Political Opposition, Legislative Oversight, and Politician Performance: Evidence From Brazil

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Abstract

An important feature of democracies around the world is separate executive and legislative branches providing checks and balances against each other, with multiple political parties vying for control. This paper measures the extent to which political opposition in the city council improves the mayor's performance and thus the quality of public services. Using corruption data from Brazilian federal audits as well as health indicators, we employ a regression discontinuity design to estimate the causal effect of an additional politically opposed legislator on measures of corruption, public service provision, and public health. We find that when the mayor faces reelection incentives, the marginal politically opposed city councilor significantly increases legislative oversight, reduces corruption, increases the probability that a physician will be present at the local health clinic, and decreases the infant mortality rate by 3.4 per 1000 births for uneducated mothers. These findings highlight the importance of legislative oversight for incentivizing the executive to act according to voter's preferences.

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1 Introduction

The effects of poor governance are felt by billions of people worldwide, and it is often in the poorest areas that politicians are least accountable. At best, low accountability leads to low politician effort. At worst, politicians may divert large amounts of public resources for their own gain, leaving government services unable to meet the basic needs of those who are most disadvantaged. It is therefore of great importance for those interested in economic development to understand what institutional arrangements can improve politician performance and the quality of public services.

A common feature of governments throughout the world is the separation of powers, with distinct executive, legislative, and judiciary branches exercising some measure of influence on each other, providing checks and balances, and discouraging the abuse of power. In such a democracy, politicians are kept in check both by voters *and* by other politicians (Persson et al. 1997). Recent empirical work has shown the positive effect that democratization has on public service provision and health, how electoral accountability and judicial checks can decrease corruption, and how voting technology can increase politician responsiveness and improve health outcomes (Martinez-Bravo et al., 2014; Kudamatsu, 2012; Ferraz and Finan, 2011; Litschig and Zamboni, 2015; Fujiwara, 2015). So while previous work shows how *voters* keep politicians in check, this paper shows how *politicians* keep politicians in check.

While the executive branch implements policies and programs, in many countries the legislative branch has the responsibility to oversee these activities and assure that they are administered properly. Despite these oversight responsibilities, legislators who are allied with the executive may not have the incentives to carry out this oversight properly. Legislators may denounce a corrupt or low-performing executive, but the executive will likely percieve a higher probability of this happening if there is also political leverage to be gained from opposing parties. In other words, political opposition in the legislative body may increase the expected cost of poor performance for the executive.[1]

[1] A simple internet search will yield a number of results that support this view. In the context of Brazil where our data comes from, there are a various news articles covering stories of corrupt mayors

In this paper, using a regression discontinuity design and corruption data from random federal audits of Brazilian local governments, we examine the effect an extra opposition legislator have on legislative oversight, corruption and public service delivery[2]. To guide the empirical section, we first present a simple two-period political agency model (Besley, 2006) where voters have to decide whether or not to reelect the incumbent mayor without observing either his type or action. The elected legislator can investigate and report the mayor's actions to voters or accept a bribe from the mayor. In equilibrium, reelection incentives motivates opposition legislators to report a mayor's wrongdoings whereas allied legislators have no incentive to do so. Hence, mayors facing strong legislative opposition cannot engage in corruption and still get reelected, though they could under a weak opposition. Two basic prediction are borne out of this model: when mayors have reelection incentives, there will be less corruption and more investigations if mayors face a stronger opposition in the legislative body.

To test these predictions empirically, we use a regression discontinuity (RD) design to estimate the causal impact of the marginal politically opposed legislator on measures of corruption, public service provision, and public health. We follow a body of literature that exploits close elections as an RD design (Lee, 2008; Pettersson-Lidbom, 2008; Caughey and Sekhon, 2011; Eggers et al., 2015), so that the estimator compares municipalities where the opposition just barely won an additional seat in the legislature to those where the opposition just barely did *not* win an additional seat. We examine how the marginal opposing legislator affects various types of corruption (embezzlement, fraud, and overinvoicing), the quality of public service provision (particularly in the health sector), and actual health outcomes.

We start by showing that an additional opposition legislator substantially increases the capacity of the opposition to exercise its oversight duty by increasing in 14 p.p. the probability that an opposition legislator is council president. The institutional powers of the president of the council plays an essential for the creation and effectiveness of investigative commissions (CPIs) on the mayor's actions[3]. Next, we show that

being denounced by city councillors from opposing parties, and even a video of a city councillor giving a speech during city council meeting in front of an audience of constituents, denouncing the mayor for having attempted to buy him off (Rodrigues; Morais; 'Vereador denuncia:', 'Vereador denuncia prefeito').

[2]It is important to keep in mind that local legislative bodies in our setting are small and usually have only 9 legislators. Hence, one extra opposition legislator represents a substantial increase of 11 p.p. of the opposition seat share.

[3]The leader of the local council is elected by the local council itself and plays an important role

this increase in oversight capacity translates into an anctual increase in oversight with the likelihood of an investigative commission been created to look into mayors' wrongdoings increasing by 6 p.p. (55% increase).

Does this increase in oversight inhibit rent seeking behavior? We find that when the mayor faces reelection incentives, the marginal politically opposed city councilor reduces the instances of corruption found by auditors by 1.77 standard deviation units. This suggests that incumbent mayors anticipating that they might be exposed by the legislative body engage in less corruption to avoid been kicked out of office.

Next, we look at whether this reduction in corruption trickles down and actually improves public service delivery. If the marginal politically opposed city councilor can decrease the amount of money potentially embezzled by the executive branch, it may find its way to the programs it is meant for. We find that the reduction in corruption is driven by a reduced irregularities in the healthcare sector of the government, which is consistent with research that shows that healthcare is one of the most salient issues for voters and politicians in Brazil (Fujiwara, 2015), as well as the fact that municipalities have a great deal of control over the quality of local healthcare provision. Our results suggest that an additional opposition legislator increases the probability that a physician will be present at the local public health clinic and decreases waiting lines and irregular hiring of health agents. Finally, this improvement in public health service provision translates into better health outcomes. Results suggest that for uneducated mothers, the marginal opposed legislator decreases infant mortality by 3.4 per 1000 births and the rate of preterm births by 0.8 per 1000 births.[4] We also test for heterogeneous effects, based on if the mayor's coalition has a controlling share the city council or not, and we find that our results are driven by situations in which the mayor's coalition does *not* have a majority in the city council. This suggests that when the mayor's coalition has agenda-setting power in the city council, the opposition can do little to check the mayor's corrupt activities.

We also test two of the main mechanisms of the model. First, we provide evidence that revealing a mayor is corrupt reduces the reelection chances of allied legislators.

in the CPI process. Firstly, he is responsible for deciding if a CPI has a valid reason to be created or not. Secondly, he appoints the legislators to the commission

[4]We cannot rule out the possibility that the improvement in public services and health outcomes is not a direct effect of the reduction in corruption previously shown. For example, additional opposition might induce higher mayor's effort directly into the provision of public goods. It is difficult to disentangle the two channels but it is clear from the results presented in this paper that political opposition improves politician performance.

Hence, legislators allied with the mayor lack incentives to report or investigate corruption, whereas opposing legislators *do* have such incentives. Using the fact that the timing of the public dissemination of the federal audit results is random (Ferraz and Finan (2008)), we estimate the effect of exposing a corrupt mayor on the reelection chances of the legislators that belong to the mayor's coalition. We find that the reelection probability of aligned legislators falls by 10 p.p. when a mayor is revealed to be corrupt and there is an AM radio station present to disseminate findings. Additionally, we also test if the presence of opposition legislators reduces the reelection chances of incumbent mayors. Opposing legislators will reduce reelection chances of mayors when reelection incentives are not strong enough to force mayors to pretend to be non corrupt, even when they know that they will be reported by legislators and this will end up costing their reelection. Results suggest that an additional opposition legislator decreases mayors reelection chances by 6.2 p.p.

These findings imply that legislative oversight has a significant role to play in decreasing corruption and ameliorating public service provision, and that methods of proportional representation should be chosen carefully so as to not disproportionately favor larger parties (as Brazil's system does), particularly when the executive's party is generally one of the stronger parties (as is the case in Brazil).

This article's main contribution is to the literature on political institutions and politician performance. While this literature has principally considered the direct effect of electoral incentives on performance (Dal Bó and Rossi, 2011; Ferraz and Finan, 2011; Lim, 2013; Martinez-Bravo et al. 2014; Gulzar and Pasquale, 2017), a smaller strand of this literature has examined the effect of checks from other branches of government (Alt and Lassen, 2008; Litschig and Zamboni, 2015).Our contribution is to exploit exogenous variation in the intensity of legislative checks, and show its effect on a chain of outcomes ranging from politician behavior to the welfare of constituents.

Thus, we also contribute to the literature on political institutions and economic and welfare outcomes (Besley and Kudamatsu, 2006; Kudamatsu, 2012; Acemoglu et al. 2014; Madsen et al. 2015). So far this literature has examined the broad effects of democracy on economic growth and health. We show a specific channel through which democracy affects outcomes by examining a specific feature of democracies and its effect on a chain of intermediate outcomes that lead to development.

There is also a large recent literature that studies the impact that centralized audits can have on corruption and public service provision at the local level (Olken,

2007; Ferraz and Finan, 2008; Litschig and Zamboni, 2016; Nishijima, Ellis, and Cati, 2016, Lichand et al., 2016; Avis, Ferraz, and Finan, 2017). Our work can be seen as complementary to this literature, since we study the effect of the auditing unit that is already *built in* to many democracies— the legislative branch.

Another contribution of this paper is to the literature on divided government. Alesina and Rosenthal (1996) build a model where the election of divided government arises from the fact that moderate voters try to implement moderate policies. This paper proposes another rationale for the formation of divided government: to incentivize good performance from the executive. This could be part of the explanation for the high degree of split-ticket voting in Latin America (Ames et al. 2009), a region with high corruption and poor public services. Much attention has also been given to the potential of divided government to generate legislative gridlock (Fiorina, 1992; Krehbiel, 1998; Mayhew, 1991), but there is little investigation on the potential of divided government to reduce rent extraction from the executive.

Finally, this article is also a contribution to the literature on political partisanship and corruption (Anduiza, Gallego, and Muñoz, 2013; Eggers, 2014), which finds that voters are more tolerant of corruption in their own political party. This paper shows that this result also holds for politicians, and that this tolerance has real impacts on outcomes such as health.

2 Institutional Background

Brazil is a federal republic much like the United States. There are 3 spheres of government: the federal government, the states, and the municipalities. Executive and legislative branches exist in all three spheres and are directly elected.

Municipal governments in Brazil are made up of of the mayor, his or her appointed secretaries, and the city council (*Câmara de Vereadores*). As the executive branch, the mayor and secretaries are responsible for implementing laws and policies through the Ministries of Health, Education, Agriculture, and so on. Mayors face a two-term limit, and thus do not face reelection incentives during their second term. As the legislative branch, the city council is given the responsibility to (1) make laws, and (2) audit and review municipal spending, which includes reviewing the accounts of the mayor and his or her secretaries.

Internally, the city council elects a board of directors— a president, vice-president,

and secretaries— which serves a purpose similar to the speaker of the house in the U.S. House of Representatives. Among other things, this board is responsible for proposing projects and authorizing procurement of public goods. The city council's twofold responsibility will require a corrupt mayor to either buy off the city council, or find some other way to get around them. If auditing responsibilities are divided up among city councillors, more city councillors from opposing parties may make it more difficult to steal money or exert low effort. Corruption frequently manifests itself in the form of fraudelent projects, which must be approved by the city council. More opposing politicians in the legislature could mean more power to block these projects from being approved. Thus, the legislature could improve executive performance and/or restrain the executive's rent-seeking either through (1) legislation it does or does not choose to pass or (2) through its auditing responsibilities.

If city councilors notice some irregularities in the mayor's accounts, they are charged with creating a Parliamentary Commission of Inquiry (CPI) in order to investigate possible malfeasance. Legislators may threaten the executive with denunciation, but if they are politically opposed, these threats will be much more credible both because political leverage stands to be gained and because politicians may not want their political enemies to have access to additional resources gained from rents.

The creation of CPIs is a right of legislative bodies at municipal, state and federal level guaranteed by the Brazilian constitution[5]. CPIs need the approval of 1/3 of the legislative body to be initiated. A CPI must be created with a very specific purpose and a time limit (usually 6 months). The CPI has judicial investigative powers. It can have access to bank, telephone and tax information and can call witnesses to be interrogated. The CPI ends with a document describing all the findings of the investigation and is passed forward to prosecutors to take the appropriate actions. The council can also use the wrongdoings uncovered by the investigation to impeach the mayor.

The leader of the local council plays an important role in the effectiveness of the CPI. Local council leaders are elected by the council itself and are responsible to decide if the purpose of the investigation is narrow enough for the commission to be created and is also responsible to decide the legislators that will work on the CPI[6].Once a CPI is created, it elects a president who is responsible to guide the

[5]Art. 58 Paragraph 3

[6]In principle, he should respect the party composition of the house. But this is commonly ignored as the examples below show.

investigations. Hence, it is common practice for council leaders— if allied with the mayor— to claim that the CPI does not have a well defined purpose to block it or create a CPI with legislators that have no interest in investigating the mayor.

Some examples are useful to illustrate how allies of the mayor can block the creation or effective investigation by CPIs. In 2015, a councilman in the municipality of Nova Friburgo in the state of Rio de Janeiro tried 2 times to create a CPI to investigate irregularities in the procurement process for medicine acquisition by the municipal government. Although he had enough votes to create the CPI, the leader of the council (who is from the same party as the mayor) did not aprove the CPI because he claimed that the purpose of the investigation was not narrow enough[7]. Two months later, the leader of the council approved the creation of the CPI due to popular pressure.

Another example comes from the city of Rio de Janeiro. Opposition legislators wanted to create a CPI to investigate several reports of schemes to defraud procurement contracts on municipal public works for the 2016 Olympics. Again, although the opposition had enough votes to create the CPI, the council leader (who is from the same party as the mayor) claimed that the purpose of the investigation was too broad and did not approve the creation of the CPI. The opposition went to the courts and a judge decided that the purpose of the investigation was very well defined and ordered the council president to accept the creation of the CPI[8]. After the CPI was created, the council leader decided that 4 of the 5 members of the commission would be from the mayor's party. The opposition did not accept this, claiming that with this composition the investigation would be compromised. The investigations have been suspended since then[9].

As the examples above illustrate, it can be extremely hard for the opposition to exert effective oversight of the executive actions if it does not have a substantial presence in the council.

On the other hand, there is anecdotal evidence that suggests that corruption in Brazil may be institutionalized and that party doesn't matter; in other words, corruption could be largely due to 'cultural norms'. As one Brazilian anticorruption organization has said, 'It seems there is some unwritten pact, a type of code of

[7]http://avozdaserra.com.br/noticias/cpi-da-saude-aprovada-em-nova-friburgo

[8]http://esportes.estadao.com.br/noticias/jogos-olimpicos,justica-do-rio-obriga-camara-municipal-a-instalar-cpi-da-olimpiada,1855211

[9]http://g1.globo.com/rio-de-janeiro/noticia/2016/09/justica-do-rio-determina-reabertura-da-cpi-da-olimpiada.html

honor among the corrupt... and they meet their terms, even when they are political enemies' (Chizzotti et al. 2012). Corruption schemes may be inhereted from previous administrations, despite the transfer of power from one party to another, with city councillors recieving monthly payments from the mayor to keep quiet.

Politics is highly fragmented in Brazil due to a proportional represention system— in our data 25 different parties had mayors elected in the municipalities of Brazil. This fragmentation makes pure majorities in the legislature almost impossible to get, and so coalitions are key to getting representatives elected and advancing a policy agenda. Four main parties dominate the political landscape in Brazil, with smaller parties generally allying themselves with larger parties according to current political issues. Parties form coalitions both for the election of both executives and legislators, with candidates running under a specific party and coalition. These political coalitions are seen by some as exacerbating the problem of corruption. Coalitions between parties are often formed based on promises to be fulfilled after the election, which could lead to fraudelent schemes in order to transfer money to party leaders as a reward. In 2015 legislation was introduced in the Brazilian National Congress to prohibit coalitions in proportional elections, but the legislation did not pass.

