman Index (HHI). The index corresponds to the sum of squared vote shares of each political candidate in a election. Hence, it varies from zero (low concentration) to one (highest level of concentration), and therefore its inverse is directly proportional to higher levels of political competition.

Fiscal data is imported from the *Secretaria do Tesouro Nacional* (STN). The entity provides public accounting statistics at several levels of government, including annual expenses and revenues reported by municipalities. Following Chamon et al (2019), we use as fiscal policy variables the level of payroll expenditures and of investment expenditures, both represented as shares of total expenditures. To account for possible noise in yearly data, we use the value of these expenditures aggregated over the four-year administration cycle.

The data is complemented by other municipal characteristics obtained from the Brazilian Institute of Geography and Statistics (IBGE), mostly contained in the last population Census, conducted in 2010. These variables include municipal aggregate income, income inequality as measured by the Gini index, share of women in the population,

illiteracy rate and life expectancy.

3.2 Summary statistics

Figures 1 and 2 contain a visual representation of characteristics of these municipalities. The graphs show the absence of relevant discontinuities at the voter threshold for the majority of characteristics. Figures 4 and 5 in the Appendix contain a visual description of the geographic location of the sample municipalities, by year of election.

Table 1 provides summary statistics for observable characteristics at the municipal level. Columns (1) and (2) report averages for municipalities above and below the voter threshold, respectively. Column (3) reports regressions discontinuity t-statistics associated to the voter threshold. From the non-statistical significance of the coefficients, we can see that, as expected, none of the observable characteristics vary discontinuously around the exogenous threshold. Thus the few visual discontinuities that might appear in Figure 2 do not translate into significant differences in characteristics.

Table 2 presents summary statistics for electoral and fiscal variables used in this analysis. In addition to the dependent variables for political competition, we also report the absolute number of candidates.

