Universidad de San Andrés
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Licenciatura en Economía

Covid-19 & the 2020 Brazilian Municipal Elections

Heterogenous effects of the fight against the pandemic on incumbency advantage using regression discontinuity designs

Abstract: This thesis explores the impact of the fight against the Covid-19 pandemic on incumbency advantage in the 2020 Brazilian municipal elections. We propose regression discontinuity models for more than 5,000 municipalities in Brazil to estimate the incumbency effect, drawing from methodologies used in Brazilian municipal and U.S. congressional elections and then model the interactions of the health variables on the treatment effect. Despite the unprecedented circumstances, our results show no significant impact on incumbency advantage and no impact of health variables on incumbency.

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1. Introduction

As it happened almost everywhere in the world, elections in Brazil on 2020 were, to say the least, atypical. Local municipal elections are held every four years in Brazil and take place on a different day from general elections (presidents, state governors, national and state legislators). Municipal executives for cities with under 200,000 voters are elected by a simple majority rule with the winner being the candidate with the most votes. Also, elections in Brazil are compulsory and around 147 million voters were expected to vote on the 2020 municipal elections.

Given the global pandemic, added to the already complicated task of ensuring clean elections in one of the world's biggest democracies the TSE (Tribunal Superior Eleitoral) had to also look out for voter's health. In Brazil, the Superior Electoral Court (TSE) is part of the judicial branch, serves as both the electoral management body (EMB) and the electoral justice authority, issuing rules and regulations for electoral processes, while also adjudicating disputes at both federal and state levels through Regional Electoral Courts (TREs). The TSE is an independent, non-partisan, and highly professionalized EMB (Tarouco, 2021).

Surges in infections unfolded at different rates, timings, and intensities across the region, and there was a lack of coordination in implementing public health measures. Special voting arrangements, such as postal voting, early voting, or online voting, which were adopted in some other countries, were not feasible in the short term. A proposal to extend the duration of voting days was quickly dismissed, and similar options were not even subject to discussion.

Given this context several ideas were proposed, keep the original dates, postpone the elections to 2022 and postpone the elections for later in 2020. It is worth noting that the election dates are regulated by the Constitution and any postponements are held to congressional approval, the TSE does not have the final word on this matter, though their recommendations are taken into account. The first option fell through because it was strongly discouraged by Brazilian health authorities. The second option (which would mean adding two more years to sitting municipal executive authorities) was presented to the Senate on March but was widely rejected. Finally, after the TSE consulted with health authorities and epidemiologists predicted that by November the amount of cases would have lowered and if a second wave were to come it would not be as high, Congress issued an amendment to postpone elections to November of the same year. (Tarouco, 2021)

In the end, Congress and the TSE established that elections that were supposed to take place on October 4th (the second round, for those municipalities with more than 200,000 voters, was to take place on October 25th) were to be postponed. The new dates were November 15th and November 29th respectively. In light of this atypical electoral context we set out to investigate if the fight against the pandemic had had an effect on the incumbency advantage (or disadvantage) for the 2020 election. Our results show a non-significant disadvantage for incumbents and no observed heterogeneous effects of health variables on incumbency advantage. To achieve this we first had to do a contribution to incumbency advantage studies in Brazil where by drawing on methodologies implemented for both Brazil municipal elections and U.S. congress elections we estimated the incumbency advantage effect for the 2020 election. We propose several models all at the candidate level and argue in favour of what the literature indicates is the most appropriate for Brazil. We then look at the interaction between our Covid-19 variables and the treatment assignment variable to see if the fight against the pandemic had affected that incumbency.

The structure of this thesis is as follows. First, we dive into the literature on both overall studies on incumbency advantage and then narrow it down to developing economies and Brazil in particular. We then propose several regression discontinuity models (RD) to see the incumbency effects on the 2020 Brazilian municipal elections. After that we do several models to study how the results of the fight against the pandemic could have heterogenic effects incumbency advantage. In the results section we discuss all the proposed models and give our reasoning as to why some of them are not suitable in the context of institutional instability we also propose possible limitations. Lastly, we do the typical robustness checks for RD studies.

2. Literature Review

2.1 On incumbency advantage

The academic history of electoral advantage for incumbents running for re-election is extensive. If we focus on developed economies, with strong party systems and institutions it seems intuitive that those in office might enjoy an influence that would allow them to maintain their position. This idea is by no means a new thought, Alexander Hamilton, arguing in favour of the possibility for re-election stated, "There are few men who would not feel much less zeal in the discharge of a duty when they were conscious that the advantages of the station with which it was connected must be relinquished at a determinate period, than when they were permitted to entertain a hope of obtaining, by meriting, a continuance to them" (Hamilton, Madison and Jay, 1788, art. 72). From then to now scholars have entertained this idea thoroughly and it is the general consensus that there is in fact an advantage for candidates holding office in developed economies. A staggering statistic is that in the past decades 90% of US legislators holding office have won their consequent election (Levit,1994).

Even though the topic was studied for decades, only relatively recently have the methodologies for the proper estimation of causality have been applied. Simple OLS applications are not a fit for this question. A positive coefficient (or even statistical significance) does not ensure a causal relationship between the holding of office and election outcomes. Mainly because of unobserved differences in candidate attributes that could correlate with becoming an incumbent in the first place. This means that instead of the simple fact of being incumbent causing an advantage (or disadvantage) in electoral outcome it is those attributes that got the incumbent candidate their station the reason for the observed *"causality"* (i.e., intelligence, charisma, etc.). To overcome this issue, recent literature has employed different methodologies such as focusing on repeated pairs of candidates difference-in-difference analyses and, most notably, the introduction of regression discontinuity designs (RDD) and using close elections as quasi-experimental random assignment to treatment and control for candidates. Lee (2008) established and outline for RDD by using data on U.S. congressional elections from 1946 to 1998, where he used vote margin as a running variable and established a cut-off in 0 and a threshold of ±5% around the cut-off. He found that candidates who barely won enjoyed a 7% advantage over those who barely lost in the subsequent election.

Using the success and theoretical framework developed by Lee, this approach started being used for different countries. However, contrary to intuition some of the results observed

were of a disadvantage to candidates holding office. Notably, Uppal (2008) replicated this analysis for Indian state legislative elections. Using data on state elections from 1975 to 2003, Uppal finds a larger negative effect of incumbency on the probability of re-election on the following election. From 1975 to 1990 incumbents were 15% more likely to lose their seats to non-incumbent candidates. These results exacerbate from 1991 onwards were Uppal observed a 22% disadvantage for incumbents. This and other studies on incumbency advantages in developing economies raised the question as to how to more thoroughly analyse causality in countries where candidate attrition is higher and were parties, party loyalty and institutions are weaker.

2.2 On incumbency advantage in Brazil

Studies for incumbency advantage in Brazil, similarly to studies on other developing economies, remain divided in their results. Methodologies as to how to properly estimate causality are still being proposed and previous attempts are continuously challenged particularly in the case of executive power offices and officials. However, Brazil is one of the largest democracies in the world and since 1997 the Brazilian Congress amended the previous constitution granting elected officials a chance for re-election. This amount of information allowed for several creative attempts to attack the incumbency advantage dilemma. Also, Samuels (2003) argues that municipal executive positions are relatively more appealing in Brazil since mayors enjoy more power in regard to budgets and public job allocations and introduction to higher offices in the executive branch.

The case for legislative officials is better understood. For example, Pereira and Reno (2007) found some historical evidence for Brazilian legislators, where since 1970 on average 68 percent of incumbents ran for re-election and on average 67 percent of all incumbents that ran for re-election maintained their position.