Brazil has an open party-list proportional system where seats are allocated according to the D'Hondt Method[10], which will be discussed later as an important part of our identification strategy. The D'Hondt Method is widely used— 44 countries[11] in the world use some form of it, principally in Europe and Latin America. The findings in this paper will have important implications for the merits of the D'Hondt Method versus alternative methods like the Webster Method[12] or the Huntington-Hill Method[13].

Brazilian municipalitites are an ideal setting to study the effect of political opposition on politician performance because we can observe a cross-section of thousands

[10]First introduced by Thomas Jefferson to allocate seats to states in the US House of Representatives, but it is most often associated with the Belgian mathematician Victor D'Hondt who introduced it a century later

[11]According to Wikipedia, these are Albania, Argentina, Armenia, Austria, Belgium, Brazil, Bulgaria, Cambodia, Cape Verde, Chile, Colombia, Croatia, the Czech Republic, Denmark, the Dominican Republic, East Timor, Ecuador, Estonia, Fiji, Finland, Guatemala, Hungary, Iceland, Israel, Japan, Kosovo, Luxembourg, Macedonia, Moldova, Montenegro, Netherlands, Northern Ireland, Paraguay, Peru, Poland, Portugal, Romania, Scotland, Serbia, Slovenia, Spain, Turkey, Uruguay, and Wales.

[12]Introduced by American statesman Daniel Webster. This method was formerly used to allocate seats to the states in the US House of Representatives.

[13]This is the method currently in use to allocate seats to states in the US House of Representatives; however, it is not currently used by any legislature to allocate seats to parties.

similar local-level governments, and because governance is highly decentralized in Brazil, meaning that local-level politics can have a large impact on important outcomes.

3 Data

3.1 Audit Data

One of the most difficult parts of studying corruption or politician effort is getting accurate and informative data. In this paper we use rich data provided by an anticorruption program in Brazil. Beginning in the year 2003, the Brazilian Federal Government began a lottery program in which every few months, municipalities from across the country would be randomly chosen to be audited with respect to all federal funds they had received in recent years. When a city is chosen by the lottery, a team of federal employees spends a few weeks in the city, inspecting receipts, budgets, bank statements, as well as the physical premises of projects targeted by federal monies, to ensure that projects have taken place. Programs audited include primary schooling, health clinics, poverty relief, and road construction. Audits are administered by the Controller-General of the Union (CGU), an agency within the System of Internal Control of the federal government's executive branch. The federal auditors are highly paid and trained professionals, and Ferraz and Finan (2008) find no evidence that they are successfully bribed by municipal governments to manipulate audit reports.

After being in the city for a few weeks reviewing documents, federal auditors write up a report (usually between 50 and 200 pages) listing all 'irregularities' pertaining to each program and service item[14] within the program, including how much money was involved in each project and service item. About 80% of funds audited are related to either health, education or social programs. We use data from audits performed during the 3 terms from 2005-2016.[15] Our data comes requested from the CGU, and lists all irregularities found in audits from the 20th to the 40th lottery.

Following classifications in Ferraz and Finan (2011), we examine 3 main types of corruption found in the reports: (1) embezzlement (diversion of funds), (2) fraud in procurement, and (3) overinvoicing. In the reports, what these respectively look

[14] A 'service item' indicates a given set of transfers from the federal government to the municipal government for a given program. This term has been used interchangebly with the term 'service order' in the literature that uses these audit reports.

[15] Terms are 4 years long

like is (1) the local government spends public money and doesn't prove where it went (presumably transferred to private bank accounts, etc.); (2) the bidding process for public projects is simulated or manipulated, either using fake firms or 'friendly' firms; or (3) government officials pay higher-than-market prices for goods or projects (and then presumably receive a kickback from the private providers). As outcome variables, we use each of these 3 types of corruption, as well an aggregate of all other irregularities not classified as embezzlement, fraud, or overinvoicing. This includes serious procedural errors and other irregularities.

In our data, we see 87,000 individual irregularities over the 1,200 audits performed from the years 2006 to 2015.[16] In order to create measures for corruption, we use regular expressions to search for words and phrases that isolate an irregularity as corruption. Details on these regular expressions can be found in the appendix in section 10.3. Given the regular expressions we use, it is clear that our fraud and overinvoicing variables are measuring corruption at some level of the government (whether the mayor directly or his or her subordinates). However, our embezzlement variable measures situations in which money was spent by the municipal government and there are no receipts or documents showing that the money was actually spent as specified, thus opening the way for diverting public resources for private purposes. So while we cannot conclude that every such circumstance was a case of embezzlement, there is evidence (presented in the results section) that at least a significant portion of them are.

Audit reports are subdivided by ministry (of health, education, etc.) and then by service item, and the CGU classifies each irregularity as either 'major' or 'minor' based on potential monetary losses to the government. Our main corruption outcome variables will be the amount of service items found to have been involved in each type of corruption that were defined as 'major' irregularities by the CGU. The variable 'Total Corruption' is the sum of irregularities associated with embezzlement, fraud, or overinvoicing, for each municipality. Summary statistics are provided in table 1.

[16] We omit the data from lotteries 29 and 30 because these audits happened in the second half of the first year of a term, making it unclear if corruption findings are due to the current or previous administration. Corruption found in audits performed in the first 6 months of a term are attributed to the previous administration.

Table 1: Audit Data Summary Statistics

	count	mean	sd	min	max
Total Audit Service Items	788	24.01269	9.552229	7	95
Total Corruption	788	.8109137	1.598453	0	13
Embezzlement	788	.2525381	.7634811	0	8
Fraud	788	.2918782	.8910597	0	8
Overinvoicing	788	.3274112	.9977917	0	12
Other Irregularities	788	3.332487	3.435536	0	30

Each variable is the count of audit service items where the given type of irregularity was found, differentiated for major and minor irregularities (as classified by the CGU).

The sample is municipalities that fit the requirements for the RD design (detailed in section 4.1).

3.2 Public Service Provision Data

When the CGU sent auditors to inspect documents for the program outlined above, they also surveyed local residents to assess the quality of public service provision, particularly to assess the quality of Brazil's Family Health Plan (*Programa Saúde da Família*). A high fraction of healthcare in Brazil is provided by the government (Family Health Plan covers over 90% of Brazilians) and is implemented at the local level. For the poor of Brazil, Family Health Plan is generally their only way to receive care. If public funds are being stolen, municipal health clinics will be underfunded and will not be able to provide people with proper healthcare. Similarly, if the municipal government is exerting low effort, healthcare providers may not be hired or incentivized to come to work, and people will not recieve care.

In each municipality, CGU auditors picked a random sample of residents to interview (22 families on average) and asked a series of questions relating to the quality of care received at local health clinics. In addition, this dataset also has nonsurvey data in which the auditors assessed the quality of public service provision based on documentation provided by the local government, including if Community Health Agents (CHA)[17] had been hired by irregular means. The questions asked are shown in table

[17]Community Health Agents in Brazil are government employees (within the Brazilian Unified Health System) with only basic healthcare training and report to a physician or nurse. They are generally selected from members of the community and make regular visits to families and promote good health.

16 in the appendix and summary statistics are provided in panel A of table 2.

Table 2: Healthcare Data Summary Statistics

Panel A: Survey Data					
	count	mean	sd	min	max
Nurse Present	5334	.9478815	.2222868	0	1
Dentist Present	4386	.7763338	.4167484	0	1
Physician Present	5359	.8303788	.3753347	0	1
Irregular Hiring	487	.3326489	.4716465	0	1
Lines at Health Unit	5278	.5617658	.4962173	0	1
CHA Visits	6730	.9257058	.2622686	0	1
Panel B: DATASUS Data					
Preterm Rate, Uned	45191	8.960052	7.841882	0	100
Infant Mort. Rate, Uned	45192	14.76405	30.48358	0	2000
Preterm Rate, Educ.	45258	8.147874	5.623468	0	100
Infant Mort. Rate, Educ.	45260	8.873812	17.66823	0	1000

All variables in panel A are binary variables indicating the respondent's answer to the questions in table 16. Sample sizes differ slightly by variable because some respondents may not have needed to see each type of medical professional during their last visit. The 'Irregular Hiring' variable has much lower sample size because it is based on responses of auditors rather than survey respondents. Panel B contains infant health indicators for uneducated and educated mothers. Preterm rate is the fraction of births born before 37 weeks, infant mortality rate is the number of infant deaths per 1000 live births.

3.3 Health Outcome Data

If poor politician performance has an adverse affect on public service provision, we may expect to see some negative effect on outcomes that these public programs are targeted at. Thus, we investigate the effect that the marginal opposing city counselor has on two infant health outcomes: fraction of infants born preterm (before 37 weeks) and the infant mortality rate per 1000 live births. We obtain this data from DATASUS, the data arm of Brazil's Unified Health System (*Sistema Único de Saúde*), the system that implements the Family Health Program. One advantage of this dataset

is that unlike the CGU data, this data is available for every year in our sample and almost every municipality in Brazil (around 5,500). Thus we have a very high sample size and thousands of clusters.

Underfunding of Brazil's Family Health Program is most likely to affect low-income families who depend on it for their healthcare (wealthier families can seek private care). While health outcomes are not available by income level, they *are* available by education level. Thus, we classify mothers who received 1-7 years of schooling as 'uneducated' and mothers who received 8+ years of schooling as 'educated'.[18] In our data 34% of births are to uneducated mothers, 64% are to educated mothers, and 2% of mother's education levels are unreported. Summary statistics are in panel B of table 2.[19]

3.4 CPI

We constructed the dataset on the creation of CPIs by searching on Google for any news reporting the creation of a CPI[20] in a municipality between the years of 2013 and 2016[21]. To limit the scope of this data collection, we follow Cattaneo et al. (2015) and use a data-driven method of determining the bandwidth around which treatment can be considered as if random. The method basically amounts to performing balance checks for a vector of covariates with successively smaller bandwidths until you can fail to reject that all the covariates are balanced at a conservative level. We performed these checks using the 12 covariates that we use as placebo test in Table 4 and arrived at a bandwidth that includes 674 municipalities.

[18] This is similar to the classification in Fujiwara (2015), though Fujiwara classifies 'uneducated' mothers as recieving 1-9 years of schooling. Though it may be ideal to reuse Fujiwara's classification, education level data for mothers is only provided in bins, and the Brazilian government reported the data in different bins during the period we study.

[19] While only 2% of mother's education levels are unreported for births, 35% of mother's education levels are unreported for infant deaths, leading to some measurement error for the infant mortality rate for educated or uneducated mothers. We assume this is because healthcare workers are in general less preoccupied with gathering this information from a mother after she has lost her infant, regardless of her educational attainment. However, even *if* lower education mothers are more likely to have their education levels unrecorded, our RD design still ensures that this measurement error is uncorrelated with regressors, and thus it will not bias our estimates.

[20] We did not include CPIs that explicitly investigated only acts of legislators and not the executive.

[21] We focus on the most recent mayor term because it is the easiest one to find news report online

3.5 Election Data

We observe data on all candidates, parties, coalitions, votes received, and seats won, for the 2004, 2008, and 2012 Brazilian municipal elections. This data is available on the website of the Superior Electoral Court of Brazil (TSE).

The summary statistics in table 3 paint a picture of what the average city council looks like. We can see that on average the city council has 9.3 seats and that there are about 4.6 different coalitions of parties competing for votes. While various separate coalitions may compete with one another in the elections for city council, multiple coalitions sometimes unite into one super-coalition for the election of a single candidate for mayor. Thus the average mayor has 1.8 coalitions that supported him or her in the election. On average the mayor's coalition wins 4.8 of the seats in the city council, and as we can see from table 21, the typical mayor's coalition is the highest ranked coalition in terms of vote share. As seen in figure 10 in the appendix, in the bulk of municipalities, the opposing coalition has between 33% and 55% of the seats.

Table 3: Election Data Summary Statistics

	RD Sample	Non-RD Sample	Diff.
Tot. City Council Seats	9.311	9.344	-0.033
	(1.963)	(1.562)	(0.053)
Second Term	0.279	0.315	-0.037^{**}
	(0.448)	(0.465)	(0.015)
Mayor's Coalitions's seats	4.767	5.35	-0.583^{***}
	(1.548)	(2.319)	(0.069)
Num. Coalitions in Municipality	4.654	5.12	-0.466^{***}
	(2.5)	(2.576)	(0.082)
Num. Coalitions Supporting Mayor	1.852	2.165	-0.313^{***}
	(1.105)	(1.316)	(0.041)
Mayor Coalition Rank	1.462	1.449	0.013
	(0.818)	(0.805)	(0.026)
Anti-Mayor Coalition Vote Share	50.688	45.62	5.068^{***}
	(14.251)	(21.451)	(0.64)
Opposition Seat Share	0.484	0.425	0.059^{***}
	(0.155)	(0.236)	(0.007)
T	0.505	.	.
	(0.5)	.	.
R	0.001	.	.
	(0.011)	.	.
	4192	1275	.

Full sample for 2004 election year (the year corresponding to most of the audit data). Means are presented in the main row, standard deviations/errors are below in parenthesis.

As will be discussed below, the RD design is only valid for a subset of our data. For example, in some municipalities the marginal seat in the city council may just be passing from one anti-mayor coalition to another, or from one pro-mayor coalition to another. Thus, the concept of being on the margin is not valid. These municipalities are dropped from the analysis, and in table 3 as well as table 14 (in the appendix), we compare the characteristics of the RD sample and the non-RD sample. As can be seen, municipalities in the RD sample have slightly fewer coalitions overall. This is expected given the criteria for dropping municipalities from the analysis. When there are fewer

coalitions, it is more likely that the marginal seat is passing from a pro-mayor party to an anti-mayor party (or vice-versa), validating the RD design. Because there are less coalitions overall in the RD sample, there are slightly fewer coalitions supporting the mayor and fewer seats occupied by pro-mayor city councillors. Municipalities in the RD sample are also slightly less likely to have a radio or TV station originating from the municipality, have lower average incomes and urbanization rates, and have higher illiteracy rates.

4 Theoretical Framework

We present here a simple two-period model[22]. There is one voter (v), one incumbent mayor (m_a), one challenger (m_b) and two legislature candidates (l_a and l_b) each coming from a party a or b. All agents want to maximize the discounted sum of their utilities:

$$U_i = u_{i1} + \delta u_{i2} \tag{4.1}$$

The voter has to elect a legislator in the first period and a mayor and a legislator in the second period. The utility of the voter is $u_v = \theta - C$ if he elects a mayor and a legislator from the same party[23](henceforth, we will call this an unified government) or $u_v = \theta - C - D$ if he elects a mayor and a legislator from different parties (henceforth, we will call this a divided government). θ is a random shock with a uniform [0,1] distribution, C is how much the elected mayor decided to steal and D is a loss of utility from having a divided government. D captures the idea that if the voter did not worry about corruption he would always choose one of the parties to control both branches of government to avoid gridlock or any other negative consequence from divided government. Voters don't observe θ but observe C with probability r.

There are two types of mayoral candidates: corrupt (c) and non-corrupt (nc). The probability of a mayor from party a being corrupt is p and from party b been corrupt is $p\prime$, with $p < p\prime$ and $\frac{2p}{p+1} < p\prime$. Corrupt mayors have a utility $u_{cm} = E + C - B$ if elected and zero otherwise. Non-corrupt mayors have utility $u_{ncm} = E$ if elected and zero otherwise. E is a ego rent politicians enjoy if elected; $C \in \{0, \bar{c}\}$, with $\bar{c} < 1$,is how much corruption rent the elected mayor extracts and $B \in [0, C]$ is how much the elected mayor gives to the legislature as bribe. Hence, by the very definition of his

[22]This maps directly to the fact that mayors can only serve two consecutive terms in Brazil.
[23]m_a and l_a or m_b and l_b

utility, a non-corrupt mayor does not extract rents.

Finally, the utility of legislators is $u_l = V + B$ if elected and zero otherwise. V is an ego rent legislators enjoy if elected and B is how much bribe they accepted from the politician.

The timing of the game is as follows:

1)Nature draws the type of the incumbent (M_a) and the challenger (M_b) .