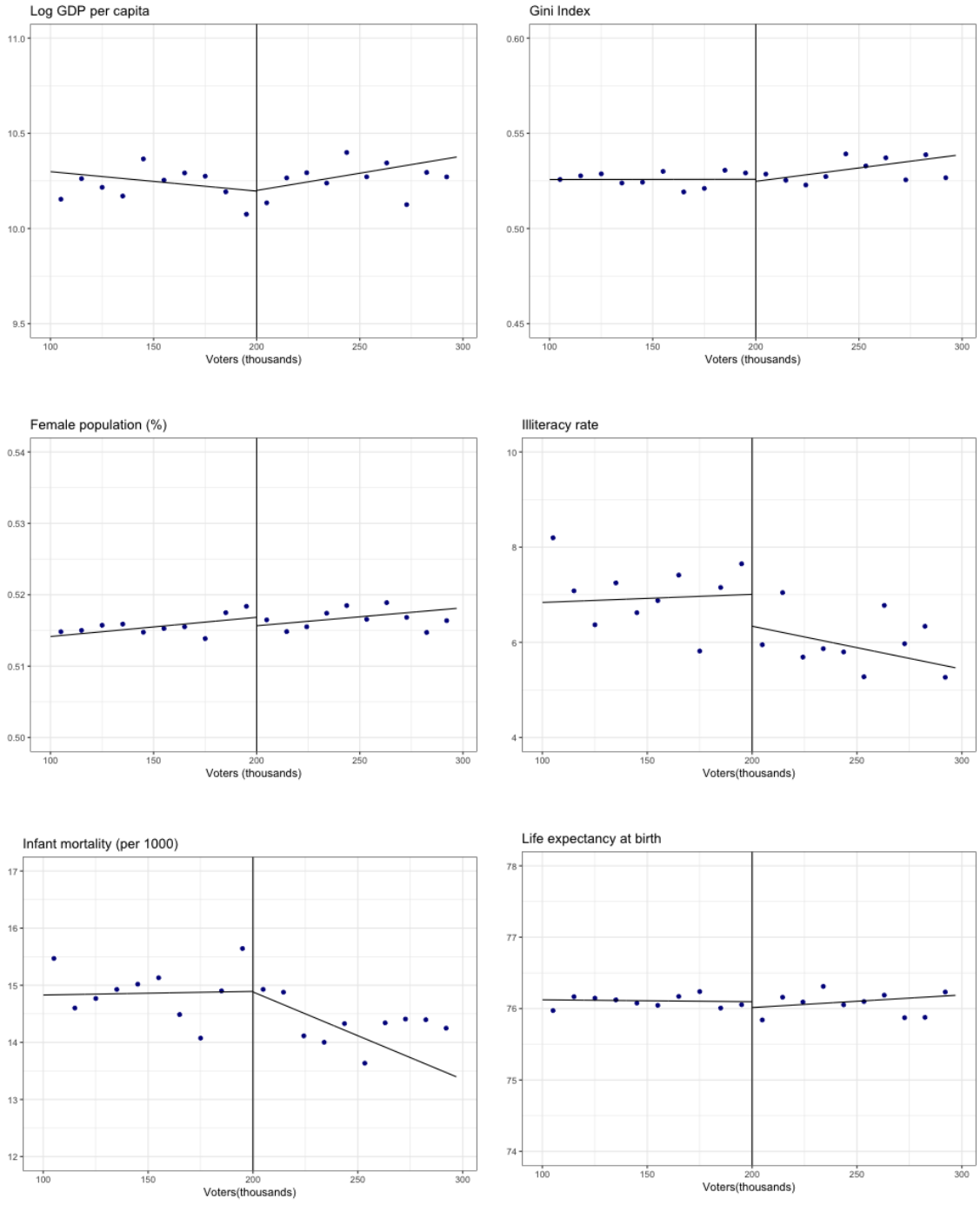


Figure 1: Municipal characteristics

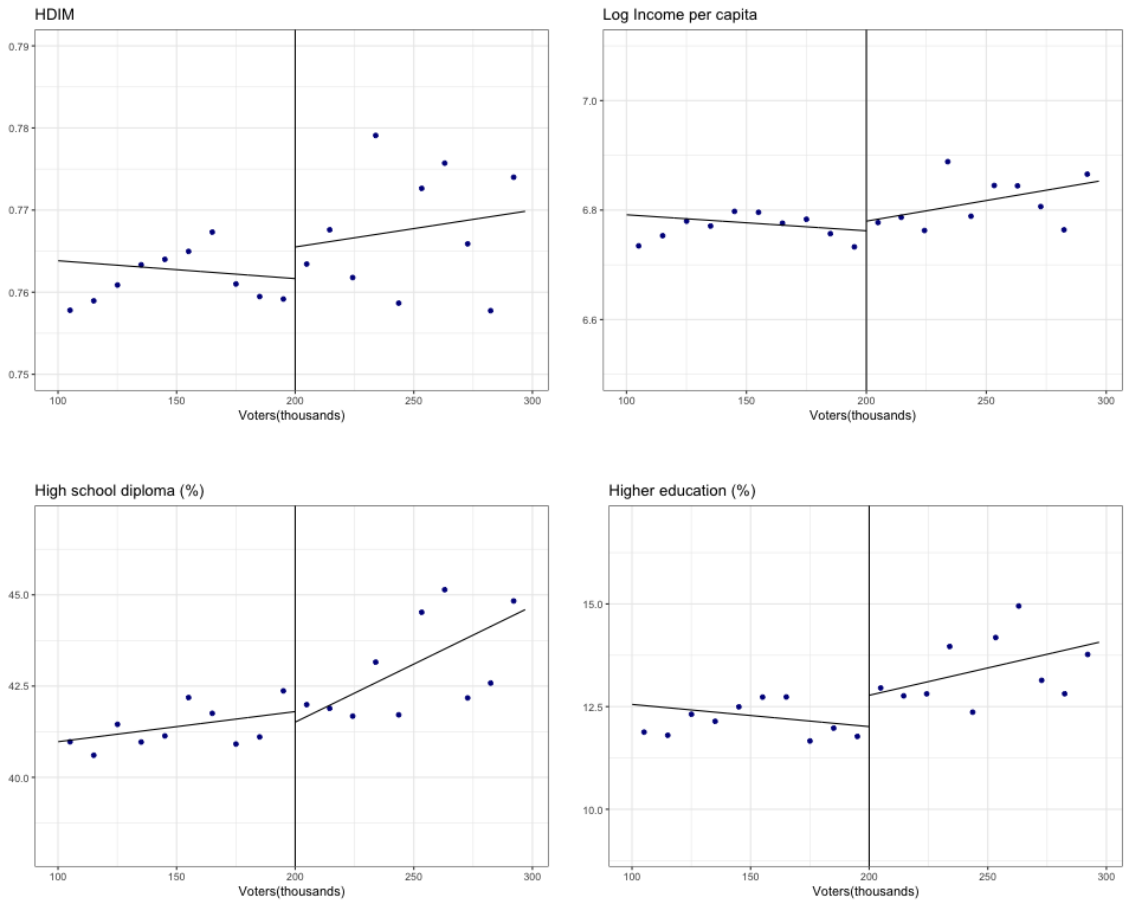


Figure 2: Municipal characteristics

Table 1: Summary statistics - Municipal characteristics

	(1) Above	(2) Below	(3) RD t-stat
Log(GDP per capita)	10.084	9.978	0.0760
	(0.631)	(0.644)	(0.212)
Gini index	0.514	0.502	0.00901
	(0.046)	(0.050)	(0.0106)
Female population (%)	0.515	0.512	-0.000258
	(0.008)	(0.008)	(0.00190)
Illiteracy_rate	5.201	6.837	-0.305
	(2.713)	(4.393)	(0.911)
Infant mortality	13.594	14.160	0.143
	(2.492)	(3.321)	(0.841)
Life expectancy	75.622	75.306	0.0480
	(1.283)	(1.569)	(0.385)
Income per capita	884.822	772.974	58.04
	(281.434)	(242.808)	(82.01)
HDI-M[1]	0.759	0.741	0.00625
	(0.036)	(0.042)	(0.0125)
High school (%)	41.912	38.151	0.117
	(6.725)	(6.995)	(1.973)
Higher education(%)	12.693	10.195	1.701
	(5.204)	(4.723)	(1.770)
Observations	113	288	401

1: HDI-M stands for Human Development Index at the municipal level, and takes into account longevity, education and income indicators.

Notes: Standard errors in parenthesis in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Municipal characteristics are obtained from the national Census (2010), with the exception of HDI-M, which is calculated by the UNDP Brazil and Ipea, and the GDP per capita, which is obtained from GDP yearly series and population estimates provided by the IBGE for municipalities.

Table 2: Summary statistics - Political competition and fiscal variables

	(1) Above	(2) Below	(3) Avg. difference
Number of candidades	7.009	5.021	-1.988
	(2.355)	(2.053)	(0.238)
			***
Effective number of candidates	2.720	2.642	-0.078
	(0.854)	(0.889)	(0.098)
Share of third and lower	19.772	17.121	-2.651
	(12.970)	(13.770)	(1.504)
Current expenditures (%)	0.874	0.878	0.004
	(0.051)	(0.048)	(0.005)
Payroll expenditures (%)	0.460	0.473	0.013
	(0.068)	(0.064)	(0.007)
Investment (%)	0.107	0.101	-0.006
	(0.051)	(0.049)	(0.005)
Observations	113	288	401

Notes: Standard errors in parenthesis in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Political variables are obtained from the *TSE* dataset and aggregated at the municipal level. Fiscal data is compiled from the Siconfi system of the *STN*.