Since the amendment local elections have been held continuously every four years in more than five thousand municipalities. Some of the most notable attempts on executive incumbency advantage are in Klašnja and Titinuik (2017) were by using a RD design they attempted to estimate the effect of incumbency of parties on electoral outcomes. Relying on Lee's (2008) methodological framework and using data on mayoral elections from 2000 and 2004 their results show a significant negative effect on incumbency for the three largest parties of the country. In Klašnja and Titinuik (2017) they replicate this analysis for the 2000-2012 period and find a similar effect. When a party barely wins an election in period t they are 15%

less likely to win the election in t+1. Brambor and Ceneviva (2011) critique this analysis arguing that focusing on incumbency effects at a party level is not the proper way to estimate it since parties in Brazil enjoy little loyalty from voters as well as candidates. Brazil's institutional environment incentivizes politicians to seek a personal vote, they tend to adopt individualistic campaign strategies and often don't follow party characteristics or values (Samuels, 2002). For the 2000-2004 period there are 27 political parties in Brazil, 74 percent of all local candidates run on a coalition party platform and 14 percent of candidates switched political parties from one election to the other. Nonetheless, the estimation of the unconditional party incumbency advantage is a valid exercise and may help us understand how a political system works within a country.

De Magalhaes (2014) formalizes this critique and argues that for the sake of consistency, analysis in developing countries should be made at a candidate level and looking at the unconditional incumbency effects. Highlighting what Brambor and Ceneiva (2011) said for electoral institutions outside the US (weak parties, candidate-party loyalty and individualistic campaigns) he argues in favour of analysis at the individual level. Arguing in favour of using unconditional incumbency effects he states:

> "[…] the unconditional incumbency effects are preferred to the conditional effects, as they facilitate clear comparisons between countries and/or political systems. In the first instance, the unconditional effect can be estimated with RDD. This provides a clear identification strategy in most electoral systems without the need for context-specific assumptions and instrumental variables. In the second instance, focusing on unconditional effects gives clear meaning to statements such as: country A has a higher incumbency advantage than country B. If we attempt to compare countries using the conditional incumbency advantage, we eliminate at least one possible mechanism through which incumbency affects the probability of being elected in the next election: the effect of incumbency on the probability of rerunning.".

2.3 On political accountability in Brazil

In recent years, political economists have conducted studies examining the impact of various factors, such as fiscal policies, budgets, and cash transfer subsidies, on the likelihood of mayors being re-elected or their party's nominee winning as their successor. Meneguin and Bugarin (2001) and Meneguin, Bugarin, and Carvalho (2005) challenge the conclusions of the political budget literature. They investigate the relationship between fiscal policy performance and the re-election prospects of *Prefeitos*. Their studies suggest that re-elections may serve as a

mechanism to restrain government spending, which contrasts with the view that political cycles can lead to fiscal distortions and hinder public spending.

Ferraz and Finan (2008) use publicly released audit reports to study the effects of disclosing information about corruption practices on electoral accountability. They exploit a program that took place in 2003 when as part of an anticorruption program, Brazil's federal government began to select municipalities at random to audit their expenditures of federally transferred funds. They compare the electoral outcomes of municipalities audited before versus after the 2004 elections, with the same levels of reported corruption. Their results show that the release of the audit outcomes had a significant impact on incumbents' electoral performance, and that these effects were more pronounced in municipalities where local radio was present to divulge the information. Their study highlights the how politicians can be held accountable for their perceived corruption and the importance of an informed electorate.

3. The Data

Three main data sources were used for this thesis. The main data source comes from the TSE (*Tribunal Superior Eleitorial*) which provides information on the 2016 and 2020 executive officials municipal elections. It contains data for the 5,563 municipalities in Brazil and characteristics for the 28,298 candidates that run for the *Prefeito* (Mayor) position in both elections. At a candidate level it provided information on gender, marriage status, educational level (primary, secondary and tertiary) and job status. On election results it provided relevant information for winners, nominal votes obtained per candidate, total registered votes in the municipality, candidate name, vote percentage, candidate parties, and more. This main data source was used for defining our outcome and running variables for the different analysis we proposed. It also permitted generating control variables at a candidate level and given that it also provided information on total registered voters it also allowed for a sharp regression discontinuity design because as noted previously municipal mayoral elections for municipalities with less than 200,000 registered voters the election is decided by a simple majority rule. It also allowed us, as shown in *Table 1*, for a prelaminar analysis in the similarity between the overall sample and the closed election sample.

Table 1. Descriptive analysis of Brazilian candidates

	Overall sample			Sample of close elections		
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Gender	11,981	0.133	0.341	4,209	0.137	0.345
Occupation	11,983	279.677	244.239	4,201	277.039	236.709
Marriage status	11,983	3.1801	1.954	4,201	3.157	1.882
Education	11,983	6.729	1.599	4,201	6.693	1.619

Note: The sample for closed elections was made with the optimal bandwidth defined by the unconditional on running analysis (0.112)

To include control variables at the municipal level to capture the underlying differences in municipal characteristics we used several data surveys from the IBGE (*Instituto Brasileiro de Geografia e Estatística*) including information from the previous population census. By name matching and using the IBGE code (a specific code for each municipality) we managed to include information on illiteracy rates, Gini coefficients, per capita income, sewerage availability scores, potable water accessibility, electricity accessibility, television & radio

accessibility, active population, rural and urban population and more. All of these variables were used as control variables for the municipal level.

Table 2. Descriptive analysis of Brazilian municipalities

	Overall sample			Sample of close elections		
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Urban population (%)	14,020	63.587	21.544	5,098	60.683	21.144
Monthly income (pc)	15,162	440.373	198.107	5,279	417.982	192.403
Active population (%)	14,912	53.761	9.387	5,240	53.614	10.171
Access to electricity	14,912	86.723	17.539	5,240	85.727	17.797
Access to radio	14,912	80.886	14.697	5,240	80.318	15.075
Access to clean water	14,912	86.459	19.141	5,240	84.922	20.148
Access to sewage system	14,912	80.594	22.868	5,240	78.044	23.768
Gini coefficient (2000)	14,912	0.553	0.0821	5,240	0.551	0.086
GDP per capita	14,912	4336.188	5710.997	5,240	3892.205	4512.253
Literacy rate	14,912	80.361	13.066	5,240	79.006	13.653

Note: The sample for closed elections was made with the optimal bandwidth defined by the unconditional on running analysis (0.112)

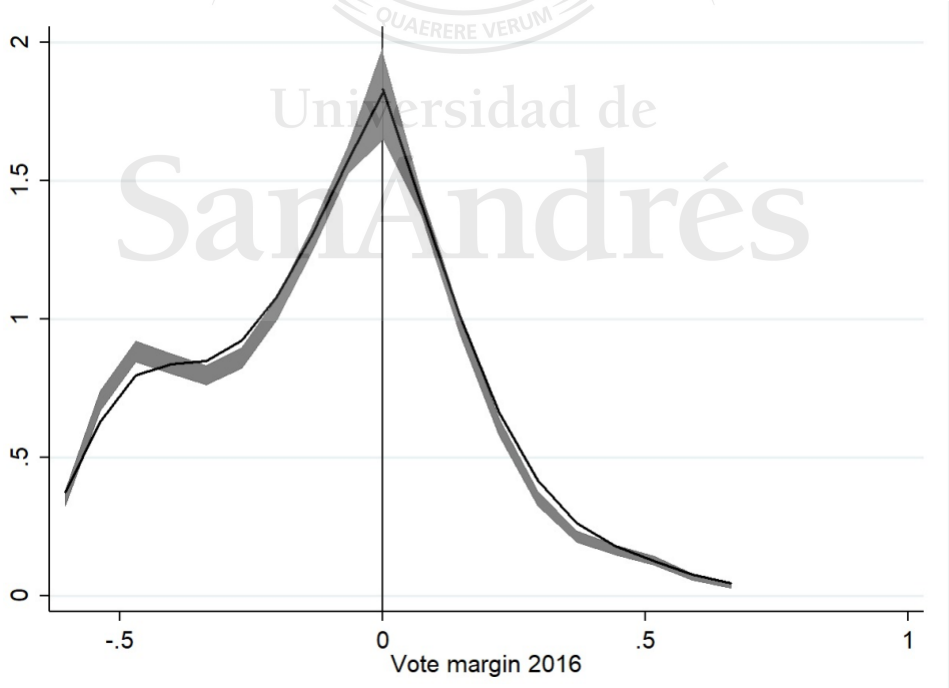
For the COVID analysis, we used a data set from the Brazilian Ministry of Health (*Ministério da Saúde*) which provided daily counts for Covid-19 cases and deaths as well as estimated population and cases per 100,000 habitants at a municipal level. We reduced the file with more than half a million observations to contemplate the information relevant to the analysis by removing all information post 2020 election, which took place on the November the 15th for municipalities with less than 200,000 registered voters. We then managed to match all the data sets by using the IBGE code for each municipality.