2)The voter elects a legislator.

3) Nature draws θ .

4)The incumbent mayor observes θ and chooses the pair (B_o, C), where B_o is the bribe offer to the legislator.

5)With an exogenous probability the pair (B_o, C) is revealed to the voter.

6) The elected legislator observes (B_o, C), if $C > 0$ he can report C to the voter[24] or take no action. If he reports the mayor, he cannot accept the bribe and $B = 0$, if he does not report the mayor, he accepts the bribe and $B = B_o$. If $C = 0$ the legislator has no action to take.

7) Voters observe their utility. They also observe C if it was exogenously revealed or reported by the legislators.

8) Voter decide whether to reelect the mayor or the legislator.

9) Repeat steps 3 to 6.

There are 4 important features of the model that will drive the results in a perfect bayesian equilibrium[25]. First, voters will kick an incumbent out of office if they think he is more likely to be corrupt than the challenger because a corrupt mayor will always extract rents on the last period when there is no reelection incentive. Second,

[24]This reporting is based on hard evidence, he cannot lie about C.

[25]The results discussed here are derived in Appendix B.

in equilibrium, voters always want to form a unified government in the last period. The intuition is simple, in the model, divided government is costly for voters and the only reason to implement it is to restrain corruption. But in the last period a corrupt mayor will always engage in corruption regardless of who controls the legislative branch. Hence, if we have a unified government in the first period , the only way a legislator can get reelected is if the mayor gets reelected and, under a divided government, the only way a legislator gets reelected is if the mayor is kicked out of office.

This brings us to the third important feature in the model. Since,under a unified government, the reelection of the legislator is completely tied to the reelection of the mayor, he will never reveal any wrongdoings of the mayor because this would get the mayor kicked out of office along with him. On the other hand, under a divided government, the reelection of the legislator is tied to the incumbent mayor been kicked out of office. Hence, he will reveal any wrongdoing of the mayor unless the bribe offered by the mayor is high enough so that he is willing to forgo his reelection.

Finally, mayors of a corrupt type might want to behave as non-corrupt mayors to get reelected. The degree to which they will do that depends on the oversight mechanisms in place. In equilibrium, under a unified government, a mayor can engage in corruption and still get reelected. This happens because voters can't tell if a mayor is stealing money in good times (high θ) and legislators never report abuses of the mayor. On the other hand, under a divided, legislators will always report corrupt mayors unless there is enough money to bribe them. Therefore, corrupt mayors that value reelection enough will be less likely to engage in corruption under a divided government. Moreover, if a mayor does not value reelection enough, he will engage in corruption regardless of the type of government. But, under a divided government, he will be reported and kicked out of office while in a unified one he will not be reported.

Therefore, municipalities with a first term mayor and opposition legislators in the council are more likely to have investigations launched into the mayor's actions and are less likely to have corruption episodes.

5 Econometric Model

5.1 Constructing the Running Variable

In order to identify causal effects we use a regression discontinuity (RD) model which exploits close elections.[26] As a key part of our RD model we construct a running variable that serves as a measure for how close a given election was. We use detailed knowledge of Brazil's electoral system in order to construct this running variable. Brazil has an open party-list proportional system, with seats allocated according to the D'Hondt Method and with coalitions treated as single parties. In order to illustrate how the D'Hondt Method works, consider the following example.

Imagine three different coalitions are competing for 6 seats in a fictional city council. The coalition of parties A & B receives 100,000 votes, the coalition of parties C & D receives 80,000 votes, and party E, which is running as an isolated party, receives 20,000 votes. The first thing that is done is that the 'electoral quotient' is calculated, which is the total amount of votes cast divided by the number of seats available. In our case, the electoral quotient is $(100,000 + 80,000 + 20,000)/6 = 33,333$. Only coalitions whose raw vote count exceeds the electoral quotient are eligible to be awarded seats. Thus, party E is already disqualified from winning seats, since it only received 20,000 votes. After this, a series of quotients is calculated, according to the formula

$$Q_s = \frac{V}{s+1}$$

where V is the total of votes the party received and s is the round of calculation (or number of seats already awarded to the party). In an election where n seats are available, coalitions are awarded 1 seat for each quotient they have among the highest n quotients.

This is illustrated in the table below, where both coalitions from the example above have been awarded 3 seats, since both have 3 quotients among the top 6 quotients.

[26] For identification of causal effects using the RD design see Hahn, Todd, and Van der Klaauw (2001). For a primer on RD see Imbens and Lemieux (2008).

D'Hondt Method Example (6 seats available)

	Q_0	Q_1	Q_2	Q_3	Q_4	Seats Won
Parties A+B	$100,000^*$	$50,000^*$	$33,333^*$	25,000	20,000	3
Parties C+D	$80,000^*$	$40,000^*$	$26,666^*$	20,000	16,000	3
~~Party E~~	~~20,000~~	~~10,000~~	~~6,666~~	~~5,000~~	~~4,000~~	0
Note: Asterisks denote quotients in the top 6.						

we will construct the running variable for our sharp RD design as the margin of victory (or loss) for last elected city council member of the anti-mayor coalition, scaled by the total amount of votes cast.

In theory, each municipality has a series of cutoffs for each possible seat that can be won (the typical city council has 9 seats, though large cities generally have more), but we observe at most 2 of these cutoffs. By this we mean that we can look at the margin by which the anti-mayor coalition barely won its last seat, and we can look at by how much they just missed winning another seat. Because our dataset is not large enough to precisely estimate the treatment effect at each individual threshold (the effect of the 1st, 2nd, or 3rd opposing city councillor and so on), we stack all of the thresholds and our estimated treatment effect is a weighted average of the treatment effect at various thresholds (as discussed in Cattaneo et al., 2016) rather than the treatment effect at a single threshold. However, this presents a small problem—choosing which side of the cutoff a municipality is on. As a simple solution to this problem, we calculate the running variable for both theoretical margins (the 'barely lost' and the 'barely won' margins) and choose the value with the lowest absolute value. In other words, we put the municipality on the side of the cutoff it is closest to. The running variable R_i is formally defined as

$$BL_i = \frac{ResQ_{anti-mayor,i} - LowW_{mayor,i}}{TotVotes_i}$$
$$BW_i = \frac{LowW_{anti-mayor,i} - ResQ_{mayor,i}}{TotVotes_i}$$

$$R_i = \begin{cases} BL_i & \text{if} \quad |BL_i| < |BW_i| \\ BW_i & \text{if} \quad |BL_i| \geq |BW_i| \end{cases}$$

- BL - The 'barely lost' margin
- BW - The 'barely won' margin
- $ResQ_{c,i}$ - Residual Quotient (Highest quotient that did not win a seat) for coalition c in municipality i
- $LowW_{c,i}$ - Lowest quotient that won a seat for coalition c, municipality i

In practice, there are often 3 or more coalitions in the legislative election, rather than just a pro-mayor and an anti-mayor coalition. We make the simplifying assumption that parties that are not formally allied with the mayor in the election coalitions are against him or her, and are considered the political opposition.

We drop observations from the analysis if they meet any of the following criteria:

- The residual quotient and the lowest winning quotient are from the same coalition, and thus the concept of 'being on the margin' is no longer valid. This happens when the marginal seat is passing from one anti-mayor coalition to another, or from one pro-mayor coalition to another. (25% of obs)
- The municipal legislatures seem to have disregarded the standard election procedure (following the D'Hondt Method). This is seen in the data when the quotients we calculate from vote totals do not acurately predict the amount of seats awarded to each party. This could also happen due to a gap in coalition data or an electoral tie (1.5% of obs)
- Coalitions are such that two parties are allied in the election for city councillors but not in the election for mayor. (1.5% of obs)

Figure 1 shows the variation that this identification strategy in generating. On average, on the left side of the discontinuity the opposition represents 45% of the local council, whereas on the on the right side of the discontinuity it represents 55%. Notice that beyond just increasing the opposition share in the council, on average our variation also flips the opposition from minority to majority on the council.

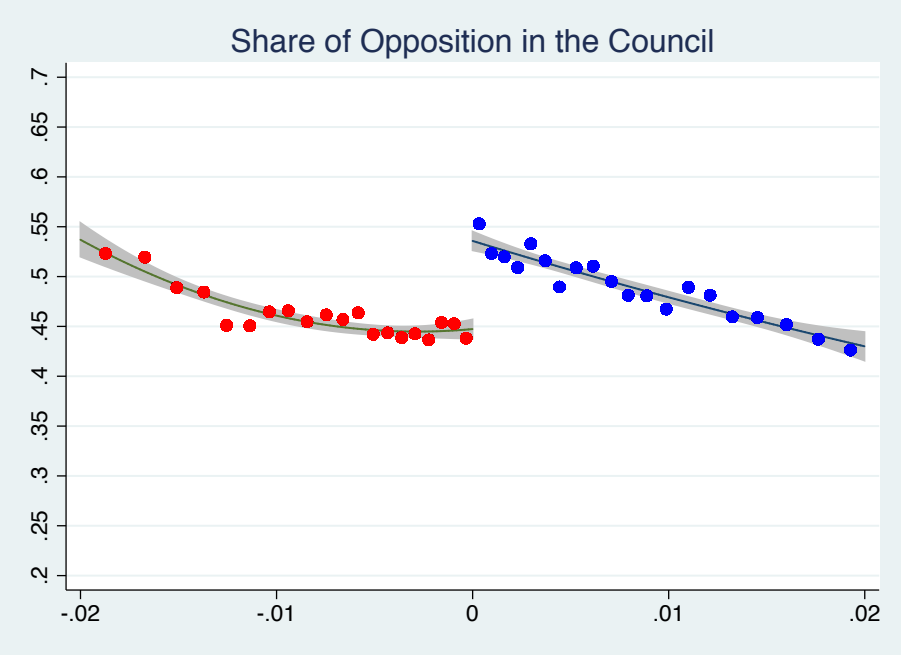


Figure 1: Share of Opposition in the Council

Notes: Here we present the RD plots for particular outcomes of interest. These plots present equally sized bins with means of the dependent variable inside each one. It also present the prediction for the dependent variable from a regression of the dependent variable on the running variable and on the running variable squared and plots the resulting line along with a 95% confidence interval.

5.2 RD Design: Smoothness and Balance Tests

The key assumption for RD to be valid is the smoothness or 'no precise manipulation' assumption. We test for manipulation of the running variable using the test outlined in McCrary (2008) and using the local polynomial methods put forth in Cattaneo, Jansson, and Ma (2017). We find no evidence of manipulation, failing to reject the null hypothesis of no manipulation with a p-value of 0.97. Figure 2 presents visual evidence of this.

As additional evidence for the validity of the RD design, in table 4 we present results from placebo tests, estimating the effect of treatment on a variety of municipal characteristics where no treatment should be found. Consistent with the validity of the RD design, there are no significant effects found.

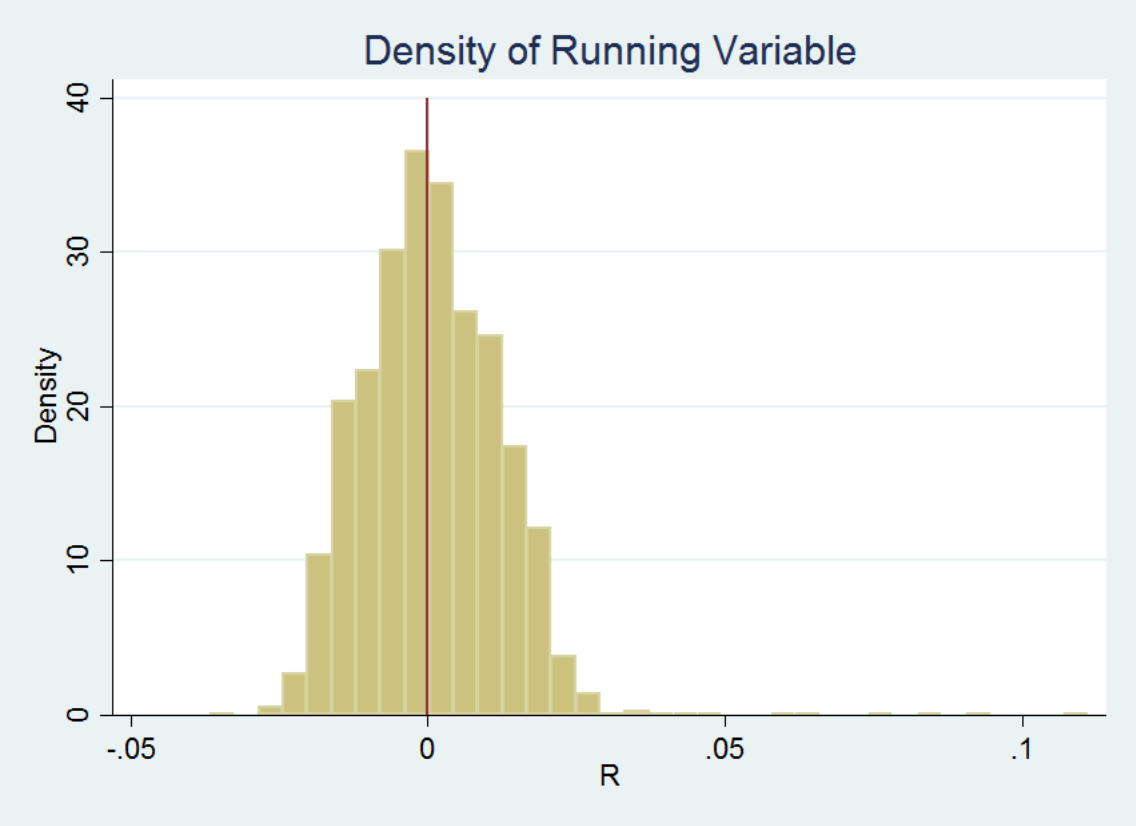


Figure 2: Density of the running variable (margin of victory/loss for the marginal legislator politically opposed to the mayor). Using McCrary's (2006) density test, we find no evidence of manipulation of the running variable.

Table 4: Placebo Tests

	2nd Term Mayor	City Council Wage	AM Radio	TV Station
T	-0.0588	131.9	-0.00603	-0.0298
	(0.0532)	(107.4)	(0.0406)	(0.0342)
Observations	2688	3577	3256	2791
	Judiciary District	Avg. Monthly Inc.	Illiteracy Rate	Urb. Rate
T	-0.0449	10.29	0.0672	-3.352
	(0.0552)	(22.86)	(1.091)	(2.124)
Observations	2632	2529	2643	3287
	Pop. 2010	City Council Size	Tot. Votes Cast	Audited Before
T	6176.6	-0.155	3986.0	0.0170
	(25633.0)	(0.223)	(13201.7)	(0.0530)
Observations	3125	3167	3172	2652

Effect of the marginal opposing legislator using a cross section of all municipalities from the 2004 election year. CCT optimal bandwidth, uniform kernel, standard errors in parenthesis.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.3 Effect on Corruption

With this running variable we estimate a series of sharp RD models. The first model, which estimates the effect of political opposition on various measures of corruption, can be written

$$c_{m,t} = \alpha_1 + \alpha_2 T_{m,t} + \alpha_3 f(R_{m,t}) + \alpha_4 f(R_{m,t}) * T_{m,t} + \varepsilon_{m,t} \tag{5.1}$$

for municipality m during term t.[27] Where $c_{m,t}$ is the amount of corrupt violations found in the municipality, the function $f(*)$ is a polynomial specification for the running variable, and $T_{m,t} = I[R_{m,t} > 0]$ denotes treatment status. Thus, α_2 is the main parameter of interest. For each outcome, we report in section 6 our preferred specification in tables (using the CCT optimal bandwidth from Calonico, Cattaneo, and Titiunik (2014) and a quadratic polynomial specification), and in section 10 in the appendix as a robustness check, we report a number of alternate RD specifications,

[27] A small number of municipalities were audited twice in the same term. In this case we only consider the first audit report.

varying the bandwidth and polynomial order. In the appendix we also report CCT's bias-corrected and robust variance estimates from Calonico, Cattaneo, and Titiunik (2014).