4 Empirical Strategy

The identification strategy in this paper exploits the discontinuous Constitutional rule that determines the eligibility to a runoff election. The existence of a voter threshold allows for a source of exogenous variation in electoral rules. Ideally, we would like to estimate:

$$E[Y_i(1) \,|\, V \geq 200,000] - E[Y_i(0) \,|\, V < 200,000] \tag{1}$$

where $Y_i(1)$ and $Y_i(0)$ are the potential outcomes under runoff and single-round elections for the same municipality i. For each municipality, however, we can only observe one outcome. Under the assumption of continuity of potential outcomes at the voter threshold, the local average treatment effect is given by:

$$lim_{V \to V^+} E[Y_i(0) \,|\, V \geq 200,000] = lim_{V \to V^-} E[Y_i(0) \,|\, V < 200,000] \tag{2}$$

That is, for municipalities right below and right above the threshold, we do not expect other characteristics to be systematically different besides the runoff system.

The validity of the identifying assumption requires that municipalities are not able to manipulate voting registration and sort around the threshold. In the robustness checks section, we verify this condition by analyzing density differences in the running variable (McCrary 2008).

Following the model developed Chamon et al (2019), we would like to estimate:

$$Y_{it} = \beta_o + \beta_1 \, E[Pol\_Comp]_{it} + \Phi(Voters) + \delta \, X + \tau_t + u_i \tag{3}$$

Where Y_{it} corresponds to the fiscal policy outcome for municipality i in year t, and $E[Pol\_Comp]$ is the level of expected political competition. The variable X is a vector of covariates, τ represents controls for years, and u is an idiosyncratic error term. The variable Φ is a function of the electorate size, and two different specifications are used in the regressions: a first-order polynomial, including an interaction with the $Voter\_200$ dummy, and a second-order polynomial.

It is reasonable to suppose that the level of political competition expected by incumbents would influence policy decisions over the administration cycle. However, because this expectation is not observable, we use the actual realized level of political competition as a proxy.

$$E[Pol\_Comp_{it}] = Pol\_Comp_{it} + \eta_i \tag{4}$$

Because of the endogeneity of political competition, we use the eligibility for a runoff election as an instrument for political competition. Therefore, we include a dummy that is equal to one if the municipality has two hundred thousand or more voters to proxy for the level of political competition that is expected by the incumbent in the next electoral cycle. In this way, the first-stage regression is:

$$Pol\_Comp_{it} = \alpha_0 + \alpha_1 Voter\_200it + \Phi(Voters) + \tau_t + \epsilon_i \tag{5}$$

The dummy $Voter\_200$ indicates eligibility for a runoff in Brazilian municipalities. From equations 3 and 5, we have the following reduced form:

$$Y_i = \gamma_o + \gamma_1 Dummy200_{it} + \Phi(Voters) + \delta X + \tau_t + \epsilon_i \tag{6}$$

The discontinuity strategy used is of the *fuzzy* type, where the eligibility for a second round election is an instrument for political competition. The identification assumption is that crossing the voter threshold only affects policy outcomes through the presence of runoff elections. This exogeneity restriction can never be tested. However, the inspection of other electoral rules and policies informs that no other instutional changes occur around the same threhshold. In particular, as discussed in Fujiwara (2011) and Chamon et al (2019), there is no discontinuity in the rules regarding transfers received from the federal government, which are the main national policy determined by municipal size.

The theoretical rationale discussed by Chamon et al (2019) for the model presented above is that runoff elections affect the probability of sincere voting as opposed to strategic

voting. This, in turn, can influence the expectation of political competition. Finally, expected political competition can change policy decisions. In particular, higher electoral competition can mean that incumbents will have to send a stronger signal of their quality to voters.

5 Results

5.1 Effects on political competition

Table 3 presents the effects of runoff eligibility on the level of political competition in municipalities, estimated according to regression 5. The dependent variable in columns (1) and (2) is the log number of effective candidates, and in columns (3) and (4) is the share of votes of the third and lower-placed candidates.

The regressions show that the eligibility for a dual ballot is associated to a lower level of political competition in first round municipal races. The effects, however, are not statistically significant. This result is somewhat surprising, considering it has the opposite direction of that found in Fujiwara (2011) and Chamon et al (2019) with respect to dual ballot in the 1996-2004 election races.

Table 3: Political competition

	(1) Effective candidates	(2) Effective candidates	(3) Share lower-placed	(4) Share lower-placed
voter_200	-0.0504	-0.0607	0.0142	-0.312
	(-0.89)	(-1.06)	(0.01)	(-0.14)
Year dummies	Yes	Yes	Yes	Yes
Polynomial	Yes	No	Yes	No
Linear interacted with dummy	No	Yes	No	Yes
Observations	401	401	401	401
Adjusted R^2	0.053	0.053	0.066	0.066

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered at the state level and all regressions include year factor variables.

When analyzing the sub-sample of races in which mayor candidates were eligible to reelection, the effects found are stronger and statistically significant. Table 4 shows that crossing the threshold is associated to a decrease in both measures of political competition, and all coefficients are significant at the 5% level. The number of effective candidates decreases by up to 20% and the share of votes received by third and lower placed candidates decreases by around 9 percentage points.