4. Methodology

4.1 Density of the running variable

We first need to check for the continuity of our running variable. We do this to check if candidates are able to manipulate the assignment to treatment around the cut-off. However, for our analysis, being able to manipulate the assignment to treatment would mean that candidates are able to win elections on command. As previously established even though Brazil is not the strongest democracy, elections are ensured and protected by all branches of government. Nevertheless, when we check for the continuity of the running variable (2016 vote margin), we find that the coefficient is -0.276 and the p-value 0.289. This means that we fail to reject the null hypothesis that there is no difference in density between the treated and control observations around the cut-off. Also, observations at the left of the cut-off and the right of the cut-off are balanced, not exactly the same as we might find some cases were for every winner there might be more than one loser inside the established bandwidth.

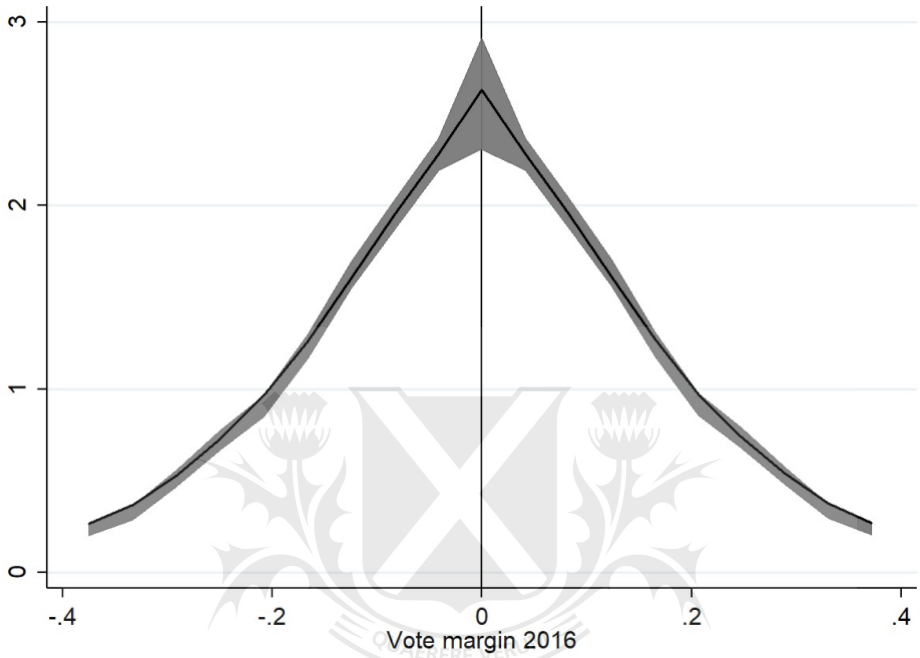
***Figure 1*: Vote margin density – whole sample**



In addition to this analysis, we ran a second continuity check for the running variable using only winners and runner ups (excluding winners that had a 100 percent vote margin – no

competition). What we expected to see is what we see in *Figure 2*, a gaussian distribution with exactly the same number of observations on either side of the cut-off.

Figure 2: Vote margin density – winners and runners-up



4.2 Econometric strategy

4.2.1 Incumbency advantage

As previously discussed, when trying to study incumbency advantage in an electoral context, we cannot use traditional OLS to compare candidates because of multiple unobservable variables that can make our estimations biased or endogenous. We then resort to a regression discontinuity model. The identification assumption is that we can consider close elections in 2016 as a random assignment of incumbency (treatment) for the 2020 elections. We do a sharp regression discontinuity design for municipalities with less than 200,000 registered voters.

Our running variable is 2016 vote margin (VM). *I* is the incumbency variable, which takes the value 1 if the candidate wins the 2016 election and 0 otherwise. VM is the vote share (VS) difference between a candidate and the other most voted candidate in their municipality. Notice that for candidates (i) that won the election, VM is the difference between their VS and the

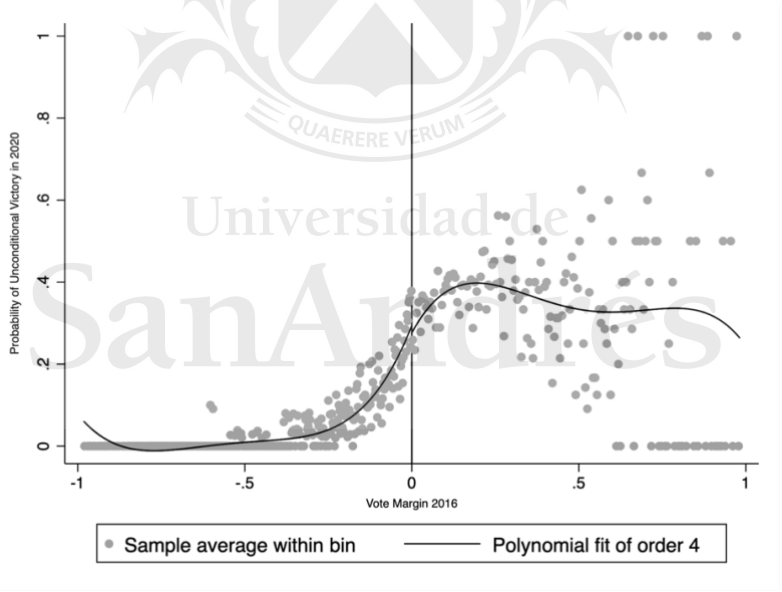
runner up. For candidates (i) that lost the election VM is the difference between the winners VS and theirs. Our cutoff will be on VM = 0, where the election would be a tie.