In the framework of Cattaneo et al. (2016), who provide conditions for interpreting regression discontinuity designs with multiple cutoffs, we have a pooled sharp RD with cumulative cutoffs. Cutoffs are cumulative in the sense that depending on opponent coalition's total vote share, units receive different treatments (an additional opposition legislator when the opposition has only 1 seat in the council represents a different percetentage change in opposition than when it has 8 seats). Due to the cumulative nature of the cutoffs, while Cattaneo et al.'s score ignorability assumption may hold, it is unlikely that cutoff ignorability will hold. Becuase of this, our estimator can be interpreted as a weighted average of the treatment effect at various cutoffs (and hence at various marginal opposing legislator levels).[28]

Figure 3 illustrates somewhat the variation from which we are identifying the treatment effect. Particularly, it shows how this estimator can be seen as a weighted average at various levels of voter preference, because we have data close to the cutoff for a variety of total anti-mayor coalition vote shares.

[28]To visualize what the weights roughly are, see figure 10 in the appendix.

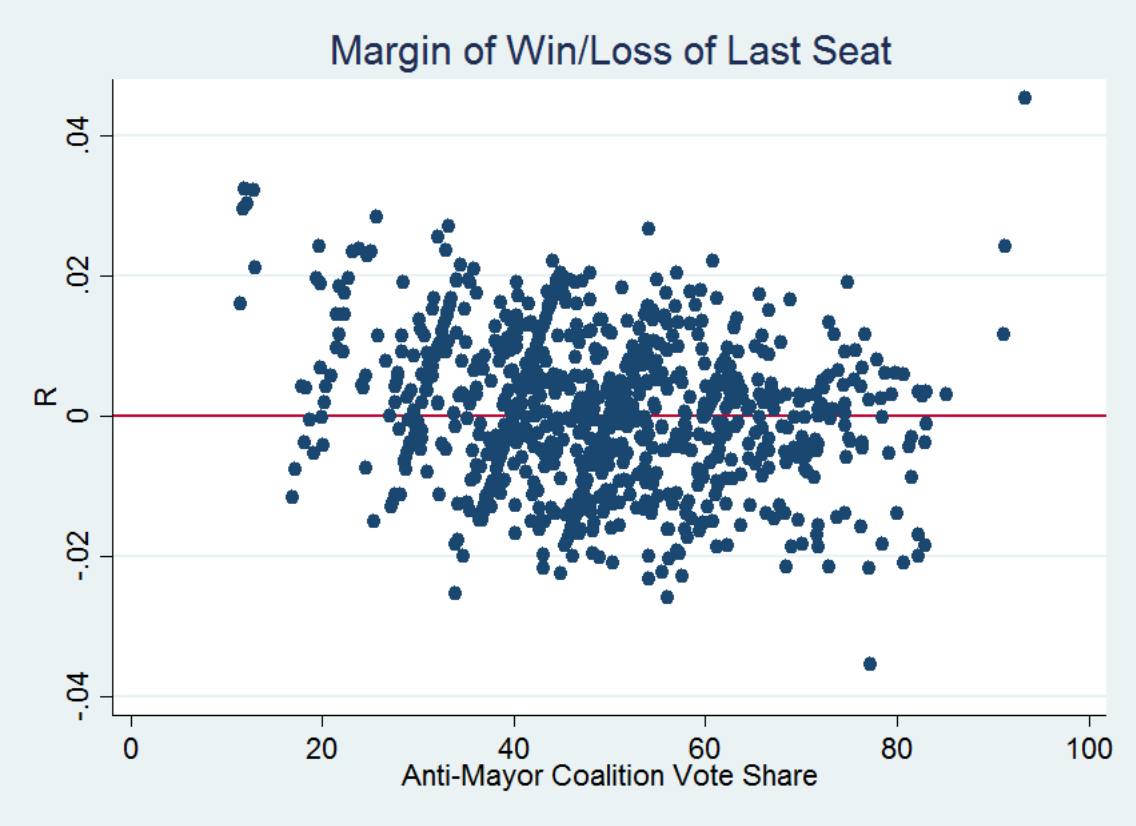


Figure 3: This figure illustrates that the estimator is a weighted average of the treatment effect at a variety of thresholds (voter preference levels). The faint pattern of upward-sloping lines comes from municipalities where there were only 2 coalitions, in which case vote share maps 1-to-1 into the running variable for a given disputed seat in the legislature.

5.4 Effect on Public Service Provision

The second model estimates the effect of political opposition on the quality of public service provision. This model differs from the first model in that we now observe data at the individual level rather than the municipality level, also it is done as a linear probability model, since survey answers are yes/no answers. The model can be written

$$ps_{i,m,t} = \beta_1 + \beta_2 T_{i,m,t} + \beta_3 f(R_{i,m,t}) + \beta_4 f(R_{i,m,t}) * T_{i,m,t} + \epsilon_{i,m,t} \tag{5.2}$$

for individual i in municipality m during term t. Where $ps_{i,m,t}$ is an indicator for the respondent answering 'yes' to a given question relating to public service provision, and now β_2 is the main parameter of interest. In this model standard errors are

clustered at the municipality level. Once again, we report in tables our preferred specification and the appendix contains a variety of robustness checks. It should be noted that this model does not limit the channel through which political opposition may affect public service provision. Political opposition may improve public service provision by a decrease in corruption, an increase in politician effort, or by other means, but based on our estimates of equation 5.1, it seems likely that corruption is at least a major channel.

5.5 Effect on Health Outcomes

The third model estimates the effect of the marginal politicaly opposed legislator on various health outcomes. In this model we again observe municipalities, though this model differs from the first model in that now we observe data for each year within an electoral term. The model can be written

$$h_{y,m,t} = \gamma_1 + \gamma_2 T_{y,m,t} + \gamma_3 f(R_{y,m,t}) + \gamma_4 f(R_{y,m,t}) * T_{y,m,t} + u_{y,m,t} \tag{5.3}$$

for municipality m in year y during term t. Where $h_{y,m,t}$ is a health outcome measure and now γ_2 is the main parameter of interest. In this model standard errors are also clustered at the municipality level. Tables contain our preferred specification and the appendix contains alternate specifications to test robustness.

6 Results

6.1 Effects on Legislative Oversight

We first show results for the most immediate outcomes: whether the president of the city council belongs to the opposition and whether a CPI investigation was opened by the city council. For the control of the city council (whether or not the council president is a member of the mayor's coalition), we use the RD model outlined above and find that flipping one city council member from pro-mayor to anti-mayor increases the likelihood that the city council will be controlled by an opposition legislator by 14 percentage points, amounting to a 43% change in probability. This is unsurprising given that most city councils have 9 seats, and thus, treatment entails an 11.11 percentage point change in composition. Figure 4 presents the corresponding RD plot.

Next we examine the effect that the marginal opposition legislator has on the probability that the mayor will be investigated for wrongdoing using a CPI. As outlined in section 3.4, in order to limit the scope of our data collection, we use the algorithm outlined by Cattaneo, Frandsen, and Titiunik (2015) in order to find the bandwidth around which treatment can be considered random, and we regress treatment on CPI opening for only this bandwidth. Here we find that the marginal opposition legislator increases the likelihood of a CPI investigation by about 6 percentage points, amounting to a 55% increase in the likelihood of an investigation.

Table 5: Effect of Opposition on Council Functioning

	Opposition Council President	CPI Opened
Mean	.322	.1086
T	0.140***	0.0596**
	(0.0459)	(0.0264)
Observations	3216	674

Effect of the marginal opposing legislator. S.E. in parenthesis.
For 'Opposition Countil President', we use the RD estimator and the mean reported is the overall mean. For 'CPI Opened', we use the randomization algorithm outlined in Cattaneo, Frandsen, and Titiunik (2015), and the mean reported is the control mean.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

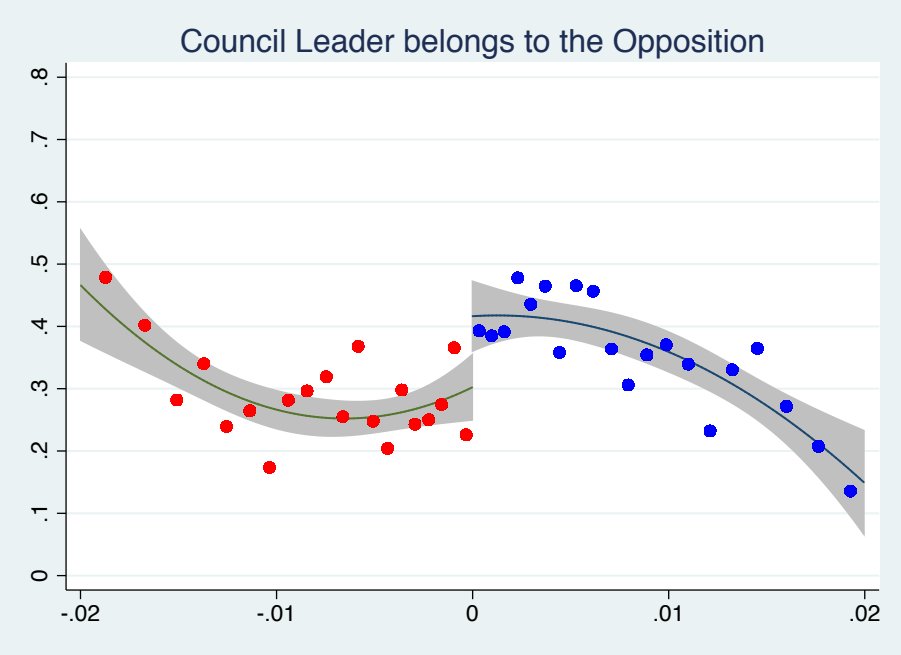


Figure 4: Council Leader Belongs to Opposition

Notes: Here we present the RD plots for particular outcomes of interest. These plots present equally sized bins with means of the dependent variable inside each one. It also present the prediction for the dependent variable from a regression of the dependent variable on the running variable and on the running variable squared and plots the resulting line along with a 95% confidence interval.

6.2 Effect on Corruption

Our estimates for the treatment effect in equation 5.1 are reported in table 6. Here we see that when the mayor faces reelection incentives (first term mayors), the marginal politically opposed legislator can decrease the amount of items audited found to have corruption by approximately 1.353 items, which amounts to a 1.77 decrease in standard deviation units. Figure 5 presents the corresponding RD plot. This effect is driven largely by embezzlement, which is decreased by .889 items. This is a sizable effect given that the average municipality only has 1.6 items audited found to be involved in some type of corruption.[29] Note that there is no significant effect on 'Other Irregularities', evidence that our embezzlement variable is indeed measuring cases of embezzlement and not mere procedural errors.

Compared to the effect on embezzlement, the effects on fraud and overinvoicing are small, in addition to being statistically insignificant. Going back to the discussion in section 2, this is evidence that the legislative branch can restrain the executive branch's rent-seeking through its auditing responsibilities, but not through its

[29]For municipalities where corruption was found, the average is 2.8 items found to be involved with some type of corruption.

lawmaking responsibilities. Restraining the executive from transferring money from government bank accounts to his or her own private bank account is fairly straightforward as long as the city council requires that the mayor and his secretaries provide receipts and other documentation for all expenditures they make. However, knowing which public projects proposed by the mayor are likely to be fraudulent may be more difficult. These findings also run contrary to the idea that corruption in Brazil is completely institutionalized, independent of party affiliation.

These results are robust to a variety of alternate specifications as shown in the appendix in section 10.

Table 6: Corruption Outcomes, First Term Mayors

	Total Corruption	Embezzlement	Fraud	Overinvoicing	Other Irreg.
T	-1.353**	-0.889***	-0.329	-0.270	0.443
	(0.578)	(0.296)	(0.309)	(0.279)	(1.065)
Obs	244	260	294	329	352

Treatment effect of the marginal opposing legislator on corruption, using the CCT optimal bandwidth and a uniform kernel. Standard errors in parenthesis. Outcomes are the count of items audited with a violation. Other irregularities captures all other irregularities found by auditors that were not classified as embezzlement, fraud, or overinvoicing, and includes a host of procedural and other errors.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Next, we briefly examine the effect of political opposition on corruption by government sector. In our audit data the largest 3 sectors in terms of irregularities are the ministries of Health, Education, and Social Development, together making up 85% of the irregularities discovered by auditors, with various other ministries making up the remainder. For this analysis we again estimate the model from equation 5.1, but using the total corruption variable differentiated for these 3 different sectors of the government. In table 7 we find that effect of political opposition on corruption is largely concentrated in the health sector, with some evidence of effects in the education sector. This motivates the next section of our analysis, in which we estimate the effect of political opposition on healthcare provision and health outcomes.

Table 7: Total Corruption by Government Sector, First Term Mayors

	Ministry of Health	Ministry of Education	Ministry of Social Dev.
T	-0.907***	-0.470*	0.0259
	(0.314)	(0.273)	(0.103)
Observations	260	297	307

Treatment effect of the marginal opposing legislator on total corruption, estimated by government sector. We use the CCT optimal bandwidth and a uniform kernel. Standard errors in parenthesis. Outcomes are the count of items audited with a violation for each sector.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

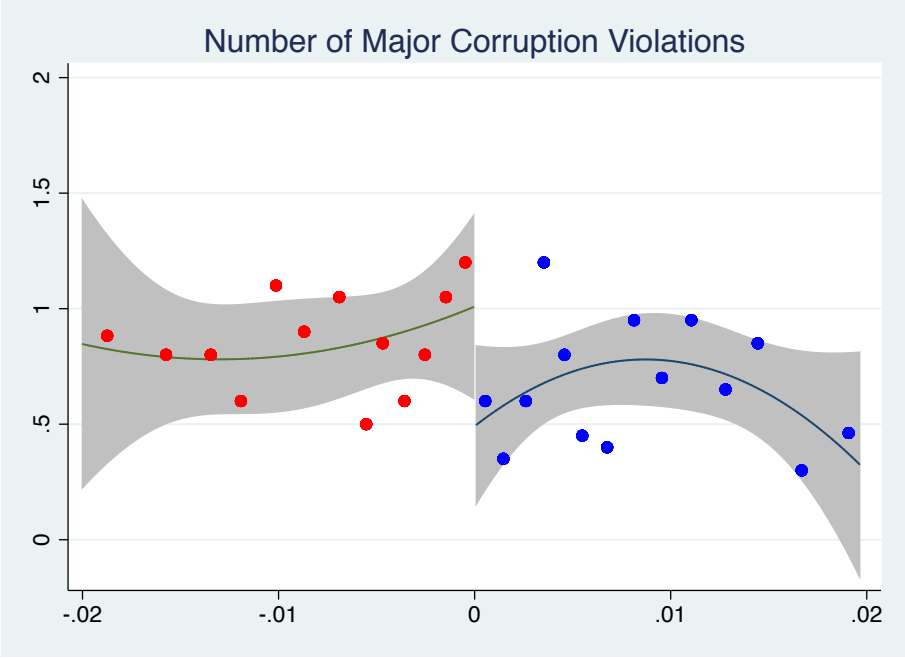


Figure 5: Total Corruption, Major Violations

Notes: Here we present the RD plots for particular outcomes of interest. These plots present equally sized bins with means of the dependent variable inside each one. It also present the prediction for the dependent variable from a regression of the dependent variable on the running variable and on the running variable squared and plots the resulting line along with a 95% confidence interval.

6.3 Effect on Healthcare Provision

If the marginal politically opposed city councillor can decrease the amount of healthcare money embezzled by the executive branch, we may hope that the money not being stolen is finding its way to the programs it is meant for. Complementary to this, there may be some direct effect of higher politician effort on public service provision. Thus, we now examine the pass-through effects on public service provision, particularly healthcare. In Brazil a large amount of healthcare is provided by the government, with local health clinics staffed by physicians, dentists, and nurses. If

money is being stolen from public coffers, local governments will be cash-constrained and may be unable to hire the adequate amount of healthcare professionals, or unable to pay the professionals they have already hired. Approximately 51% of physicians in Brazil work in both the public and private sectors.[30] If these physicians are unpaid for their public work because of missing funds, they will likely substitute towards their private practice, leaving the public clinics understaffed and unable to provide care to those who depend on Brazil's public healthcare. Additionally, it may be that mayors with more opposition in the city council exert higher effort in assuring that health clinics are adequately staffed. We examine this effect on public service provision in table 8, which contains our estimates for the treatment effect from equation 5.2. Becasue of our small amount of clusters in the healthcare provision data, in this table we pool first and second term mayors together.