Table 4: Political competition: reelection races

	(1) Effective candidates	(2) Effective candidates	(3) Share lower-placed	(4) Share lower-placed
voter_200	-0.208**	-0.219**	-8.867**	-9.093**
	(-2.54)	(-2.82)	(-2.55)	(-2.64)
Year dummies	Yes	Yes	Yes	Yes
Polynomial	Yes	No	Yes	No
Linear interacted with dummy	No	Yes	No	Yes
Observations	150	150	150	150
Adjusted R^2	0.095	0.094	0.110	0.114

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered at the state level and all regressions include year factor variables.

The change in signals and the non statistical significance of the coefficient in the first set of regressions signalizes that there might be heterogeneous effects operating for each subset of election races. In this way, we also run the regression separately for the group of elections in which there was no mayor running for reelection. This includes all municipalities not present in the reelection sub-sample.

Table 5 shows that the effect of runoff eligibility on political competition is positive for the non-reelection races. While the increase in the effective number of candidates is not statistically significant, the coefficient in the regression for the share of votes attributed to third and lower-placed candidates is statistically significant at the 1% level. It indicates an increase of 6.2 to 6.7 percentage points. Therefore, in races where a mayor is not running for reelection, the possibility of a runoff increases political competition as proxied by the

vote shares of candidates other than the first and second-placed.

Table 5: Political competition: non-reelection races

	(1) Effective candidates	(2) Effective candidates	(3) Share lower-placed	(4) Share lower-placed
voter_200	0.0723	0.0605	6.654***	6.183***
	(1.28)	(1.04)	(3.52)	(3.00)
Year dummies	Yes	Yes	Yes	Yes
Polynomial	Yes	No	Yes	No
Linear interacted with dummy	No	Yes	No	Yes
Observations	251	251	251	251
Adjusted R^2	0.034	0.032	0.050	0.048

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered at the state level and all regressions include year factor variables.

5.2 Effects on fiscal expenditures

The effects found for electoral competition indicate that crossing the threshold for runoff election eligibility is associated with lower levels of political competition in races where a mayor is running for reelection. In non-reelection races, however, the effect of runoff eligibility over political competition is positive, in consistence with results found in Chamon et al (2019). Thus, there seems to be evidence that crossing the threshold may produce heterogeneous effects according to the endogenous presence of an incumbent mayor in the race. For this reason, we proceed with the analysis of fiscal outcomes in separate sub-samples as well.

According to the model described in Chamon et al (2019), if the voter threshold discontinuity does not produce higher levels of political competition, the quasi-random assignment should not be associated to improvement in fiscal policy outcomes. Table 4 displays the results for the reduced-form regressions associated to the share of payroll expenditures and the share of investment in total expenditures, aggregated over the administration cycle, for the sub-sample of reelection races. The regressions are the same

as those displayed in Table 3, except for the dependent variable. The coefficient for the 200,000 voters dummy indicates that the effect of dual ballot eligibility is roughly to lower payroll share in expenditures by almost 2 percentage points, but it is not statistically significant. For investment as a percentage of expenditures, the coefficient indicates an increase of 0.3 percentage points but it is also not statistically significant.

This means that, in municipalities where mayors were subsequently running for reelection and a runoff election was possible, although marginally lower share of payroll expenditure and higher investment expenditures are present, the difference is not statistically significant with respect to those municipalities not eligible to a runoff election.

Table 7 reproduces the analysis for the sub-sample of election races where the mayor was not running for reelection. While signals are opposite to those in the first sub-sample, the coefficients are not statistically significant either. The possibility of a runoff mayor election does not seem to be associated to discontinuous changes in fiscal policy.

Table 6: Fiscal policy outcomes - reelection sample

	(1) Share Payroll	(2) Share Payroll	(3) Share Investment	(4) Share Investment
voter_200	-1.760	-1.710	0.273	0.310
	(1.600)	(1.533)	(1.677)	(1.696)
Year dummies	Yes	Yes	Yes	Yes
Polynomial	Yes	No	Yes	No
Linear interacted with dummy	No	Yes	No	Yes
Observations	150	150	150	150
Adjusted R^2	0.165	0.165	0.216	0.216

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered at the state level and all regressions include year factor variables.

Table 7: Fiscal policy outcomes - non-reelection sample

	(1) Share Payroll	(2) Share Payroll	(3) Share Investment	(4) Share Investment
voter_200	0.504	0.422	-0.00643	-0.0182
	(1.893)	(1.733)	(1.127)	(1.096)
Year dummies	Yes	Yes	Yes	Yes
Polynomial	Yes	No	Yes	No
Linear interacted with dummy	No	Yes	No	Yes
Observations	251	251	251	251
Adjusted R^2	0.195	0.197	0.220	0.220

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered at the state level and all regressions include year factor variables.

Finally, we present the instrumental variable Regression Discontinuity approach, where the voter threshold is used as an instrument for political competition, as proxied by the share of votes attributed to third and lower placed candidates. As we have seen in Tables 4 and 5, the instrument yields a significant first-stage. However, as the low reduced-form effects seemed to indicate, the exogenous change in political competition as instrumented by the runoff rule does not have a significant effect over fiscal policy results, as shown in columns (1) and (2) of Table 8.