Equation (1) defines our base model, where the unconditional probability of a candidate winning in 2020 is the dependent variable with no control variables. We will not carry out a party-level analysis. τ_1 quantifies the impact of incumbency on the probability of winning in subsequent (2020) elections. Equation (2) adds control variables for both municipalities and candidates. *Figure 3* shows a preliminary analysis of what equation (2) looks like for all observations.

$$(1)\ \textit{Won 2020}_{ik} = \alpha + \tau_1 I_{ik} + \beta_1 \textit{(2016 VM)}_{ik} + \epsilon$$

$$(2)\ \textit{Won 2020}_{ik} = \alpha + \tau_1 I_{ik} + \beta_1 \textit{(2016 VM)}ik + \beta_{mun} X_{mun} + \beta_{cand} X_{cand} + \epsilon$$

Figure 3: Incumbency RD effect on the unconditional probability of winning in 2020



On a second instance, we will analyze the incumbency advantage typical in studies on US congress elections which estimate the effect of incumbency (winning on t-1) on the probability of winning on t, conditional on rerunning. As discussed in literature review, this framework of analysis could be biased because of differences in rerunning rates between the treated and control groups. This will be analyzed in the results section. Equations (3) and (4) are similar to (1) and (2) but conditioning the dependent variable on rerunning. This means only candidates that participate in both elections will be considered for the analysis.

$$(3)\ (\textit{Won 2020}|\textit{Rerun})_{ik} = \alpha + \tau_1 I_{ik} + \beta_1\ \textit{(2016 VM)}_{ik} + \epsilon$$

$$(4)\ (\textit{Won 2020}|\textit{Rerun})_{ik} = \alpha + \tau_1 I_{ik} + \beta_1\ \textit{(2016 VM)}_{ik} + \beta_{mun} X_{mun} + \beta_{cand} X_{cand} + \epsilon$$

On a third instance we will only take into account repeated candidate pairs to estimate incumbency advantage. This will have the smallest sample size, as it requires that both the winner and the runner-up rerun on the 2020 election. Notice that this method does not contemplate the possibility of a three-way close election and is described by equations (5) and (6). These instances are analogous to (1) and (2) but conditioning on repeated pairs:

$$(5)\ \ (\textit{Win 2020}|\textit{Rep. pair})_{ik} = \alpha + \tau_1 I_{ik} + \beta_1\ (\textit{2016 VM})ik + \epsilon$$

$$(6)\ \ (\textit{Win 2020}|\textit{Rep. pair})_{ik} = \alpha + \tau_1 I_{ik} + \beta_1\ \textit{(2016 VM)}ik\ + \beta_{mun} X_{mun} + \beta_{cand} X_{cand} + \epsilon$$

When carrying out RDDs it is important to take into consideration the kernel function and the bandwidth (bw). The kernel function assigns more weight to observations as they get closer to our cutoff. Selection of the bandwidth for our models brings the bias-variance trade-off into play. Making the bw bigger brings more observations into the model, simultaneously lowering the variance of our main coefficient and jeopardizing our identification assumption, increasing the risk of getting a biased estimator. On the other hand, a smaller bandwidth narrows down the number of observations. In this case, the main coefficient will have more variance, but we reduce the possibility of obtaining a biased estimation. In consequence, it is important to keep in mind the effects found using RDD will be local, therefore lacking external validity: we cannot say anything about effects of incumbency advantage outside of our bandwidth. For all our models, we used a triangular kernel and a bw that optimized the Minimal Square Error (Calonico, Cattaneo & Titiunik, 2017).

4.2.2 Covid-19

On a final instance, we will analyze the impact of results of the fight against the Covid 19 pandemic up to the date of the election on incumbency advantage. To do this, we must decide which variable is best suited to describe the pandemic effect. We have two main interest variables: (7) *Cases/100k*, which represents cases per 100,000 habitants and (8) Covid *Death rate*. (9) i[*Cases/100k*] and (10) i[*Death rate*] are dummy variables that take value 1 if the

municipality is over the median of each variable and 0 otherwise. They will all be as an interaction with I_{ik} (incumbency) to quantify heterogeneity effects. This means that the Covid results can only impact candidates that were in office when the pandemic started.

$$(7)\ \textit{Won 2020} = \alpha + \tau_1 I_{ik} + \beta_1 \textit{(2016 VM)}_{ik} + \beta 2\ [\textit{Cases/100k}_{\text{ik}} \cdot I_{ik}] + \beta_{mun} X_{mun} + \beta_{cand} X_{cand} + \epsilon$$

$$(8)\ \textit{Won 2020} = \alpha + \tau_1 I_{ik} + \beta_1 \textit{(2016 VM)}_{ik} + \beta 2\ [\textit{DeathRate}_{\text{ik}} \cdot I_{ik}] + \beta_{mun} X_{mun} + \beta_{cand} X_{cand} + \epsilon$$

$$(9)\ \textit{Won 2020} = \alpha + \tau_1 I_{ik} + \beta_1 \textit{(2016 VM)}_{ik} + \beta 2\ \{\text{i}[\textit{Cases/100k}_{\text{ik}}] \cdot I_{ik}\} + \beta_{mun} X_{mun} + \beta_{cand} X_{cand} + \epsilon$$

$$(10)\ \textit{Won 2020} = \alpha + \tau_1 I_{ik} + \beta_1 \textit{(2016 VM)}_{ik} + \beta 2\ \{\text{i}[\textit{DeathRatek}_{\text{ik}}] \cdot I_{ik}\} + \beta_{mun} X_{mun} + \beta_{cand} X_{cand} + \epsilon$$

4. Results

4.1 Unconditional probability

Table 3 shows the impact of incumbency on the unconditional of probability winning the 2020 elections with no control variables. All three cases show a slight incumbency disadvantage. However, the disadvantage is only significant when the bandwidth is set at a 5% vote margin. In this case, incumbency decreases the probability of winning by 0,099. Notice the number of observations on the right of the cutoff is greater than on the left. This makes sense as there can only be one winner, but there can be multiple losers. Table 4 shows the results when adding control variables both for municipality and candidates (equation 2). Results are similar to the first unconditional model, showing an incumbency disadvantage significant to 95%. Figure 4 shows the RDD estimation for (2) with the optimal bandwith and covariates.

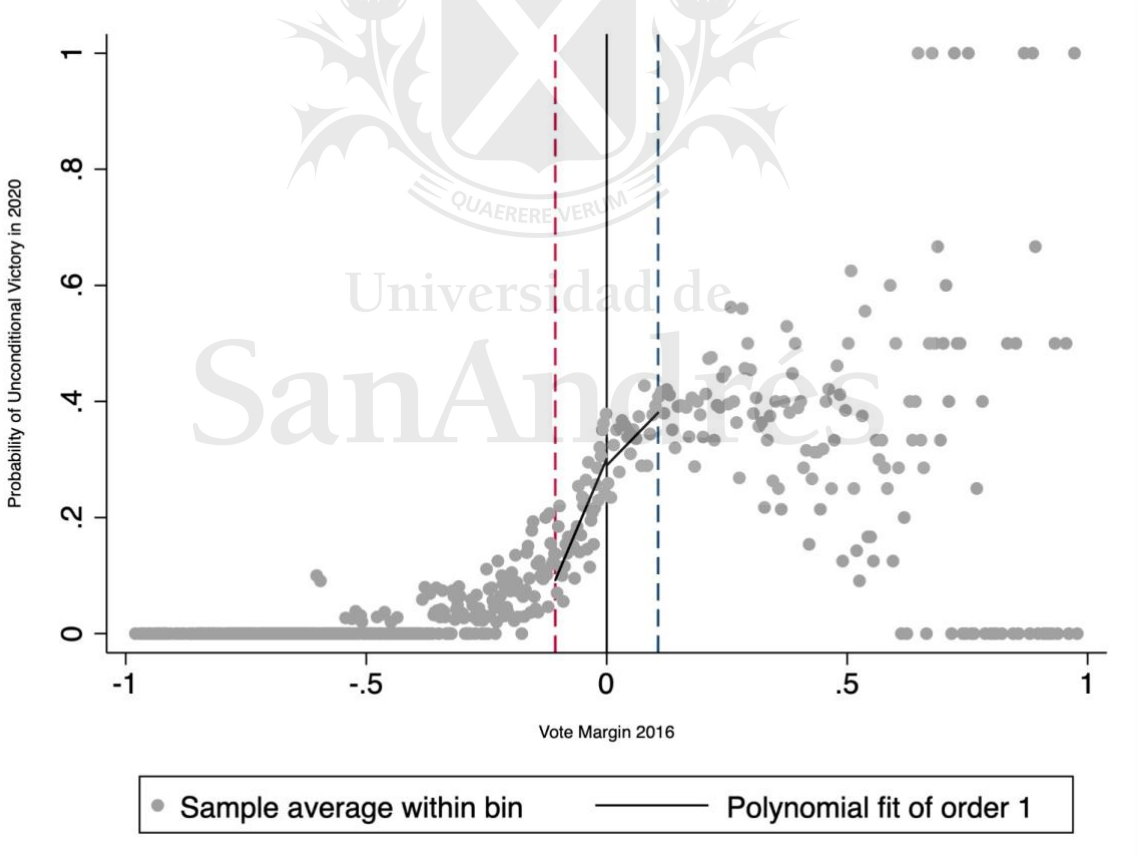
Table 3: RD effect of winning in 2016 on Victory in 2020 (Unconditional on Running) for individual candidates – without covariates.