Estimates in panel A of table 8 suggest that flipping a city counselor from being allied with the mayor to being opposed to the mayor results in a 34 p.p. increase in the likelihood a dentist will be present to see patients, and a 28 p.p increase in the likelihood that a physician will be present to see patients. Figure 6 presents the corresponding RD plots.

Results in panel B show that political opposition also improves public services by decreasing the likelihood that patients will have to wait in lines to recieve care at local health units (resulting in a 40 p.p decrease in probability), and decreasing the likelihood that the municipal government uses irregular hiring practices for healthcare professionals (while the coefficient is not interpretable due to the steep slope of the regression function, it is clear that there is a large effect).

In recent years, Brazil has experienced a significant shortage of physicians at public health clinics. There are various news articles documenting this (Falcão and Amorim; 'Postos de saúde') and the Brazilian Federal government has responded with an ongoing federal program which started in 2013, *Mais Médicos* (More Doctors), which is aimed at recruiting more physicians for public health clinics, including importing them from other countries. Experts cited in these news articles suggest that this public sector shortage of physicians could be due to underfinancing of the public health system. Our results confirm this and suggest that a significant share of the physician shortage in the public sector could explained by missing funds due to corruption, and that much of this corruption could be stopped by legislators who will fulfil their

[30] Meanwhile 27% work exclusively in private medicine and 22% work only in public medicine (Scheffer M. et al. 2015).

oversight responsibilities.

Table 8: Public Service Provision, First and Second Term Mayors

Panel A: Presence of Healthcare Professionals			
	Nurse Present	Dentist Present	Physician Present
T	0.150	0.339**	0.277**
	(0.128)	(0.139)	(0.128)
Observations	2711	2233	2751
Clusters	127	121	130
Panel B: Community Health Agents and Lines			
	Irregular Hiring	Lines at Health Unit	Healthcare Visits
T	-1.055***	-0.402**	-0.0369
	(0.256)	(0.170)	(0.0487)
Observations	243	2439	2482
Clusters	74	119	117

Treatment effect of the marginal opposing legislator on public service provision outcomes, using the CCT optimal bandwidth and a uniform kernel. Clustered standard errors in parenthesis.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

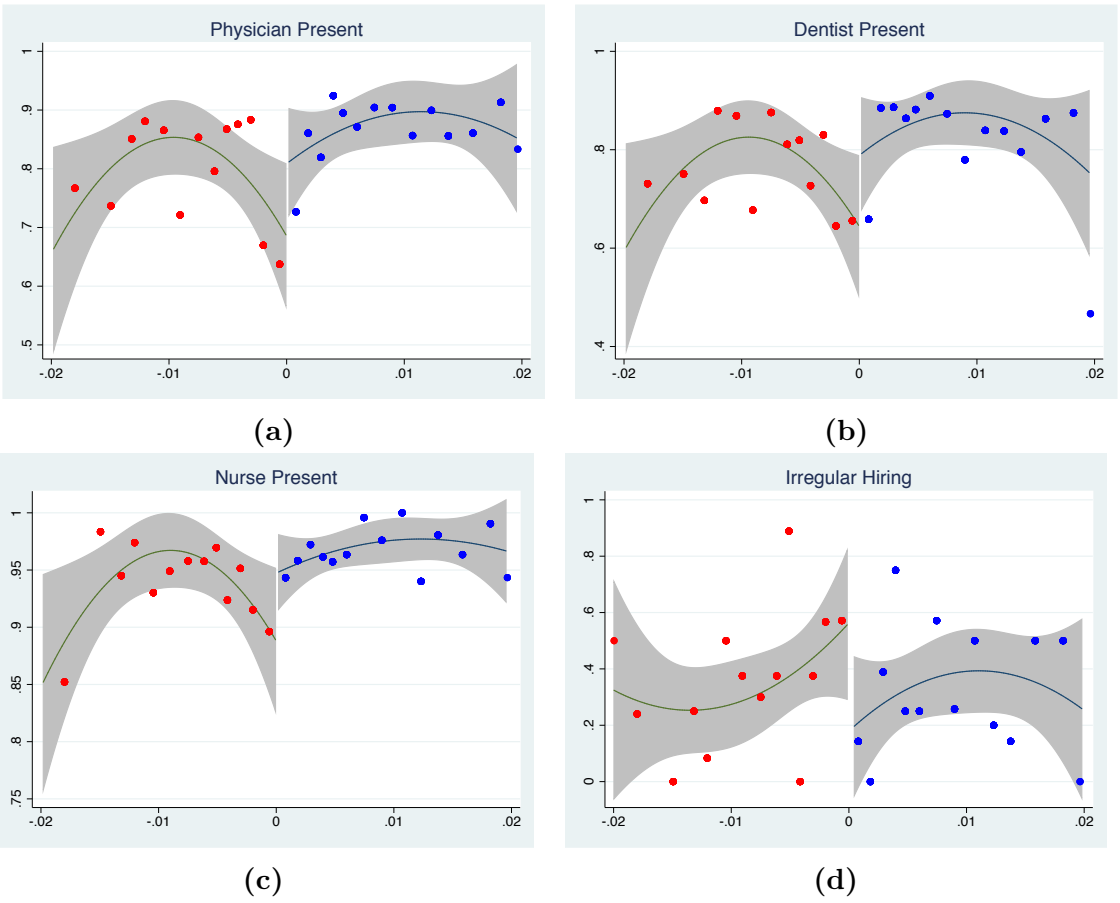


Figure 6: Effect on Healthcare Provision

Notes: Here we present the RD plots for particular outcomes of interest. These plots present equally sized bins with means of the dependent variable inside each one. It also present the prediction for the dependent variable from a regression of the dependent variable on the running variable and on the running variable squared and plots the resulting line along with a 95% confidence interval.

6.4 Effect on Health Outcomes

Going further down the causal chain, we now estimate the effect that the marginal opposing legislator has on actual health outcomes, particularly infant health. If physicians are missing from local health clinics due to missing funds or low politician effort, it is natural to expect to see negative health outcomes for the population, especially for infants, who are among the most vulnerable.[31] Table 9 contains our estimates for the treatment effect from equation 5.3. Figure 7 presents the corresponding RD plots.

The most interesting finding from this section is that in panel A of table 9 we see that in municipalities where the mayor faces reelection incentives, the marginal

[31] In addition, many researchers use infant mortality rate as a proxy measure for the overall health of a population.

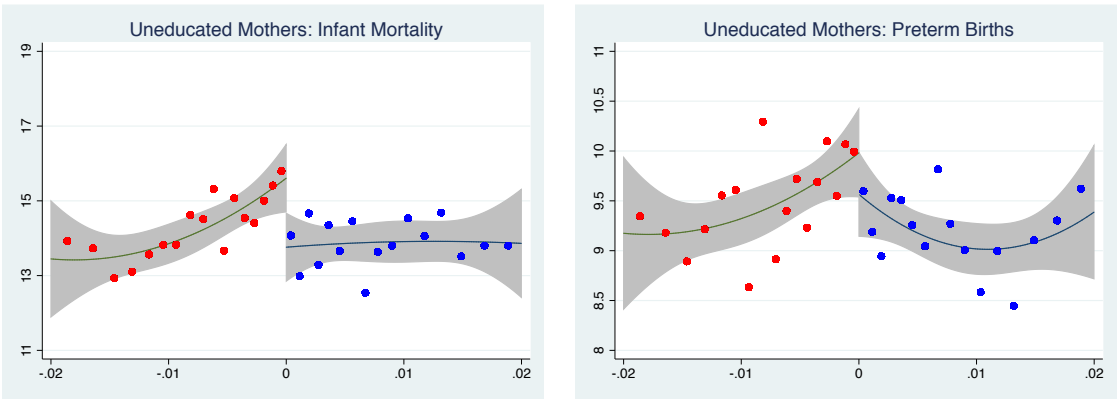
opposing legislator can improve executive performance to the extent that on average it lowers the infant mortality rate by 3.4 deaths per 1000 live births for uneducated mothers. This estimate is robust to a variety of specifications as shown in the appendix in section 10. Given that the overall infant mortality rate in Brazil is approximately 15 per 1000 live births, this is a large effect for only a single city councillor to have. The coefficient on the rate of preterm births is also significant at the 10% level, preterm birth being a leading cause of child deaths (*Preterm Birth* 2016). As predicted, no effect is found on infant health outcomes for educated mothers.

Table 9: Public Health Outcomes, First Term Mayors

Panel A: Uneducated Mothers		
	Preterm	Infant Mort. Rate
T	-0.824*	-3.402***
	(0.431)	(1.254)
Observations	17297	19819
Clusters	3580	3945
Panel B: Educated Mothers		
	Preterm	Infant Mort. Rate
T	-0.377	-0.228
	(0.304)	(0.765)
Observations	18645	15136
Clusters	3772	3238

Treatment effect of the marginal opposing legislator on public health outcomes, using the CCT optimal bandwidth and a uniform kernel. Clustered standard errors in parenthesis.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

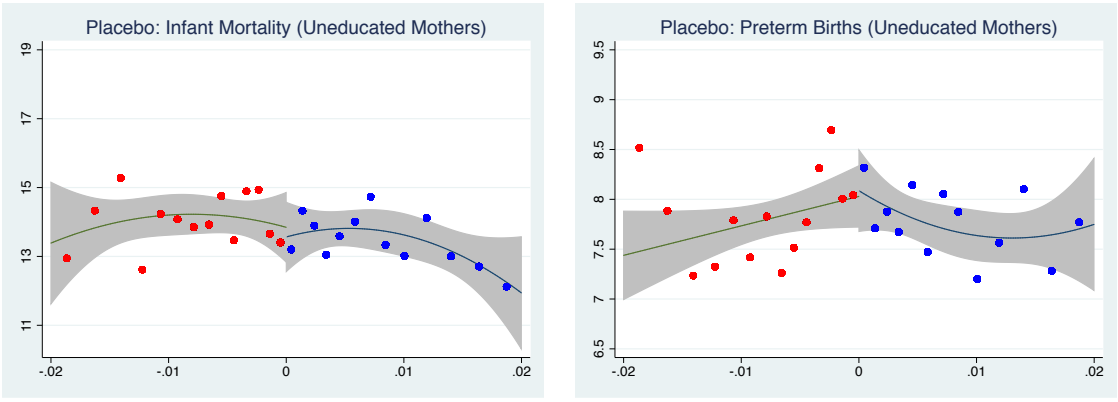


(a) **(b)**

Figure 7: Effect on Health Outcomes

Notes: Here we present the RD plots for particular outcomes of interest. These plots present equally sized bins with means of the dependent variable inside each one. It also present the prediction for the dependent variable from a regression of the dependent variable on the running variable and on the running variable squared and plots the resulting line along with a 95% confidence interval.

Leveraging the fact that the health outcomes above are in panel format (we observe the same municipality for different year), we can perform a placebo test for our estimated effects on health outcomes. We reestimate the previous RD results using previous health outcomes as the dependent variable. If our identification strategy is valid, then having an extra opposition legislator in time t should have no effect on health outcomes in that municipality in time $t-1$. Figure 8 shows the graphical results of this exercise. Unlike Figure 7, Figure 8 shows no differences in health outcomes around the discontinuity whatsoever, strongly suggesting that our results are not been driven by any possible imbalances among municipalities around the threshold.



(a) **(b)**

Figure 8: Placebo: Effect on Lagged Health Outcomes

Notes: Here we present the RD plots for particular outcomes of interest. These plots present equally sized bins with means of the dependent variable inside each one. It also present the prediction for the dependent variable from a regression of the dependent variable on the running variable and on the running variable squared and plots the resulting line along with a 95% confidence interval.

6.5 Heterogeneous Effects

With the main effects established, we now examine heterogeneity of the treatment effect depending on whether the mayor's coalition has a majority in the city counsel or not. It is possible that the effect is strongest when the mayor's coalition *does* have a majority, because this represents a large percentage change in opposition, or it is possible that the effect is strongest when the mayor's coalition does *not* have a majority, because then the mayor's coalition does not have agenda-setting power in the city council. Thus, it remains an empirical question.

We examine these heterogeneous effects for 5 outcomes of interest, total corruption, the presence of dentists and physicians at local health clinics, and the percentage of infants born pre-term and the infant mortality rate, both for uneducated mothers. For each of these models we estimate the baseline RD model, but include an interaction term with an indicator for if the mayor's coalition had a majority.[32]

In table 10 we find broad evidence that the marginal opposing legislator affects the mayor's performance only when the mayor's coalition is already in the minority, or in other words, when there is divided government. This suggests that when the mayor's coalition is in the majority, they have complete control of the agenda of the city council, and opposing legislators can do little to check the executive's activities.

Table 10: Heterogeneous Effects: Mayor's Coalition Share, First Term Mayors

	Tot. Corruption	Dentist	Physician	Preterm	Infant Mort.
T	-1.551	0.584***	0.594***	-1.058	-5.269*
	(0.952)	(0.114)	(0.192)	(0.689)	(3.201)
TxMajority	-0.263	-0.209	-0.543*	0.310	2.318
	(1.255)	(0.242)	(0.290)	(0.915)	(3.542)
Observations	244	1537	1960	17297	19819
Clusters	-	80	91	3580	3945

CCT optimal bandwidth, uniform kernel, s.e. in parenthesis, clustered at the municipality level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[32] Specifically, the indicator indicates if the mayor's coalition was in the majority, *or* if the marginal legislator would put the mayor's coalition in the majority.

6.6 Mechanisms

Finally, we test two of the main mechanisms of the model. First, revealing a mayor is corrupt reduces the reelection chances of allied legislators. To test this we use the same identification strategy of Ferraz and Finan (2008). They explore the fact that the timing of the public dissemination of the federal audit results is random. Some municipalities had the results of the audit reported before the municipal elections and some municipalities had the results published after the election took place. They use this variation to estimate the effect of exposing a corrupt mayor on their reelection chances. We use the same strategy, but we estimate the effect of exposing the mayor on the 2008 reelection chances of legislators that belonged to the mayor's coalition.

Also motivated by Ferraz and Finan (2008), we examine the interaction of audits with the presence of AM radio stations which disseminate knowledge about the results of the audits and our indicator for corrupt indicates when 2 or more items were found to have corruption, since Ferraz and Finan's findings suggest that voters tolerate a low level of corruption, but not high levels.

The two specifications we use are these:

$$y_i = \beta_0 + \beta_1 PreAudit_i + \beta_2 Corrupt_i + \beta_3 PreAudit_i X Corrupt_i + X_i + \varepsilon_i$$

$$\begin{aligned} y_i = &\beta_0 + \beta_1 PreAudit_i + \beta_2 Corrupt_i + \beta_3 AMRadio_i + \beta_4 PreAudit_i X Corrupt_i \\ &+ \beta_5 AMRadio_i X Corrupt_i + \beta_6 PreAudit_i X AMRadio_i + \beta_7 PreAudit_i X AMRadio X Corrupt_i \\ &+ X_i + \varepsilon_i \end{aligned}$$

where X_i is a vector of municipal charactaristics.

In addition to city counselor reelection, we also examine the effect that audit report dissemination has on a legislator's likelihood of challenging the incumbent mayor or succeeding a term-limited mayor from the same party.

In table 11 we find that when the mayor is revealed to be corrupt and there is a local AM radio station present to disseminate the audit report results, this lowers reelection probability for mayor-allied legislators by about 10 percentage points.[33] We also find in table 12 that for first-term mayors, revealing that the mayor is *not* corrupt decreases the likelihood that an opposing legislator will challenge the mayor

[33] This is $\beta_4 + \beta_7$

for his office in the next election by 9 percentage points. For second-term mayors, revealing that the mayor is not corrupt increases the likelihood that a mayor-allied city counselor will go on to be elected the next mayor by 9 percentage points. While the coefficients for Pre-AuditXCorrupt are not statistically significant, their sign and magnitude suggest the effect going the opposite way when mayors *are* found to be corrupt, though this effect is not large. This is consistent with the findings in Ferraz and Finan (2008) that voters expect some amount of corruption in the government, and clearly shows that having an clean mayor is viewed as increasing the electoral chances of allied politicians.