Table 8: Instrumental Variable - RDD

	(1) Share Payroll	(2) Share Investment
Panel A: Reelection races		
Share of third and lower	0.188	-0.0350
	(0.153)	(0.214)
Observations	150	150
Panel B: Non-reelection races		
Share of third and lower	0.0683	-0.0645
	(0.265)	(0.125)
Observations	251	251

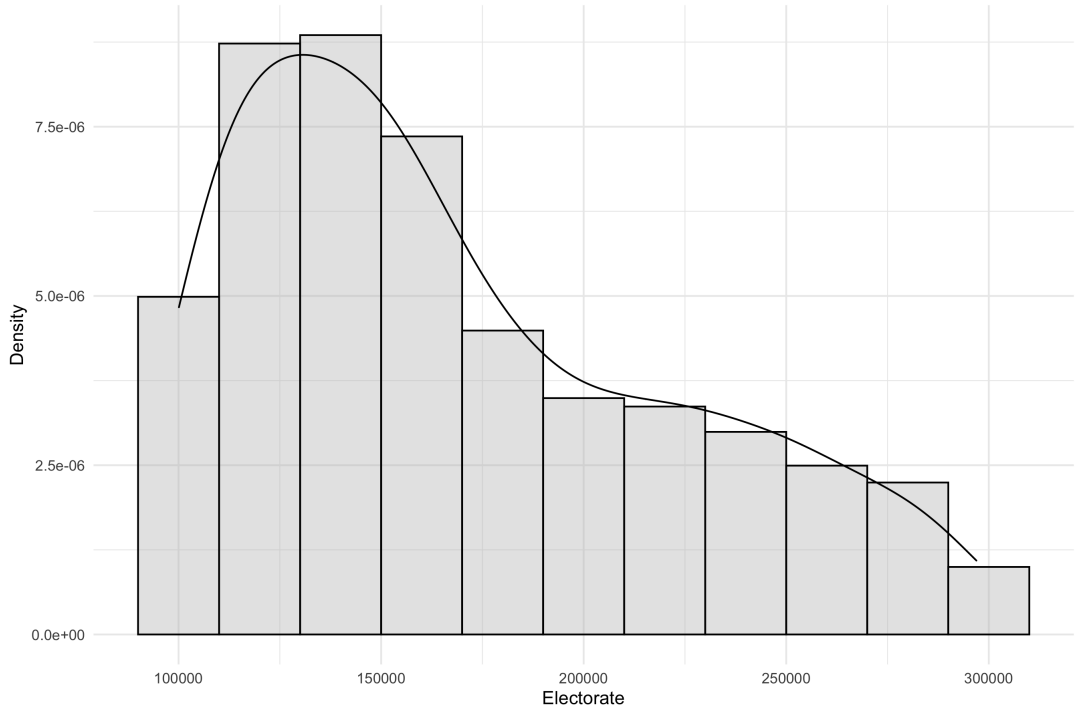
Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors clustered at the state level and all regressions include year factor variables.

5.3 Robustness checks

The validity of the regression discontinuity strategy depends on the absence of manipulation around the threshold, as discussed in the previous sections. Figure 3 shows no evident discontinuity in the density of voters around 200,000. I formally test for this condition using the procedure described in McCrary (2008), based on a non-parametric local polynomial estimator, as well as the manipulation test developed in Cattaneo, Jansson, and Ma (2017b), involving a novel local-polynomial density estimator that does not require previous binning of the data and exhibits power improvements in comparison to other manipulation tests.[5] Figure 6 shows the results of the density continuity tests. In both cases, we fail to reject the null hypothesis that there is no manipulation of the density of number of voters. Therefore, there is no evidence of discontinuity of the running variable and sorting around the threshold.

Figure 3: Density of Electorate Size



[5]For the specifics of the manipulation test and its implementation, see Cattaneo, Jansson, and Ma (2017b; 2018).

Furthermore, due to its local empirical strategy, the regression discontinuity specification should not be sensitive to the exclusion of covariates, as discussed in Imbens and Lemieux (2008). Tables 9 and 10 in the Appendix show that estimated effects are not sensitive to the exclusion of the covariates vector. Coefficient point estimates are virtually unchanged and there is no loss of statistical significance.

Another robustness check performed is the treatment of outliers. Tables 11 and 12 present the political competition regressions with the dependent variable winsorized at the 5%-95% level.[6] The coefficients after outlier treatment are smaller in magnitude but otherwise similar to those found in the regressions for the untreated sample, and there is an increase in statistical significance across all specifications. Therefore, the significant results found for the effect of runoff eligibility over political competition do not seem to be driven by outliers.

As a further robustness test, the regressions for political competition are re-run restricting observations to smaller bandwidths around the discontinuity. Tables 13 and 14 show that coefficient point estimates and their signals are consistent with the wider bandwidth specification. The reduction in statistical significance for some regressions in the reelection sub-sample can be explained by the very limited number of observations. For the non-reelection sub-sample, coefficients remain statistically significant at the 5% level, and the positive effect of runoff eligibility over political competition is actually stronger for the tighter bandwidth.

Finally, I perform falsification tests using a placebo discontinuity, replacing the true cutoff value at 200,000 by a different value at which the runoff rule does not actually change. The procedure is repeated twice for two different artificial discontinuities: at 150,000 and 250,000. To avoid contamination due to the actual treatment effects, for the 150,000 placebo we use only observations below the true runoff cutoff; for the placebo cutoff above the true threshold we restrict observations to those above the runoff eligibility (Cattaneo et al, 2020). Because continuity away from the cutoff is expected, the presence of discontinuities at placebo thresholds could cast doubt on the validity of the regression

[6]The choice of winsorizing procedure as opposed to trimmming is due to the already limited number of observations in the sample.

discontinuity design. Tables 15 and 16 show that no significant effects over political competition are found at neither of the placebo cutoffs, for reelection or non-reelection sub-samples, which provides further confidence in the validity of the empirical strategy and the results.