	Optimal BW	Lower BW	Bigger BW
RD Estimate (without covariates)	-0.03034	-0.09862**	-0.01084
N	15,176	15,176	15,176
P-value	0.250	0.012	0.636
Eff. Observations	5,281	2,594	6,743
Left	2,716	1,307	3,521
Right	2,565	1,287	3,225
Bandwidth	0.112	0.05	0.15
	*p<0.1	**p<0.05	***p<0.01

Table 4: RD effect of winning in 2016 on Victory in 2020 (Unconditional on Running) for individual candidates – with covariates

	Optimal BW	Lower BW	Bigger BW
RD Estimate (with covariates)	-0.0421	-0.09948**	-0.01795
N	11,191	11,191	11,191
P-value	0.164	0.021	0.486
Eff. Observations	3,928	1,997	5,115
Left	2,007	1,019	2,707
Right	1,921	978	2,483
Bandwidth	0.107	0.05	0.15
	*p<0.1	**p<0.05	***p<0.01

***Figure 4*: RD effect of winning in 2016 on Victory in 2020 (Unconditional on Running) for individual candidates – with covariates**



4.2 Conditioning on rerunning

Table 5 shows the effect of incumbency on the of probability winning the 2020 election conditional to rerunning with no control variables. As in the unconditional models, results show

an incumbency disadvantage, which is only significant in the lower BW context. In this case, the disadvantage is greater, as winning in 2016 reduces the probability of being reelected by 0.144.

Table 5: RD effect of winning in 2016 on Victory in 2020 (Conditional on Running) for individual candidates – without covariates

	Optimal BW	Lower BW	Bigger BW
RD Estimate (without covariates)	-0.05177	-0.14385**	-0.02964
N	5,287	5,287	5,287
P-value	0.143	0.015	0.351
Eff. Observations	3,115	1,280	3,629
Left	1,306	587	1,502
Right	1,809	693	2,127
Bandwidth	0.152	0.05	0.20
	*p<0.1	**p<0.05	***p<0.01

In table 6 we added covariates to the model. In this case, both the optimal and lower bandwidths show an incumbency disadvantage, significant to 95%. These coefficients show decreases of probability between 0.099 and 0.171 for incumbents.

Table 6: RD effect of winning in 2016 on Victory in 2020 (Conditional on Running) for individual candidates – with covariates

	Optimal BW	Lower BW	Bigger BW
RD Estimate (with covariates)	-0.09923**	-0.17109**	-0.07319*
N	3,937	3,937	3,937
P-value	0.037	0.010	0.073
Eff. Observations	1,846	972	2,360
Left	784	452	980
Right	1,062	520	1,380
Bandwidth	0.108	0.05	0.15
	*p<0.1	**p<0.05	***p<0.01

Notice that in all cases there are more observations to the right of the cutoff, meaning there are more bare winners rerunning than bare losers. When studying the situation in depth, we find that only 23.29% of losers run for re-election, while 54.47% of winners rerun. Moreover, when taking out winners that are not eligible for reelection (as they were incumbents

on the 2016 elections), the treated rerun rate rises to 62.14%. This shows a near 40p.p difference in rerun rates between groups, suggesting that incumbency influences the probability of rerunning. This issue (described by De Magalhaes, 2014) gives us grounds to state that conditioning the model on rerunning provides a biased estimation of incumbency advantage.

4.3 Repeated pairs

Table 7 shows the effects of incumbency on the probability of winning by restricting the observations to repeated candidate pairs without. By requiring both the winner and the runner up to rerun for them to be considered, we eliminate the difference in rerunning rates between treated and control groups. Once again, all three show an incumbency disadvantage that is only significant whit a 0.5 vote margin bandwidth. In this case, incumbency decreases the probability of being reelected 0.249.

Table 7: RD effect of winning in 2016 on Victory in 2020 (for repeated pairs) for individual candidates – without covariates

	Optimal BW	Lower BW	Bigger BW
RD Estimate (without covariates)	-0.08936	-0.24869***	-0.0533
N	1,588	1,588	1,588
P-value	0.133	0.004	0.337
Eff. Observations	1,027	518	1141
Left	513	259	570
Right	514	259	571
Bandwidth	0.125	0.05	0.15
	*p<0.1	**p<0.05	***p<0.01

Table 8 shows the same model with covariates. In this case, we have evidence to claim with a 95% significance that within a 10.3% vote margin bandwidth, incumbency generates a decrease of 0.171 in the probability of winning the subsequent election. When narrowing down the bandwidth to 5%, the decrease in probability is 0.303 with a 99% significance.

Table 8 : RD effect of winning in 2016 on Victory in 2020 (for repeated pairs) for individual candidates – with covariates

	Optimal BW	Lower BW	Bigger BW
RD Estimate (with covariates)	-0.1714**	-0.3025***	-0.1019
N	1174	1174	1174
P-value	0.025	0.004	0.123
Eff. Observations	674	379	855
Left	333	190	424
Right	341	189	431
Bandwidth	0.103	0.05	0.15
	*p<0.1	**p<0.05	***p<0.01

4.4 Covid-19

Table 9 shows the results of the Covid models (7-10). A negative β_2 coefficient would have different interpretation for different models. When analyzing model (7), it would mean that augmenting one case per one hundred thousand people would decrease the probability of incumbents winning in 2020. On model (8), 1p.p increase in death rate would be associated with a β_2 decrease of probability of winning in 2020 for incumbents. Models (9) and (10) would bring into play performance vs other municipalities, as β_2 represents the effect of being incumbent and being over the median on the probability of winning in 2020. Although every model shows a negative RD Estimate (incumbency disadvantage) and a negative β_2 coefficient, none of these results are statistically significant for the MSE bandwidth. This means we have no evidence to establish/quantify the effects of results of the fight against Covid-19 on incumbency advantage. However, when using a 5% bandwidth, model (10) has a negative and significant coefficient which indicates that incumbents from municipalities with death rates above the median suffer a 0.08 decrease in the probability of winning in 2020. Keep in mind this last results are extremely local and lack external validity.