In all, these results show that city counselors that are allied with the mayor lack incentives to report and investigate corruption, because revealing this corruption would likely damage their own political careers.

Table 11: The effect of revealing that the mayor is corrupt

	Incumbent Mayor Allies Reelected	
Pre-Audit	-0.0286	-0.0587**
	(0.0258)	(0.0289)
Pre-AuditXCorrupt	0.0465	0.0844
	(0.0576)	(0.0599)
Pre-AuditX AMRadio		0.128**
		(0.0616)
Pre-AuditX AMRadio X Corrupt		-0.179**
		(0.0826)
Observations	1629	1629
Clusters	448	448

The outcome for both columns is an indicator for if a mayor-allied member of the city council is reelected.

Standard errors in parentheses, municipal charactaristics used as controls.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: The effect of revealing that the mayor is corrupt

	Opp. Council Member Challenger (1st term mayors)	Mayor Ally Wins (2nd term mayors)
Outcome Mean	.1203	.0573
Pre-Audit	-0.0928***	0.0961**
	(0.0346)	(0.0461)
Corrupt	-0.0400	0.0184
	(0.0614)	(0.128)
Pre-AuditXCorrupt	0.0295	-0.118
	(0.0749)	(0.140)
Observations	482	157

The outcome in the first column is in indicator for if a member of the opposition in the city counsel challenged the incumbent mayor in the 2008 election. The outcome in the second column is an indicator for if the city counselor allied with the mayor went on to be elected mayor after the mayor concludes his or her 2nd term.

Standard errors in parentheses, municipal charactaristics used as controls.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Finally, we also test if the presence of opposition legislators reduces the reelection chances of incumbent mayors. According to our model, opposing legislators will reduce reelection chances of mayors when reelection incentives are not strong enough to force mayors to pretend to be non corrupt, even when they know that they will be reported by legislators and this will end up costing their reelection. Table 13 shows that an additional opposition legislator decreases mayors' reelection chances by 6.2 p.p. If we estimate the effect of an additional opposition legislator in municipalities where the incumbent mayor actually ran for office, there is a reduction of 9.2 p.p. on reelection chances. These results are robust to a variety of alternate specifications as shown in the appendix in section 10.

Table 13: Incumbent Mayor Reelection

	Reelection	Reel. Conditional on Running	Incumbent Vote Share
T	-0.0618*	-0.0926**	-0.0215
	(0.0360)	(0.0433)	(0.0163)
Observations	5539	3985	3800

Effect of the marginal opposing legislator. CCT optimal bandwidth, uniform kernel, s.e. in parenthesis.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

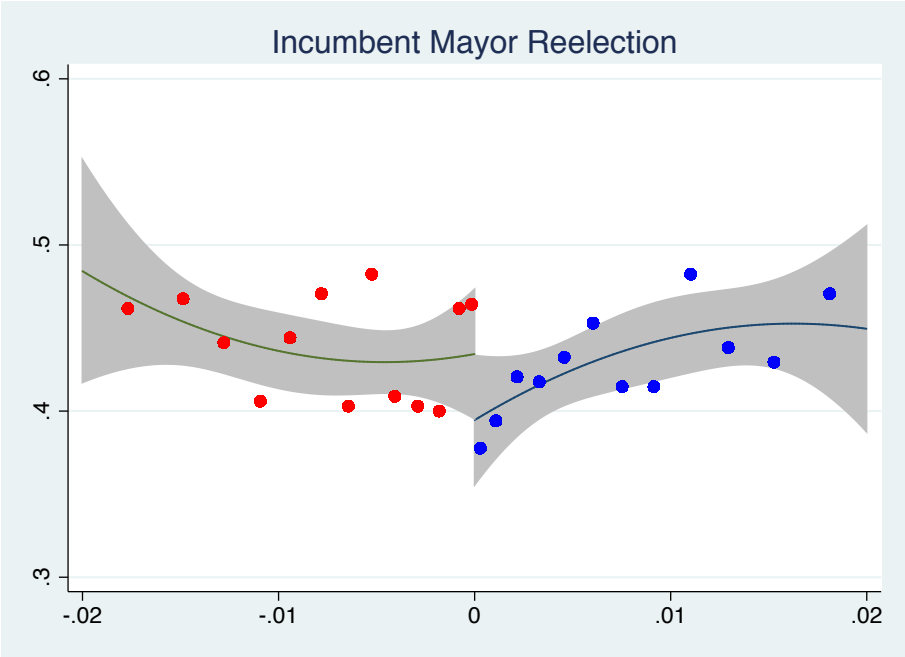


Figure 9: Probability of Mayor Reelection

Notes: Here we present the RD plots for particular outcomes of interest. These plots present equally sized bins with means of the dependent variable inside each one. It also present the prediction for the dependent variable from a regression of the dependent variable on the running variable and on the running variable squared and plots the resulting line along with a 95% confidence interval.

7 Discussion and Conclusion

Because of our new method of measuring corruption using regular expressions, it is difficult to directly compare our estimates of the effect of the marginal opposing legislator to other treatments already considered in the corruption literature; however, it is quite straightforward to compare our estimates of the effect on public service quality and public health to those in the existing literature. Litschig and Zamboni (2017) examine the effect that increased audit risk from Brazil's central audit program

has on corruption as well as the same survey measures of public service provision that we use. While Litschig and Zamboni find that increased audit risk significantly decreases corruption, they find that it has no significant effect on measures of public service provision, including the probability that physicians and dentists will be at local health clinics to see patients. In contrast, we find that the marginal opposing legislator can increase the probability that these healthcare professionals will be present to see patients by 28 and 34 percentage points, respectively.

Our work contrasts Lichand et al. (2016) which finds that though Brazil's centralized audit program decreased corruption, it also worsened some health outcomes such as hospital beds and immunization coverage. Overall, indicates that auditing by the legislative branch may be more effective than top-down auditing by the federal government for improving public services. This is also interesting in comparison to Olken (2007), who finds that top-down monitoring is more effective than grassroots monitoring in decreasing corruption.

Our estimates of the sizable effect of the marginal opposing legislator on corruption, public service delivery, and health outcomes, coupled with the fact that the typical mayor has 5 city councillors in his or her coalition (table 19) suggests that mayors depend significantly on having city councillors on their side in order to extract rents or exert low effort.

This suggests that it may be favorable to have more legislators politically opposed to the mayor, but legislators are chosen by voters, not economists, so what can be done? It so happens that the D'Hondt Method used in Brazil (and many other countries) to apportion seats is known to disproportionately favor larger parties. As can be seen in table 21, the typical mayor's coalition in Brazil is the largest coalition in terms of vote share. Thus, using an alternative method that does not disproportionately favor larger parties may almost costlessly increase political opposition, decrease corruption, and improve public service provision.

I conduct counterfactual simulations using the Webster Method, the Danish Method, and the Huntington-Hill Method on Brazil's municipal electoral data from 2004 to 2016, and report results in tables 31 through 33 in appendix 10.1. The three methods only differ in the way that quotients are calculated.[34]

In the Huntington-Hill case for example, 83% of elections have no change in the

[34]The formulas for the three alternate methods are respectively $Q_s = \frac{V}{2s+1}$, $Q_s = \frac{V}{3s+1}$, and $Q_s = \frac{V}{\sqrt{s*(s+1)}}$.

size of the mayor's coalition and in 4.4% of elections the mayor's coalition gains a member, but in 12.4% of cases the mayor loses a coalition member. So on net, 8% of municipalities would have an additional legislator politically opposed to the mayor[35].

Beyond the possible benefits of alternative methods of allocating seats, this work emphasizes the importance of strengthening legislative oversight to combate corruption and promote the good use of public resources. Stapenhurst, Pelizzo, Olson, and von Trapp (2008) document that various tools of legislative oversight are common throughout the world, but they are not universal.[36] For example, in a sample of 39 countries— 25 of which are OECD countries— only 28% have a specialized budget research organization attached to the legislature.[37] The number is likely much lower in a sample of only developing countries. Our estimates suggest that strengthening legislative oversight may be an alternative to centralized audit programs.

In conclusion, we use a regression discontinuity design to show that the marginal politically opposed legislator can have a large impact in reducing corruption as well as improving healthcare provision and actual health outcomes. Finally, we address this work's implications for the methods of proportional representation that are most likely to encourage good governance, as well as the importance of legislative oversight to combat corruption.

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[35] With the caveat that these simulations don't take into account possible changes in strategic responses that voters and politicians could make in response to a change in voting methods.

[36] See table 1.1 specifically.

[37] Table 6.6

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9 Appendix

9.1 Additional Summary Statistics

Table 14: Municipal Characteristics

	RD Sample	Non-RD Sample	Diff.
AM Radio	0.213	0.236	-0.023^{*}
	(0.409)	(0.425)	(0.013)
TV Station	0.102	0.127	-0.026^{***}
	(0.302)	(0.334)	(0.01)
Judiciary District	0.472	0.492	-0.019
	(0.499)	(0.5)	(0.016)
Avg. Monthly Income	433.133	446.383	-13.25^{**}
	(196.475)	(202.788)	(6.447)
Illiteracy Rate	16.36	15.69	0.67^{**}
	(9.862)	(9.812)	(0.315)
Urbanization Rate	63.263	65.589	-2.325^{***}
	(21.978)	(22.171)	(0.708)
Population 2010	34135.8	34273.96	-138.153
	(224619.0)	(97499.66)	(4420.171)
Tot. Votes Cast	17692.5	17334.42	358.079
	(116821.2)	(49890.38)	(2282.044)
Observations	4192	1275	.

Full sample for 2004 election year (the year corresponding to most of the audit data). Means are presented in the main row, standard deviations/errors are below in parenthesis.

Table 15: Conditional Summary Statistics

	count	mean	sd	min	max
Total Audit Service Items	432	25.38657	10.13098	9	95
Total Corruption	432	1.479167	1.916961	0	13
Embezzlement	432	.4606481	.984015	0	8
Fraud	432	.5324074	1.149545	0	8
Overinvoicing	432	.5972222	1.287019	0	12
Other Irreg.	432	4.118056	3.786954	0	30

RD Sample, conditional on corruption being found

Table 16: Public Service Assessment Questions

Variable	Survey Questions
Nurse Present	*When you needed to be seen at the Family Health Unit, was there a nurse there to serve you?*
Dentist Present	*When you needed to be seen at the Family Health Unit that has a dentist, were you served?*
Physician Present	*When you needed to be seen at the Family Health Unit, was there a physician there to serve you?*
Healthcare Visits	*Does the family recieve visits from Community Health Agents?*
Lines at Health Unit	*Have you or someone in your family had to wait in lines to recieve care?*
	Auditor's Assessment
Irregular Hiring	*Are there Community Health Agents that were contracted irregularly?*

	Total City Council Seats	
	freq	pct
9	778	88.41
10	42	4.77
11	28	3.18
12	5	0.57
13	12	1.36
14	4	0.45
15	5	0.57
16	1	0.11
18	2	0.23
19	3	0.34
Total	880	100.00

Table 17

	Num. Coalitions in Municipality	
	freq	pct
2	190	21.59
3	185	21.02
4	142	16.14
5	137	15.57
6	85	9.66
7	54	6.14
8	38	4.32
9	19	2.16
10	8	0.91
11	11	1.25
12	4	0.45
13	4	0.45
15	3	0.34
Total	880	100.00

Table 18

	Mayor's Coalition's Seats	
	freq	pct
0	4	0.45
1	7	0.80
2	39	4.43
3	95	10.80
4	177	20.11
5	273	31.02
6	174	19.77
7	73	8.30
8	25	2.84
9	8	0.91
10	3	0.34
11	1	0.11
12	1	0.11
Total	880	100.00

Table 19

	Num. Coalitions Supporting Mayor	
	freq	pct
1	444	50.45
2	253	28.75
3	124	14.09
4	44	5.00
5	11	1.25
6	3	0.34
7	1	0.11
Total	880	100.00

Table 20

	Mayor's Coalition Rank (In Vote Share)	
	freq	pct
1	591	67.16
2	231	26.25
3	41	4.66
4	11	1.25
5	3	0.34
6	2	0.23
8	1	0.11
Total	880	100.00

Table 21

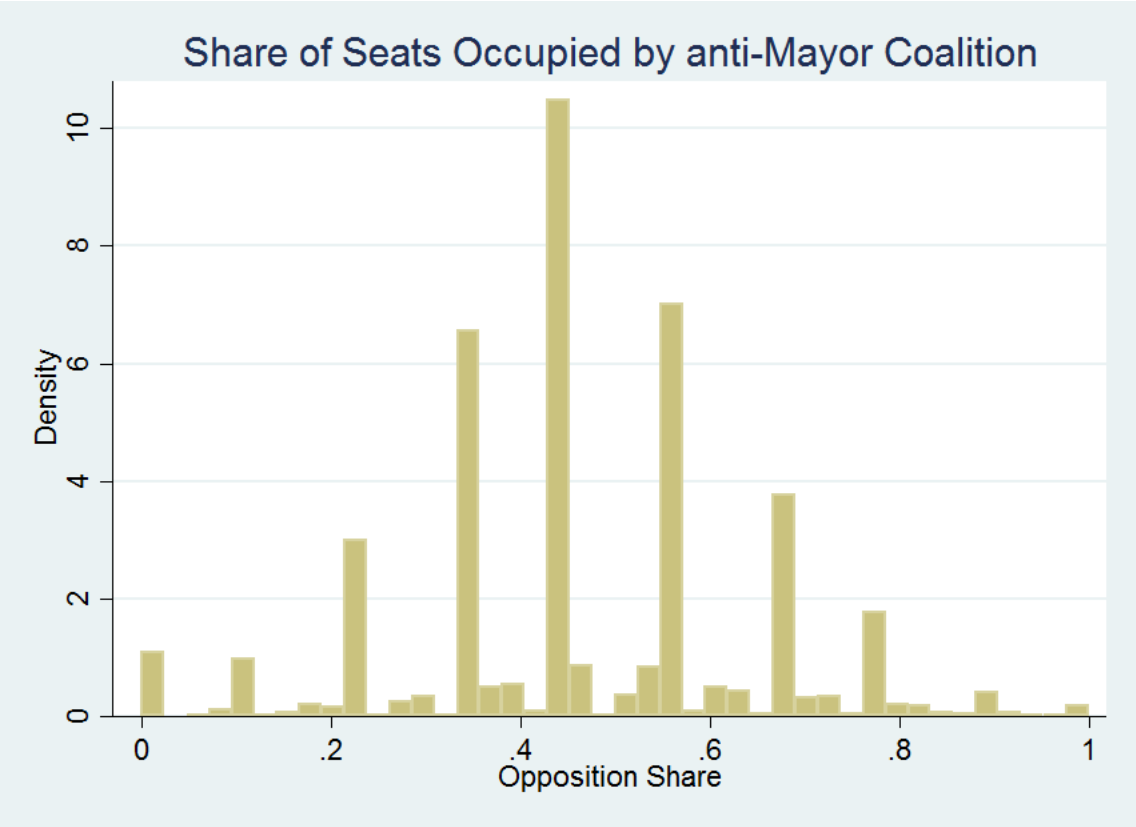

Figure 10: The density of opposition seat shares. The density clusters at levels that are fractions of 9 because the majority of municipalities have 9 seats.

9.2 Additional Results

In the model shown in 5.1 we use conventional standard errors. Heteroskedasticity-robust standard errors are biased in small samples, so we conduct the Breusch-Pagan test to test for possible heteroskedasticity. We fail to reject the null hypothesis of homoskedasticiy for all of our main outcome variables, with all F-statistics arbitrarily close to zero. This is unsurprising, since due to the RD design, we do not expect variance of the error term to be different between municipalities where the anti-mayor coalition barely won an additional seat versus municipalities where they barely didn't win an additional seat. Results available upon request.

Below we report results from Calonico, Cattaneo and Titiunik's RD robust estimator. Their 'conventional' standard errors are heteroskedasticity robust standard errors.