5.4 Discussion

In light of the difference between the results found in this paper and outcomes observed in the previous works of Fujiwara (2011) and Chamon et al (2019), we discuss some features of the model for political competition, which assumes that the eligibility of a municipality for a runoff election alters the behavior of voters. The principal mechanism proposed by the authors for the rise in political competition is the fact that the dual ballot rule increases the probability of sincere voting as opposed to strategic voting, which in turn would result in more candidates choosing to run in the first round of election.

The fact that higher levels of political competition were not present for the *reelection* sample analyzed in this paper may indicate that this mechanism is not operating for the more recent municipal elections in Brazil. With the presence of incumbents in the election, the possibility of a runoff does not seem like a strong enough incentive for voters to behave sincerely in first round elections, as opposed to strategically.

Rather, there seems to be some sort of endogenous behavior in the races where incumbents are running for reelection, that results in lower levels of political competition. This is an interesting finding because it suggests, in this setting, an undesirable effect of the reelection rule - the reduction of political competition levels. In municipalities where there were no incumbents running for reelection, on the other hand, political competition seems to be stimulated by the potential presence of a runoff. Third and lower-placed candidates have higher share of votes by almost 7 percentage points.

One possible explanation for the pattern observed in races with reelection-running mayors is the presence of incumbency advantage. The logic is that, in municipalities where a second round can happen and a current mayor is up for reelection, potential candidates perceive that higher levels of effort and stronger political campaigns are required. This

explanation is consistent with the fact that, when a runoff happens, there is a longer election period, with attention focused only on two candidates.

By raising the threshold for victory, the dual ballot rule may discourage candidates from smaller parties and non-political careers from running against incumbents, more so if they anticipate that voters can behave strategically and rally behind top two candidates. The decrease in vote shares attributed to third and lower-placed candidates suggests that they do, at least in relative terms. However, developing an alternative model for political competition and costs of entry, taking into account this novel approach to reelection and runoff eligibility, is beyond the scope of this paper. It remains, though, an interesting possibility for future research.

In both cases, with increases in political competition or not, fiscal policy outcomes do not to be significantly affected by political competition. We conclude that there is little evidence that political competition as instrumented by the dual-ballot produced differences in fiscal policy for the more recent subset of municipal races.

The set of outcomes analyzed in this paper, however, is only a particular group of measures of welfare and performance, and different set of policy outcomes can be put forward by future research. In addition, as discussed in previous sections, the effects found are restricted to the vicinity of the 200,000 voter threshold by construction. Therefore, any extension of these results to the broader universe of municipalities in the country is to be made with caution.

Overall, the results indicate there are significant changes in political competition induced by the exogenous runoff rule, and an interesting divergence is observed between two subsets of municipal races, according to the presence of a mayor running for reelection. This suggests a complex interaction between reelection rules, second-round elections and ultimately the behavior of voters.

While the development of an alternative model of entry costs of political participation and its effects on policy outcomes is outside the scope of this paper, this is also an interesting perspective for future research. It is increasingly important to understand how and in which measure electoral rules can influence political competition levels and

contribute to the quality of governments. In a decentralized, federalist and continental country such as Brazil, this issue is critical, especially considering the growth of municipalities' participation in public policy since 1988.

6 Conclusion

This paper exploits a discontinuity strategy to analyze the effects of runoff election eligibility over political competitions and fiscal policy outcomes at the local level. Adding to previous works that explore this design for municipal elections in Brazil, we find evidence of heterogeneous effects of such threshold over political competition, regarding the municipal elections occurred between 2008-2016.

While no differential fiscal policy outcomes are found for this sample, there are significant changes in measures of political competition. Interestingly, coefficients associated to the runoff discontinuity have opposite signals according to the presence or absence of a current mayor running for reelection. In the reelection sub-sample, crossing the runoff eligibility threshold decreases the number of effective candidates by 20-22% and reduces the share of votes of third and lower-placed candidates by 8.5-9 percentage points. In the non-reelection sub-sample, runoff eligibility increases the share of votes attributed to lower-placed candidates by 6.2 to 6.8 percentage points.

The presence of heterogeneous effects creates an interesting perspective for future research, as it suggests an intricate interaction between multiple political rules and electoral outcomes. The results add to the political economy literature, resonating, in particular, with recent works that explore second-round elections and voter incentives. It finds support for the hypothesis that the dual-ballot rule *per se* may not constitute an incentive to political competition and sincere voting behavior, creating different incentives to strategic behavior which interact with other electoral rules and the particular institutional context.