Table 9: Covid 19 variables effect on the estimated probability of winning in 2020

	(7) Cases/100k	(8) Death rate	(9) i(Cases/100k)	(10) i(Death rate)
RD Estimate	-0.02043	-0.00956	-0.01496	-0.00057
β_2	0.00000	-0.2672	-0.00732	-0.03815
RD Estimate (5% BW)	-0.1102*	-0.07053	-0.1039*	-0.05061
β_2 (5% BW)	0.00005	-0.5886	-0.03348	-0.07709*
N	6044	6044	6044	6044
Eff. Observations	2568	2568	2568	2568
Left	1330	1330	1330	1330
Right	1238	1238	1238	1238
Bandwidth MSE	0.139	0.139	0.139	0.139

*p<0.1 **p<0.05 ***p<0.01

5. Robustness Checks

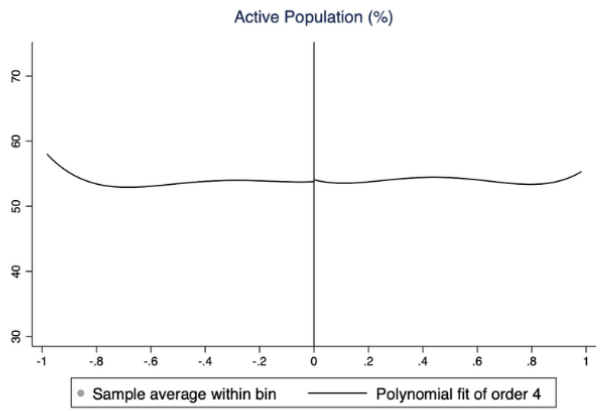
5.1 Predeterminate Covariates

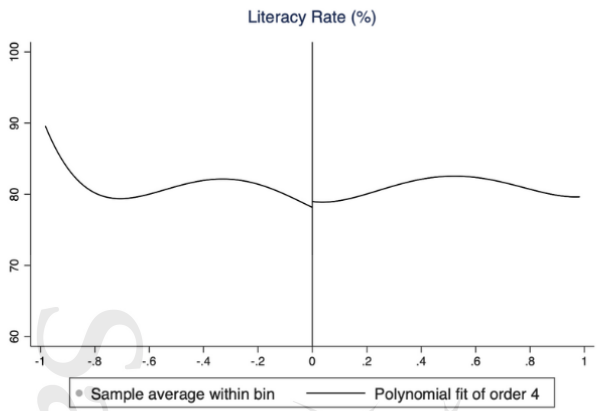
The first falsification test we run is the effect of the treatment effect on the predetermined covariates. We need to check that they are not affected by the running variable as they are assigned to treatment. All the tables and graphs below show the treatment effect on their respective covariate. All the covariates, both at the candidate and municipal level, show no statistically significant effects.

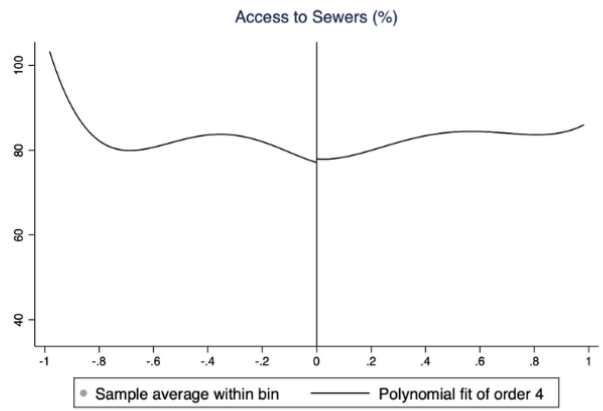
Table 10: Treatment Effect on Municipality Level Covariates

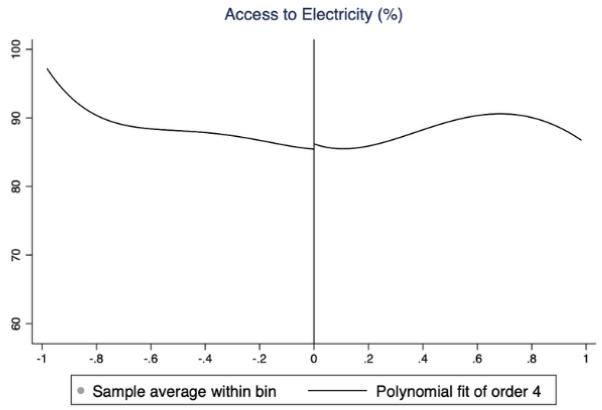
Variable	RD Estimate	P-value	N	Effective Obs. Right	Effective Obs. Left	Bandwitdth
Urban population (%)	0.05724	0.956	14,020	3,599	3,301	0.163
Monthly income (pc)	3.0084	0.769	15,162	3,426	3,146	0.145
Active population (%)	0.07805	0.883	14,912	3,418	3,139	0.146
Access to electricity	0.24214	0.783	14,912	3,575	3,272	0.154
Access to radio	0.24097	0.745	14,912	3,575	3,272	0.154
Access to clean water	0.07062	0.945	14,912	3,578	3,275	0.155
Access to sewage system	0.07809	0.951	14,912	3,302	3,042	0.14
Gini coefficient	0.00014	0.972	14,912	3,852	3,478	0.171
Literacy rate	0.15202	0.836	14,912	3,208	2,968	0.135

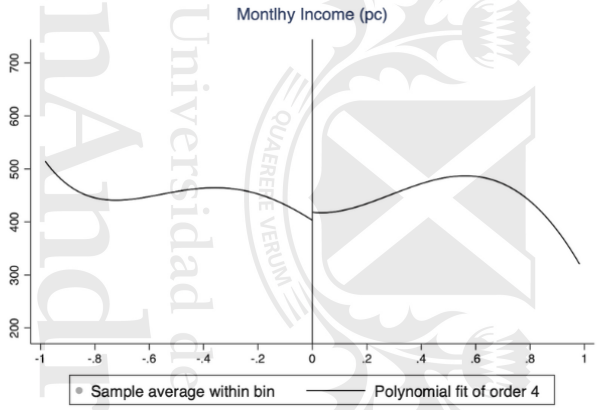
Note: *p<0.1; **p<0.05; ***p<0.01. The statistical significance is determined by the robust standard errors. All bandwidths are selected by MSE optimal bandwidth selection.