Table 22: CCT Robust Estimation

	Total Corruption	Embezzlement
Conventional	-1.353**	-0.889*
	(0.566)	(0.471)
Bias-corrected	-1.464***	-0.960**
	(0.566)	(0.471)
Robust	-1.464**	-0.960*
	(0.628)	(0.561)
Observations	552	552

Treatment effect using CCT robust confidence intervals.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Tables 26 through 27 show results for all mayors, rather than just first term mayors

Tables 28 through 30 show results for second term mayors.

Table 23: CCT Robust Estimation

	Physician Present	Dentist Present
Conventional	0.133	0.291*
	(0.141)	(0.155)
Bias-corrected	0.167	0.320**
	(0.141)	(0.155)
Robust	0.167	0.320*
	(0.159)	(0.174)
Observations	3854	3150
Clusters	91	80

Treatment effect using CCT robust confidence intervals.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 24: CCT Robust Estimation

	Preterm	Infant Mort. Rate
Conventional	-0.824*	-3.402***
	(0.429)	(1.249)
Bias-corrected	-0.851**	-3.559***
	(0.429)	(1.249)
Robust	-0.851*	-3.559***
	(0.480)	(1.342)
Observations	30725	30726
Clusters	17297	19819

Treatment effect using CCT robust confidence intervals.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 25: Major Violations, Extensive Margin (1/0)

	Total Corruption	Embezzlement	Fraud	Overinvoicing	Other Irreg.
T	-0.330*	-0.101	-0.139	-0.0652	-0.0471
	(0.177)	(0.123)	(0.117)	(0.122)	(0.133)
Observations	253	282	336	324	274

Treatment effect of the marginal opposing legislator on corruption, using the CCT optimal bandwidth and a uniform kernel. Standard errors in parenthesis. Outcomes are the count of items audited with a violation. Other irregularities captures all other irregularities found by auditors that were not classified as embezzlement, fraud, or overinvoicing, and includes a host of procedural and other errors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 26: Corruption Outcomes, First and Second Term Mayors

	Total Corruption	Embezzlement	Fraud	Overinvoicing	Other Irreg.
T	-0.876*	-0.642**	-0.271	-0.106	0.235
	(0.474)	(0.256)	(0.259)	(0.293)	(0.911)
Observations	381	342	402	399	505

Treatment effect of the marginal opposing legislator on corruption, using the CCT optimal bandwidth and a uniform kernel. Standard errors in parenthesis. Outcomes are the count of items audited with a major violation. Other irregularities captures all other irregularities found by auditors that were not classified as embezzlement, fraud, or overinvoicing, and includes a host of procedural and other errors.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 27: Public Health Outcomes, First and Second Term Mayors

Panel A: Uneducated Mothers		
	Preterm	Infant Mort. Rate
T	-0.547	-2.324**
	(0.340)	(0.983)
Observations	25297	27702
Clusters	4259	4278
Panel B: Educated Mothers		
	Preterm	Infant Mort. Rate
T	-0.275	-0.346
	(0.250)	(0.538)
Observations	25403	25673
Clusters	4259	4278

Treatment effect of the marginal opposing legislator on public health outcomes, using the CCT optimal bandwidth and a uniform kernel. Clustered standard errors in parenthesis.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 28: Corruption Outcomes, Second Term Mayors

	Total Corruption	Embezzlement	Fraud	Overinvoicing	Other Irreg.
T	0.491	0.166	0.0521	0.432	-1.479
	(0.947)	(0.353)	(0.527)	(0.698)	(1.523)
Observations	124	114	124	121	141

Treatment effect of the marginal opposing legislator on corruption, using the CCT optimal bandwidth and a uniform kernel. Standard errors in parenthesis. Outcomes are the count of items audited with a violation. Other irregularities captures all other irregularities found by auditors that were not classified as embezzlement, fraud, or overinvoicing, and includes a host of procedural and other errors.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 29: Public Service Provision, Second Term Mayors

Panel A: Presence of Healthcare Professionals			
	Nurse Present	Dentist Present	Physician Present
T	0.448**	0.470*	0.541***
	(0.216)	(0.276)	(0.165)
Observations	724	538	725
Clusters	36	32	36
Panel B: Community Health Agents and Lines			
	Irregular Hiring	Lines at Health Unit	Healthcare Visits
T	0.944	-0.168	-0.0319
	(0.590)	(0.190)	(0.104)
Observations	19	734	757
Clusters	8	39	38

Treatment effect of the marginal opposing legislator on public service provision outcomes, using the CCT optimal bandwidth and a uniform kernel. Clustered standard errors in parenthesis.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 30: Public Health Outcomes, Second Term Mayors

Panel A: Uneducated Mothers		
	Preterm	Infant Mort. Rate
T	-0.0204	0.430
	(0.544)	(1.814)
Observations	7617	6406
Clusters	1919	1624
Panel B: Educated Mothers		
	Preterm	Infant Mort. Rate
T	0.00245	-0.327
	(0.434)	(1.116)
Observations	6181	6028
Clusters	1569	1531

Treatment effect of the marginal opposing legislator on public health outcomes, using the CCT optimal bandwidth and a uniform kernel. Clustered standard errors in parenthesis.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

10 Robustness: BW Sensitivity Exercise

The following plots show the results from a variety of alternate model specifications for outcome variables of interest, including various bandwidth selections and polynomial specifications. In the plots, 1.0 is the optimal BW selected by the Calonico et al. (2015) procedure and 0.5, for example, is half the optimal BW.

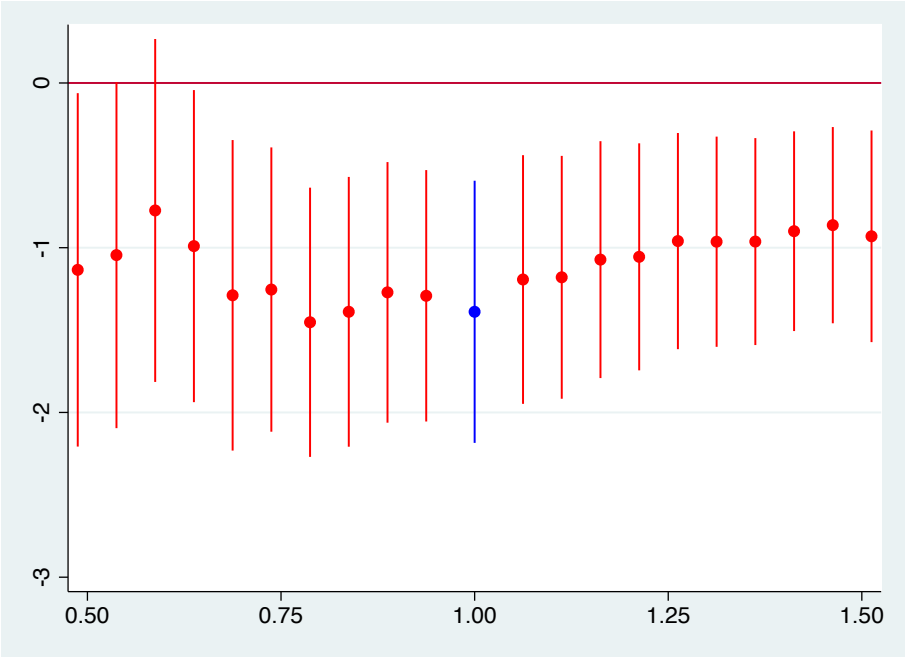

Figure 11: BW Sensitivity First Degree Polynomial: Major Corruption Violations

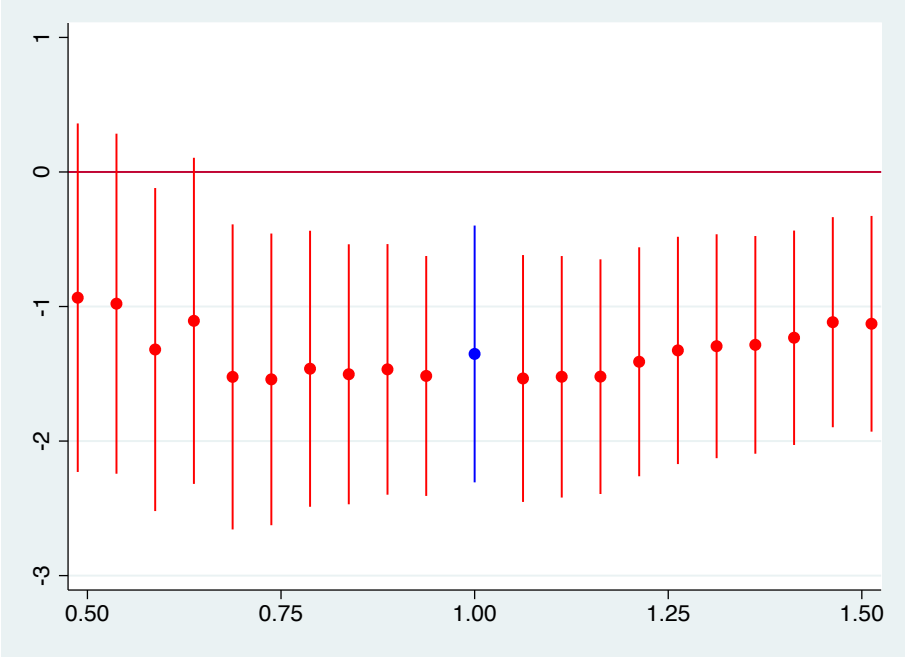

Figure 12: BW Sensitivity Second Degree Polynomial: Major Corruption Violations

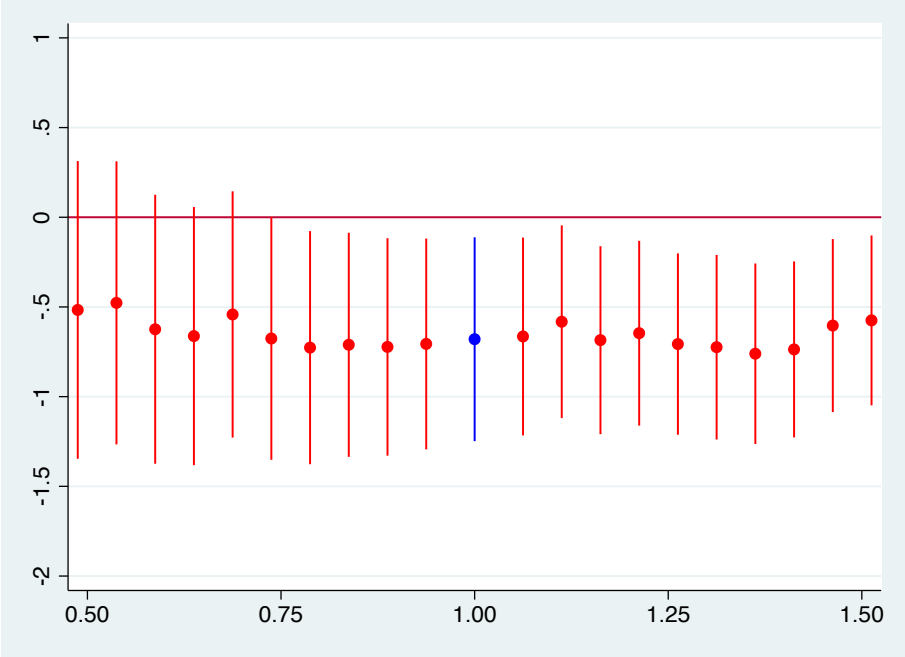

Figure 13: BW Sensitivity First Degree Polynomial: Preterm Births Uneducated Mothers

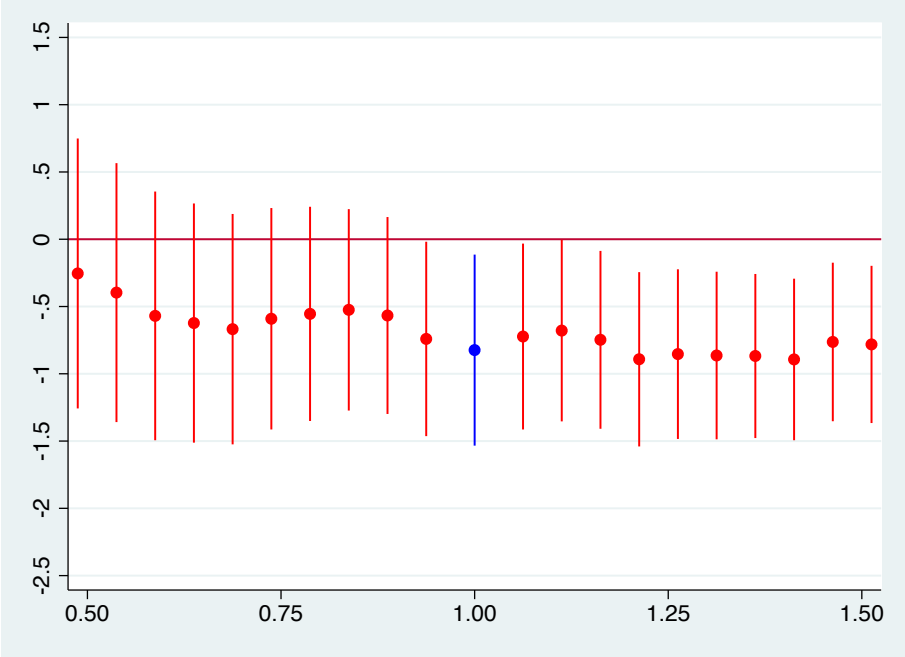

Figure 14: BW Sensitivity Second Degree Polynomial: Preterm Births Uneducated Mothers

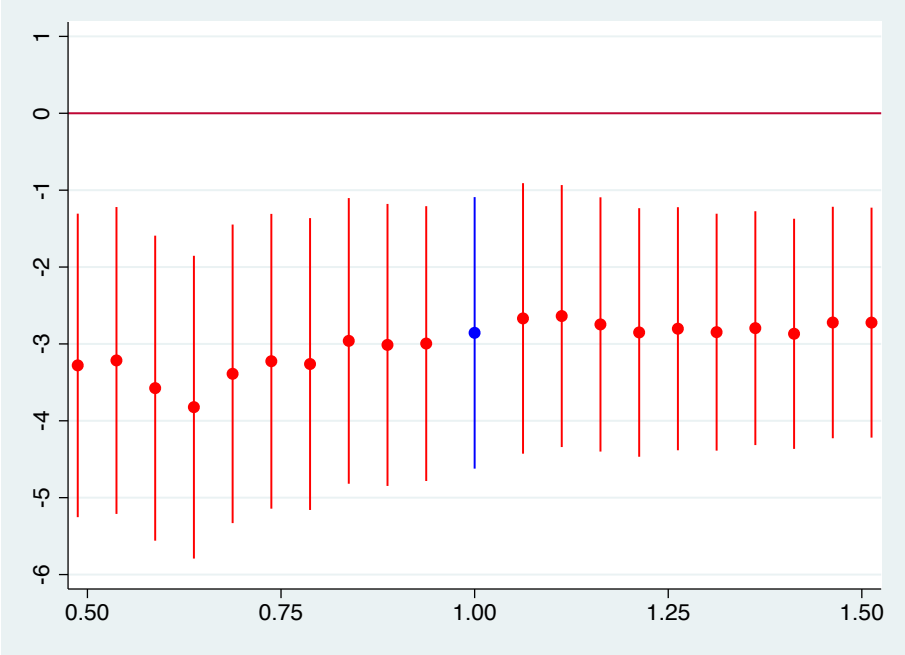

Figure 15: BW Sensitivity First Degree Polynomial: Infant Mortality Uneducated Mothers