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8 Appendix

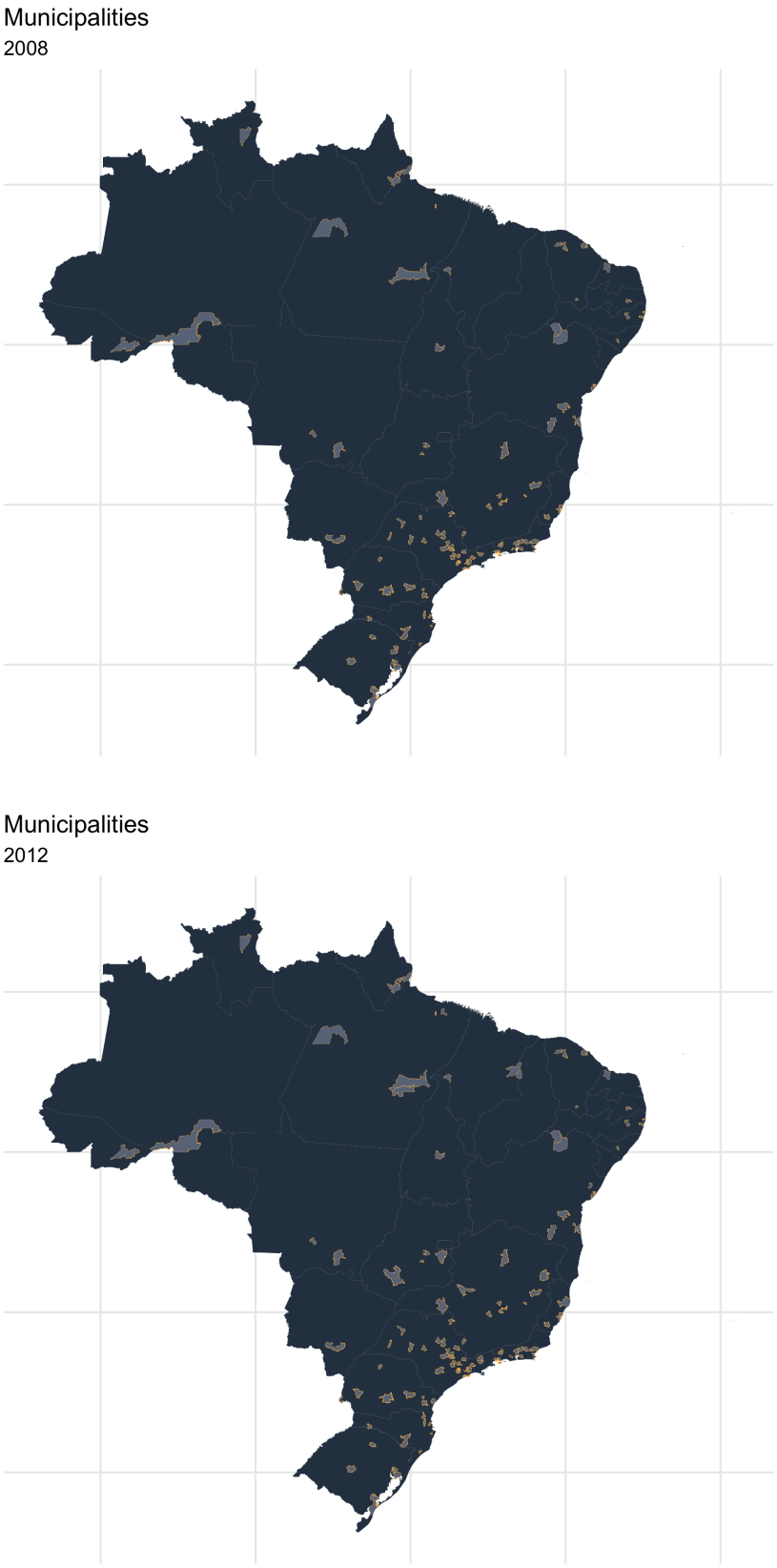


Figure 4: Municipalities in the sample

Figure 5: Municipalities in the sample

Table 9: Political Competition - covariates excluded

	(1) Effective candidates	(2) Effective candidates	(3) Share lower-placed	(4) Share lower-placed
voter_200	-0.208**	-0.221**	-8.504**	-8.774**
	(0.0878)	(0.0831)	(3.638)	(3.584)
Year dummies	Yes	Yes	Yes	Yes
Polynomial	Yes	No	Yes	No
Linear interacted with dummy	No	Yes	No	Yes
Observations	150	150	150	150
Adjusted R^2	0.095	0.094	0.110	0.114

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered at the state level and all regressions include year factor variables.

Table 10: Political Competition, non-reelection - covariates excluded

	(1) Effective candidates	(2) Effective candidates	(3) Share lower-placed	(4) Share lower-placed
voter_200	0.0767	0.0641	6.763***	6.271***
	(0.0536)	(0.0553)	(1.874)	(2.018)
Year dummies	Yes	Yes	Yes	Yes
Polynomial	Yes	No	Yes	No
Linear interacted with dummy	No	Yes	No	Yes
Observations	251	251	251	251
Adjusted R^2	0.034	0.032	0.055	0.054

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered at the state level and all regressions include year factor variables.

Table 11: Political Competition - Winsorized - reelection sample

	(1) Effective candidates	(2) Effective candidates	(3) Share lower-placed	(4) Share lower-placed
voter_200	-0.162**	-0.169**	-7.595**	-7.841***
	(0.0655)	(0.0624)	(2.709)	(2.660)
Year dummies	Yes	Yes	Yes	Yes
Polynomial	Yes	No	Yes	No
Linear interacted with dummy	No	Yes	No	Yes
Observations	150	150	150	150
Adjusted R^2	0.091	0.092	0.135	0.138

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered at the state level and all regressions include year factor variables.
Dependent variables winsorized at the 5% and 95% percentiles

Table 12: Political Competition - Winsorized - non-reelection sample

	(1) Effective candidates	(2) Effective candidates	(3) Share lower-placed	(4) Share lower-placed
voter_200	0.0902*	0.0780	6.802***	6.344***
	(0.0481)	(0.0506)	(1.853)	(2.017)
Year dummies	Yes	Yes	Yes	Yes
Polynomial	Yes	No	Yes	No
Linear interacted with dummy	No	Yes	No	Yes
Observations	251	251	251	251
Adjusted R^2	0.035	0.033	0.051	0.050

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered at the state level and all regressions include year factor variables.
Dependent variables winsorized at the 5% and 95% percentiles

Table 13: Political Competition - smaller bandwidth - reelection

	(1) Effective candidates	(2) Effective candidates	(3) Share lower-placed	(4) Share lower-placed
Panel A: 125,000 - 275,000 voters				
voter_200	-0.191	-0.203	-9.766*	-10.36*
	(-1.48)	(-1.54)	(-1.95)	(-2.00)
Observations	118	118	118	118
Panel B: 150,000 - 250,000 voters				
voter_200	-0.195	-0.191	-10.66*	-10.57*
	(-1.38)	(-1.37)	(-2.01)	(-2.04)
Observations	71	71	71	71

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors clustered at the state level and all regressions include year factor variables.