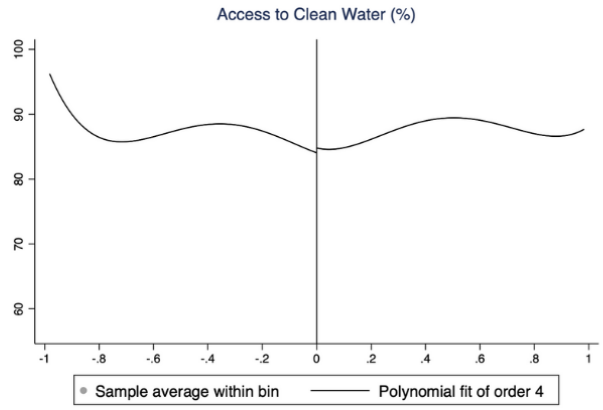

Active Population (%)
Sample average within bin
Polynomial fit of order 4

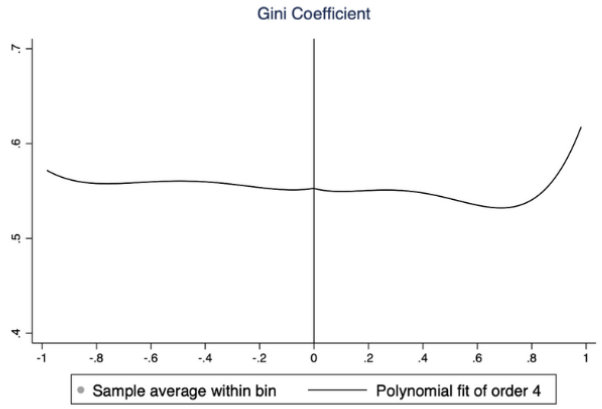

Literacy Rate (%)
Sample average within bin
Polynomial fit of order 4

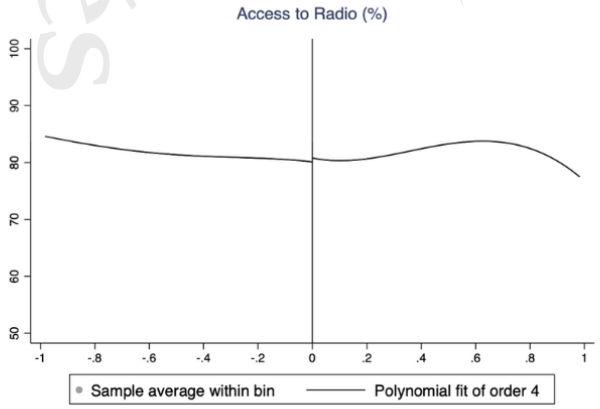

Access to Sewers (%)
Sample average within bin
Polynomial fit of order 4


Access to Electricity (%)
Sample average within bin
Polynomial fit of order 4


Monthly Income (pc)
Sample average within bin
Polynomial fit of order 4


Access to Clean Water (%)
Sample average within bin
Polynomial fit of order 4


Gini Coefficient
Sample average within bin
Polynomial fit of order 4


Access to Radio (%)
Sample average within bin
Polynomial fit of order 4

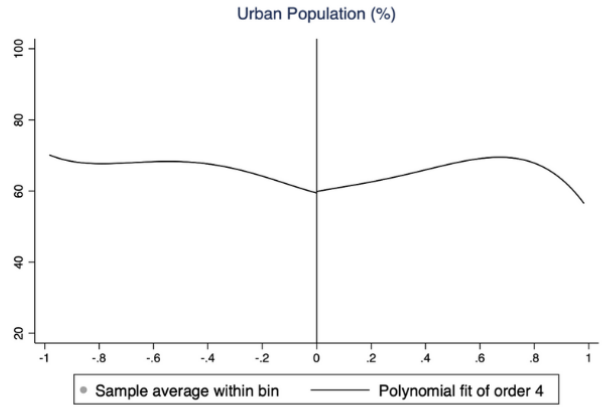

Urban Population (%)
Sample average within bin
Polynomial fit of order 4

***Figure 5*: Candidates Education Level**

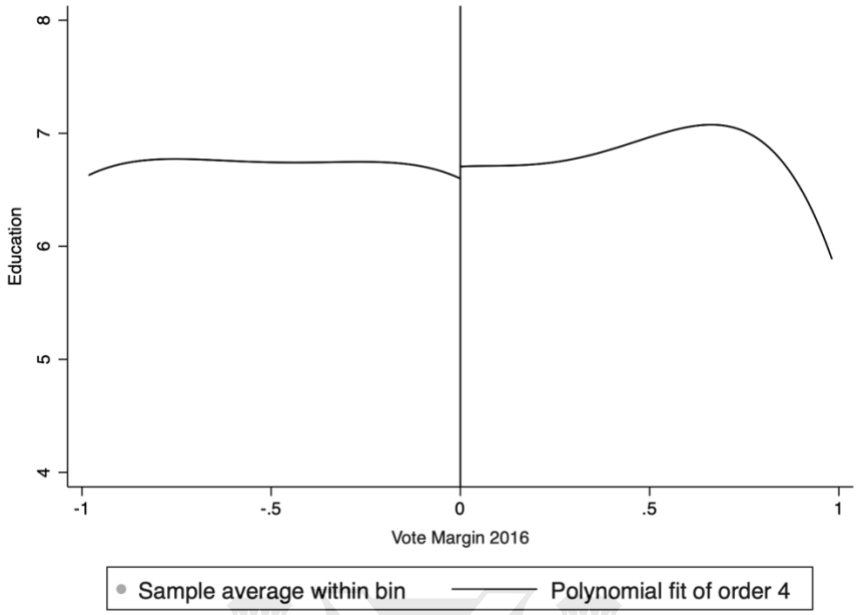


Figure 5 shows the RD estimation for the whole sample.

Table 11 : Treatment effect on candidate's education level

RD Estimate	0.02018
N	11,983
P-value	0.826
Eff. Observations	5,390
Left	2,821
Right	2,569
Bandwidth	0.151
*p<0.1; **p<0.05; ***p<0.01	
Notes: The dataset is at the candidate-election level. Dependent variable: gender of candidates. The statistical significance is determined with robust standard errors.	

***Figure 6*: Candidates Gender**

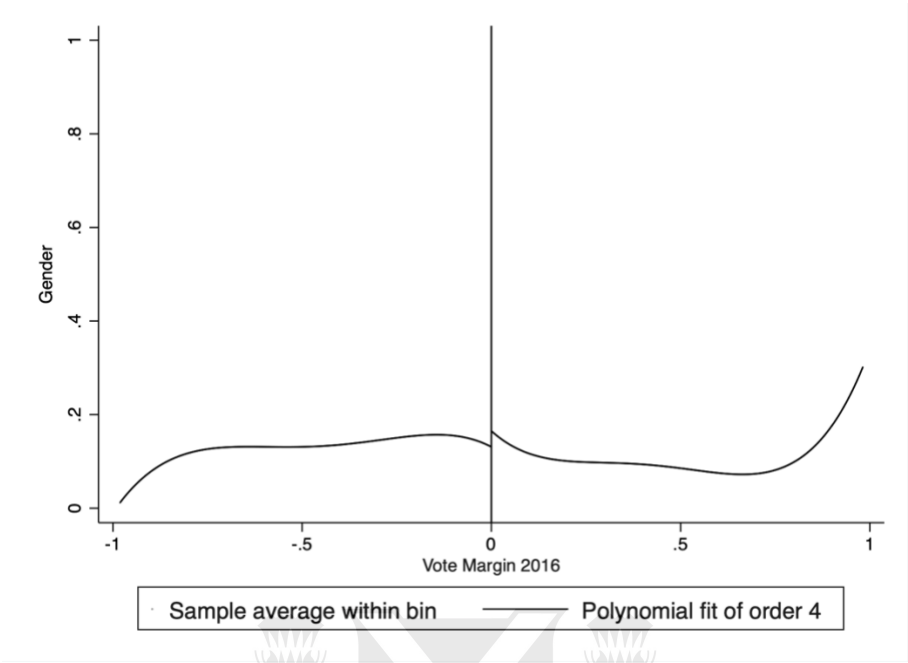


Figure 6 shows the RD estimation for the unconditional analysis dataset.

Table 12 : Treatment effect on candidate's gender

RD Estimate	0.02449
N	11,981
P-value	0.197
Eff. Observations	5,783
Left	3,042
Right	2,741
Bandwidth	0.165
*p<0.1; **p<0.05; ***p<0.01	
Notes: The dataset is at the candidate-election level. Dependent variable: gender of candidates. The statistical significance is determined with robust standard errors.	

***Figure 7*: Candidates Marriage Status**

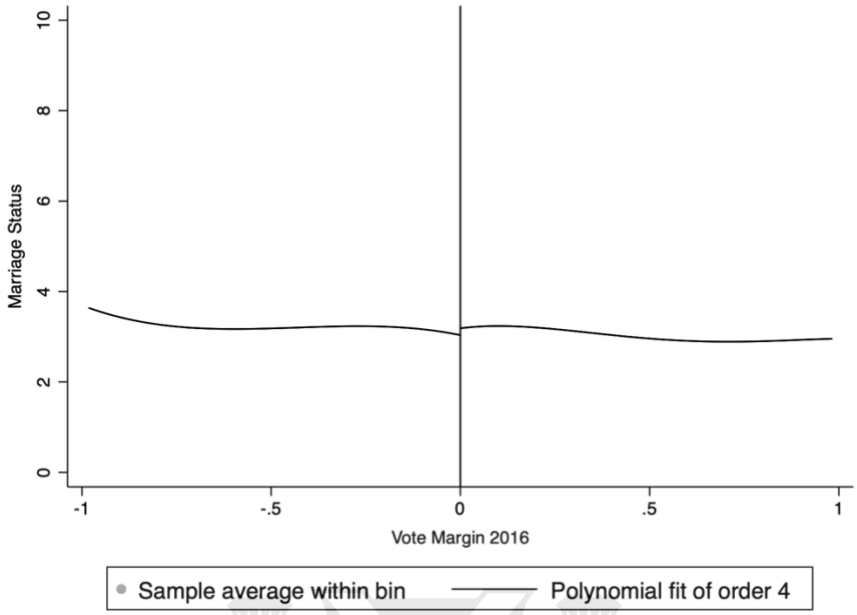


Figure # shows the RD estimation for the whole sample.