Columns (1) and (3) include a second-order polynomial specification, while columns (2) and (4) include a first-order linear specification, with an interaction between the number of voters and the dummy variable for 200,000 or more voters.

Table 14: Political Competition - smaller bandwidth - non-reelection

	(1) Effective candidates	(2) Effective candidates	(3) Share lower-placed	(4) Share lower-placed
Panel A: 175,000 - 275,000 voters				
voter_200	0.0661	0.0647	6.454***	6.410***
	(1.08)	(1.11)	(2.88)	(2.94)
Observations	166	166	166	166
Panel B: 150,000 - 250,000 voters				
voter_200	0.249**	0.240**	11.64**	11.57**
	(2.56)	(2.58)	(2.56)	(2.59)
Observations	103	103	103	103

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors clustered at the state level and all regressions include year factor variables.

Columns (1) and (3) include a second-order polynomial specification, while columns (2) and (4) include a first-order linear specification, with an interaction between the number of voters and the dummy variable for 200,000 or more voters.

Table 15: Placebo tests - reelection sample

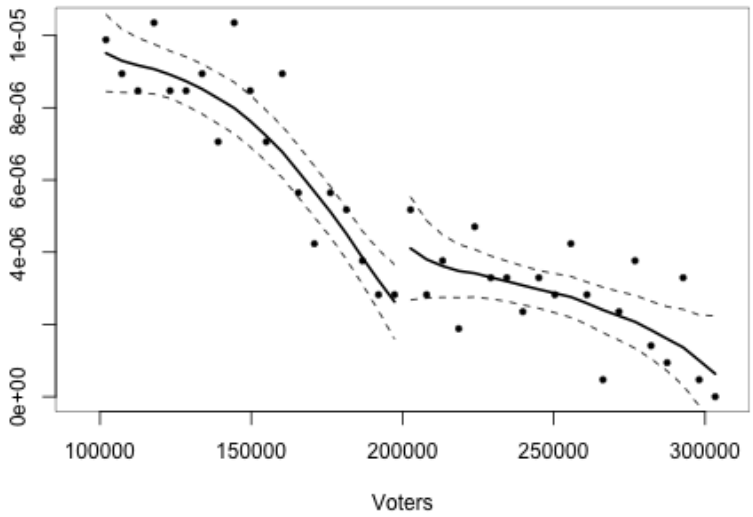
	(1) Effective candidates	(2) Effective candidates	(3) Share lower-placed	(4) Share lower-placed
Panel A: 150,000 placebo				
voter_150	0.217	0.216	9.740	9.966
	(0.124)	(0.128)	(5.809)	(5.779)
Observations	111	111	111	111
Panel B: 250,000 placebo				
voter_250	-0.114	-0.124	-1.363	-2.010
	(0.167)	(0.170)	(6.523)	(6.498)
Observations	39	39	39	39

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered at the state level and all regressions include year factor variables.

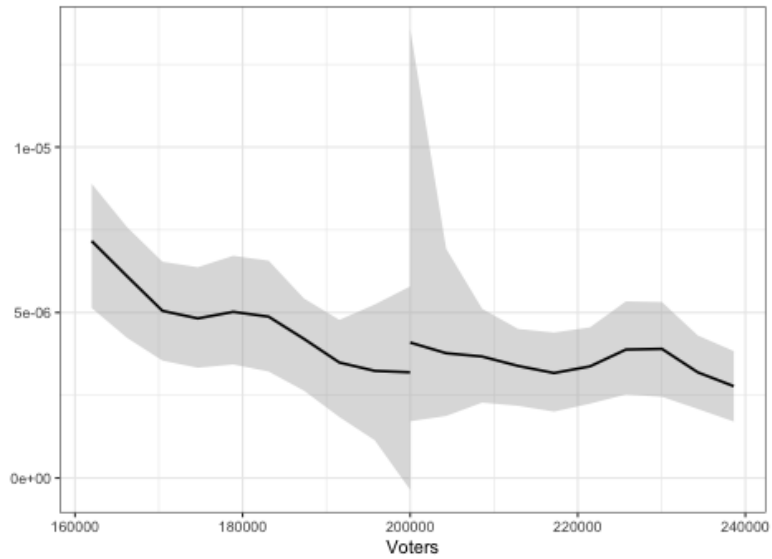
Table 16: Placebo tests - non-reelection sample

	(1) Effective candidates	(2) Effective candidates	(3) Share lower-placed	(4) Share lower-placed
Panel A: 150,000 placebo				
voter_150	0.0157	0.0145	-0.0567	-0.0401
	(0.0557)	(0.0582)	(2.137)	(2.152)
Observations	177	177	177	177
Panel B: 250,000 placebo				
voter_250	0.263	0.264	3.543	3.582
	(0.198)	(0.199)	(7.760)	(7.717)
Observations	74	74	74	74

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Standard errors clustered at the state level and all regressions include year factor variables.



(a): McCrary (2008)



(b): Cattaneo et al (2018)

Figure 6: Density Manipulation tests

Notes: Associated p-value of tests (a) and (b) are 0.146 and 0.156. In both cases we do not reject the null hypothesis of density continuity at the cutoff. Density estimates at the threshold are near and the 95% confidence intervals overlap.