Table 13 : Treatment effect on candidate's marriage status

RD Estimate	0.15135
N	11,983
P-value	0.107
Eff. Observations	6,499
Left	3,456
Right	3,043
Bandwidth	0.201
*p<0.1; **p<0.05; ***p<0.01	
Notes: The dataset is at the candidate-election level. Dependent variable: marriage status of candidates. The statistical significance is determined with robust standard errors.	

***Figure 8*: Candidates Occupation**

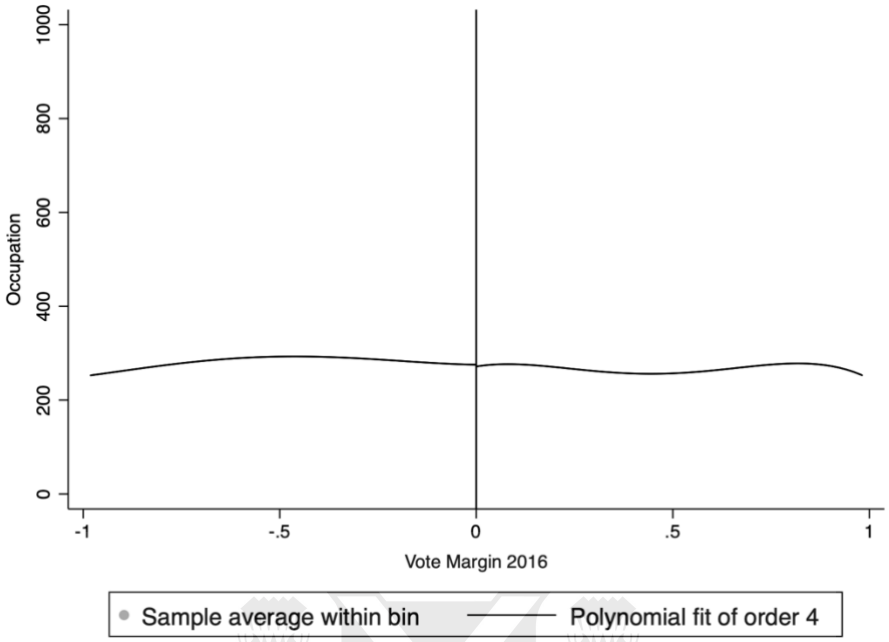


Figure 8 shows the RD estimation for the whole sample.

Table 14 : Treatment effect on candidate's occupation

RD Estimate	-1.3201
N	11,983
P-value	0.906
Eff. Observations	6,989
Left	3,757
Right	3,232
Bandwidth	0.226
*p<0.1; **p<0.05; ***p<0.01	

Notes: The dataset is at the candidate-election level. Dependent variable: occupation of candidates. The statistical significance is determined with robust standard errors.

5.2 Higher Polynomial Degree

In this part of the analysis, we test increasing the polynomial degree of regressions on both sides of the cutoff. The model estimated for equation 2 used a local linear fit. Table # shows the results of this model. Applying a quadratic fit causes the optimal bandwidth to be doubled. In this case, the main coefficient of the regression is similar to its linear counterpart but presents a 90% significance level.

***Figure 9*: RD effect of winning in 2016 on Victory in 2020 (Unconditional on Running) for individual candidates – with covariates**

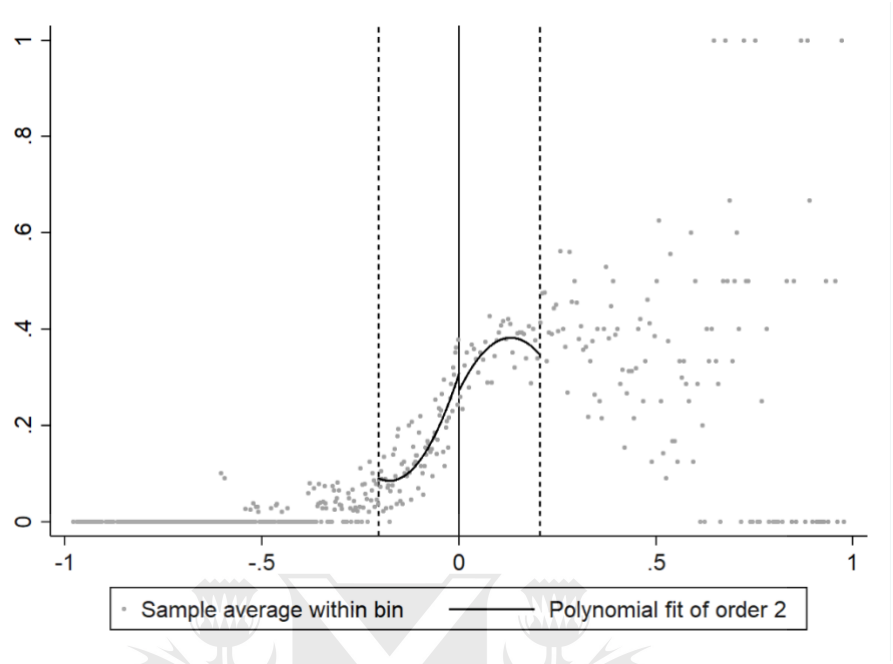


Table 15. RD effect of winning in 2016 on Victory in 2020 (Unconditional on Running) for individual candidates – with covariates. Quadratic fit

RD Estimate	-0.0566*
N	11,191
P-value	0.081
Eff. Observations	6,352
Left	3,371
Right	2,981
Bandwidth	0.205
*p<0.1; **p<0.05; ***p<0.01	

Notes: The dataset is at the candidate-election level. Dependent variable: 2016 vote margin. The statistical significance is determined with robust standard errors.

5. Concluding remarks

This study serves two main contributions. In the first part, the study updated previous literature of incumbency advantage in Brazilian municipal elections for 2020. We were able to establish a significant incumbency disadvantage in a repeated pairs context, but have no evidence to establish any kind of causality for unconditional analysis. On the other hand, we cannot defend the assumption that rerunning was not endogenous as rerunning rates vary from treated group to control group. This means we have no evidence to state incumbency advantage/disadvantage in municipal elections in Brazil outside of a repeated pair context.

In the second part of the research, we investigated the influence of results against the Covid pandemic via heterogeneous effects. Despite considering multiple Covid interaction variables we did not find statistically significant evidence to support the impact of these variables on the incumbent's probability of winning for optimal bandwidths.

While the absence of statistical significance in our study may initially appear inconclusive, these findings may still provide some valuable insights. Most previous literature showed significant results for RDD incumbency disadvantage for Brazilian municipal elections, except Magalhaes (2014), which found a positive incumbency effect with another theoretical framework. The non-significance on the incumbency models already shows something interesting for 2020 as most studies on incumbency show a significant disadvantage for candidates in Brazilian municipal elections. There could be an argument that there is a missing piece of the puzzle. Future investigations could dive into other factors, as there could be an argument that responsibility could be attributed to the head national government. These opens lines of research regarding alignment of incumbents with the head government, or Covid performance comparisons between more countries, etc.

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