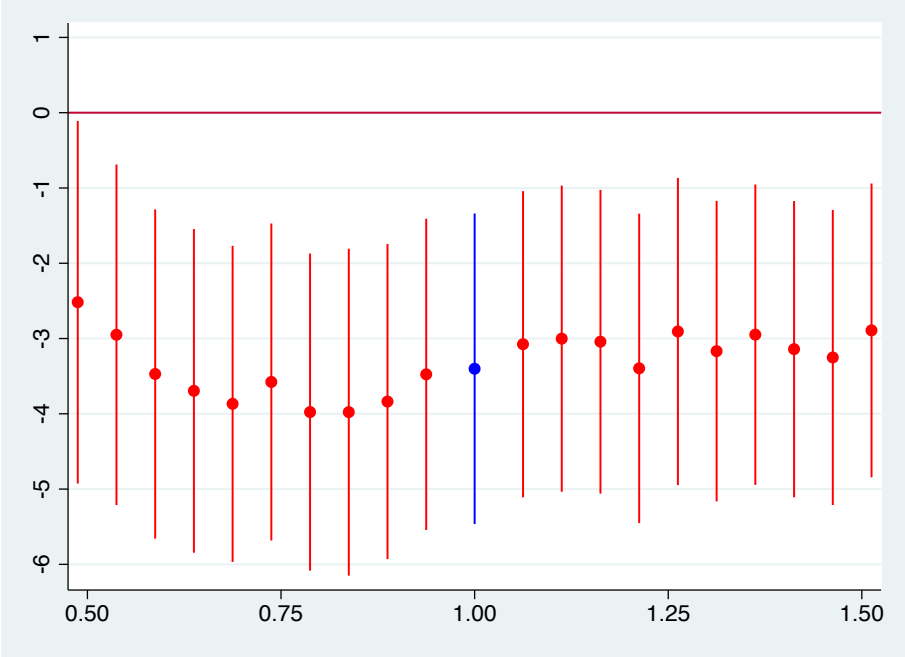

Figure 16: BW Sensitivity Second Degree Polynomial: Infant Mortality Uneducated Mothers

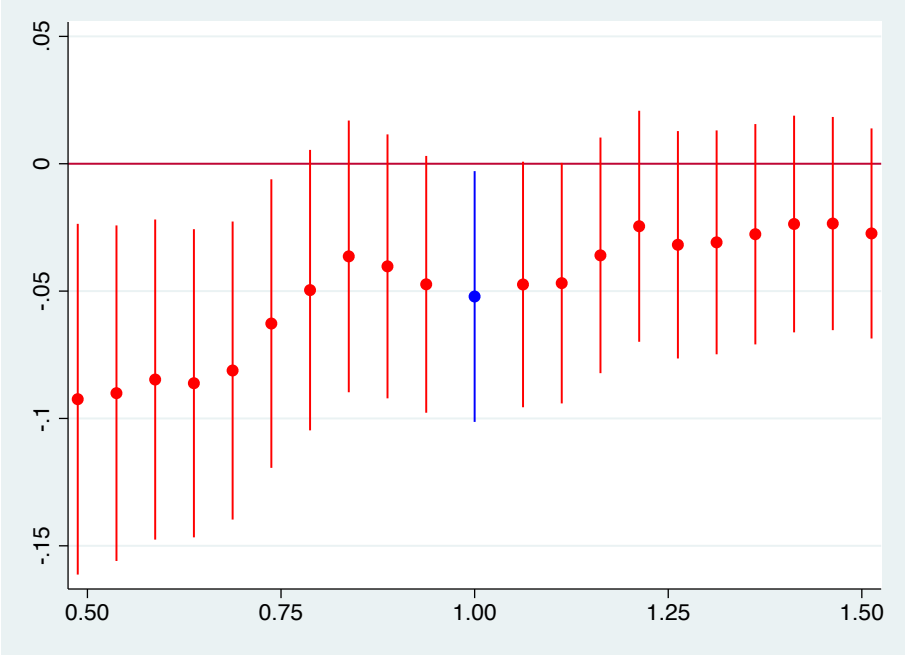

Figure 17: BW Sensitivity First Degree Polynomial: Mayor Reelection

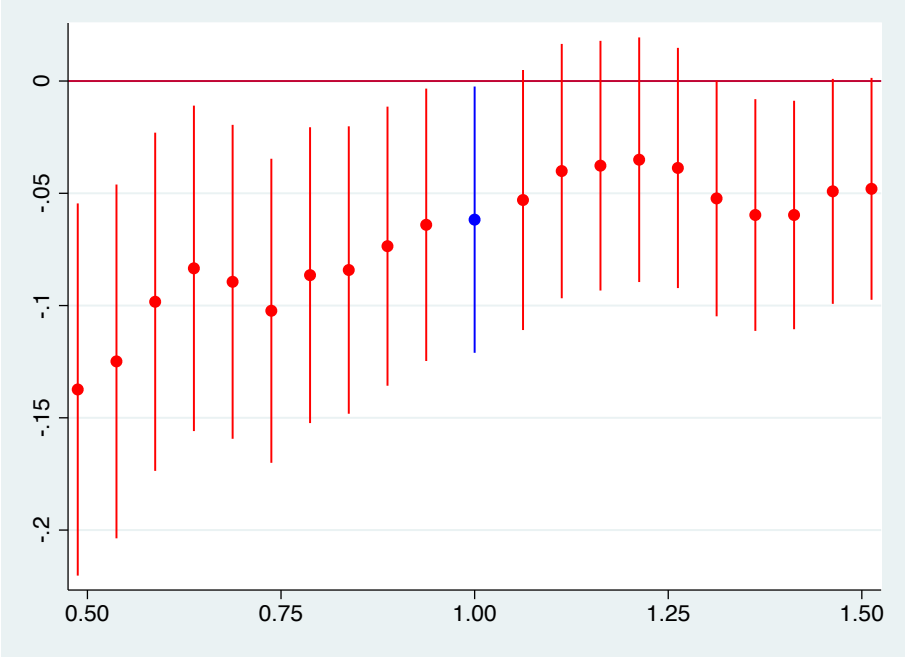

Figure 18: BW Sensitivity Second Degree Polynomial: Mayor Reelection

10.1 Counterfactuals

Webster Method		
	Freq.	Pct.
-2	8	0.05
-1	1627	10.15
0	13794	86.02
1	607	3.79
Total	16036	100.00

Difference in mayor's coalition size from using
Webster's Method rather than the D'Hondt Method.

Table 31

Danish Method		
	Freq.	Pct.
-2	19	0.12
-1	2227	13.89
0	13019	81.19
1	769	4.80
2	2	0.01
Total	16036	100.00

Difference in mayor's coalition size from using
the Danish Method rather than the D'Hondt Method.

Table 32

Huntington-Hill Method		
	Freq.	Pct.
-2	16	0.10
-1	1989	12.40
0	13317	83.04
1	712	4.44
2	2	0.01
Total	16036	100.00

Difference in mayor's coalition size from using the
Huntington-Hill Method rather than the D'Hondt Method.

Table 33

10.2 Details on the Theoretical Model

Let's start solving the game by the last period. A legislator will accept any bribe $B_o > 0$ and will be indifferent between reporting the executive or not if $B_o = 0$. If a mayor is corrupt, he will make $B_o = 0$ and $C = \bar{c}\ \forall\theta$ because there are no reelection incentives. Since a corrupt mayor will always steal in a divided or unified government in the second period, the voter always elect a unified government in the second period and avoid paying the cost D. But voters still have to decide if they will elect a unified government under party a or b. This decision boils down to the voter's belief about the probability of the first period mayor been a corrupt type given the utility or reports he gets. Hence, if $P(c/u, r) < p\prime$, he reelects the mayor, otherwise, he does not. We will break down by cases under a unified and a divided government to pin down these beliefs in each case.

Under a Unified Government in period 1

Case 1: $\bar{c} > \delta(\bar{c} + E)$

As in all cases under a unified government, the legislator will never be better of reporting the mayor because by doing so the voter will know that the mayor is a corrupt type and will not reelect any of the branches, hence, $B_o = B = 0$ and the legislative never reports.

In this specific case, the rents a corrupt mayor can extract today are too large compared with what he can get tomorrow. Hence, he makes $C = \bar{c}\ \forall\theta$. If the actions of the mayor are not exogenously revealed, voters reelect the mayor if $U_{v1} > 0$ and do not reelect the mayor if $U_{v1} \leqslant 0$. Voter beliefs are $P(c/u_{v1}) = 1$ if $u_{v1} < 0$, $P(c/u_{v1}) = p$ if $1 - \bar{c} > u_{v1} > 0$ and $P(c/u_{v1}) = 0$ if $1 - \bar{c} < u_{v1}$. If the actions of the mayor are exogenously revealed voter reelect the mayor if $C = 0$ and do not reelect the mayor if $C = \bar{c}$.

Case 2: $r\delta(\bar{c} + E) < \bar{c} < \delta(\bar{c} + E)$

As in all cases under a unified government, the legislator will never be better of reporting the mayor because by doing so the voter will know that the mayor is a corrupt type and will not reelect any of the branches, hence, $B_o = B = 0$ and the legislative never reports.

In this specific case, the rents a corrupt mayor can extract tomorrow are enough to prevent him from stealing if he knows he will get caught. Hence, he makes $C = \bar{c}$ for

$\theta > \bar{c}$ and $C = 0$ for $\theta < \bar{c}$. If the actions of the mayor are not revealed, voters always reelect the mayor. Voter beliefs are $P(c/u_{v1}) = \frac{2p}{p+1}$[38] if $\bar{c} > u_{v1} > 0$, $P(c/u_{v1}) = p$ if $1 - \bar{c} > u_{v1} > \bar{c}$ and $P(c/u_{v1}) = 0$ if $1 - \bar{c} < u_{v1}$.

Case 3: $r\delta(\bar{c} + E) > \bar{c}$

As in all cases under a unified government, the legislator will never be better of reporting the mayor because by doing so the voter will know that the mayor is a corrupt type and will not reelect any of the branches, hence, $B_o = B = 0$ and the legislative never reports.

In this specific case, the rents a corrupt mayor can extract tomorrow are enough to prevent him from stealing today. Hence, he makes $C = 0\ \forall\theta$. Voters always reelect the mayor. Voter's beliefs are $P(c/u_{v1}) = p$.

Under a Divided Government in period 1

Case 1: $\bar{c} > \delta(\bar{c} + E)$ and $\bar{c} < \delta V + r\delta(\bar{c} + E)$

As in all cases under a divided government, the legislator will accept the bribe and won't report the mayor if $B_o \geq \delta V$ and will report the mayor otherwise.

In this specific case, the rents a corrupt mayor can extract today are too large compared with what he can get tomorrow and the legislator is too expensive to buy off. Hence, he makes $C = \bar{c}$ and $B_o = 0\ \forall\theta$. Legislators will always report the mayor and he will not be reelected.

Case 2: $r\delta(\bar{c} + E) < \bar{c} < \delta(\bar{c} + E)$ and $\bar{c} < \delta V + r\delta(\bar{c} + E)$

As in all cases under a divided government, the legislator will accept the bribe and won't report the mayor if $B_o \geq \delta V$ and will report the mayor otherwise.

In this specific case, the rents a corrupt mayor can extract tomorrow are enough to prevent him from stealing if he knows he will get caught. Also, the legislator is to expensive to be bought off. Hence, , he makes $C = \bar{c}$ and $B_o = 0\ \forall\theta$. Legislators won't have anything to report and the mayor will always get reelected.

Case 3: $\bar{c} > \delta V + r\delta(\bar{c} + E)$ and $(1 - r)(\bar{c} + E) < V$

As in all cases under a divided government, the legislator will accept the bribe

[38] Remember that by assumption $\frac{2p}{p+1} < p\prime$.

and won't report the mayor if $B_o \geq \delta V$ and will report the mayor otherwise.

In this specific case, the rents a corrupt mayor can extract today are too large compared with what he can get tomorrow and the legislator is too expensive to buy off. Hence, he makes $C = \bar{c}$ and $B_o = 0\ \forall\theta$. Legislators will always report the mayor and he will not be reelected.

Case 4: $\bar{c} > \delta V + r\delta(\bar{c} + E)$ and $(1 - r)(\bar{c} + E) > V$ and $\bar{c} > \delta(\bar{c} + E)$

As in all cases under a divided government, the legislator will accept the bribe and won't report the mayor if $B_o \geq \delta V$ and will report the mayor otherwise.

In this specific case, the mayor prefers to buy off the legislators, keep the rest of the corruption proceeds and be reelected. But he also prefers to steal $\bar{c}$ and not get reelected than steal 0 and get reelected. Hence, he will make $C = \bar{c}$ and $B_o = 0$ if $\theta < \bar{c}$ and $C = \bar{c}$ and $B_o = \delta V$ if $\theta > \bar{c}$. In the first case, he gets reelected and the legislator does not report him. In the second case, he does not get reelected and the legislator reports him.

Case 5: $\bar{c} > \delta V + r\delta(\bar{c} + E)$ and $(1 - r)(\bar{c} + E) > V$ and $r\delta(\bar{c} + E) < \bar{c} < \delta(\bar{c} + E)$

As in all cases under a divided government, the legislator will accept the bribe and won't report the mayor if $B_o \geq \delta V$ and will report the mayor otherwise.

In this specific case, the mayor prefers to buy off the legislators, keep the rest of the corruption proceeds and be reelected. He also prefers to steal 0 and get reelected than to steal $\bar{c}$ and not get reelected. Hence, he will make $C = 0$ and $B_o = 0$ if $\theta < \bar{c}$ and $C = \bar{c}$ and $B_o = \delta V$ if $\theta > \bar{c}$. In both cases, he gets reelected and the legislator doe not report him.

Case 6: $r\delta(\bar{c} + E) > \bar{c}$

As in all cases under a divided government, the legislator will accept the bribe and won't report the mayor if $B_o \geq \delta V$ and will report the mayor otherwise.

In this specific case, the rents a corrupt mayor can extract tomorrow are enough to prevent him from stealing today. Hence, he makes $C = 0$ and $B_o = 0\ \forall\theta$. Voters always reelect the mayor. Voter's beliefs are $P(c/u_{v1}) = p$.

Finally, in period 1, the voter decides between electing a unified or a divided government based on their expected utility. This decision basically depends on how

costly is divided government versus how much rent a corrupt mayor can extract from the voter.

Now, we will connect the theoretical results above with our empirical strategy. Since we claim that in close election the formation of a unified or divided government is as good as random, we will just compare what is the difference in corruption levels and investigations if a municipality had a divided or a unified government.

Notice that if $r\delta(\bar{c}+E) < \bar{c} < \delta(\bar{c}+E)$ and $\bar{c} < \delta V + r\delta(\bar{c}+E)$,there is less corruption under a divided government because the mayor wants to get reelected but can't extract rents and not be exposed to voters when the legislator is to expensive to be bought.

If $\bar{c} > \delta V + r\delta(\bar{c}+E)$ and $(1-r)(\bar{c}+E) < V$ or $\bar{c} > \delta(\bar{c}+E)$ and $\bar{c} < \delta V + r\delta(\bar{c}+E)$, there is more investigations in a divided government because reelection incentives are not strong enough to force mayors to pretend to be non corrupt, even when they know that this will cost their reelection. Hence, corruption levels are the same in both types of government but, in a divided government, mayor are reported and kicked out of office.

For other parameter values, the level of corruption and investigations are the same under the two types of government.

Finally, it is easy to se that as r gets larger, the set of parameters values for which there is a difference in corruption between a divided and an unified government becomes smaller. If $r = 1$, there is no difference in corruption level between a divided and an unified for any set of parameter values.

10.3 Regular Expressions Used to Measure Corruption

Each violation found by the CGU auditors includes a description of the irregularity. We use regular expressions to search for words and phrases that isolate an irregularity as a certain type of corruption. We arrived at these words and phrases after personally reading through audit reports and taking note of the language used by the auditors. We have inspected a sample of irregularities flagged by these regular expressions and found that they were indeed corruption.

Fraud: Any irregularites containing

- *simulação* OR *simulado(a)* OR *simulações* ['simulation' OR 'simulated' OR 'simulations' (of the bidding process)]

- *montagem* ['assemblage/rigging' (of the bidding process)]
- *fraude* OR *fraudulento* OR *fraudar* ['fraud' OR 'fraudulent']
- *fachada* OR *fantasma* ['façade' OR 'phantom' (referring to fake firms)]

Overinvoicing: Any irregularites containing

- *superfatura* ['overinvoice']
- *sobrepreço* ['overprice']
- *preço superior* OR *preços superiores* ['higher price' OR 'higher prices']

Embezzlement: Any irregularites containing

- *falta de comprovação/comprovante* AND (*pagamento* OR *despesa* OR *aplicação*)

  ['lack of proof/receipt' AND ('payment' OR 'expenditure' OR 'aplication')]
- *não comprovação* AND (*despesa* OR *aplicação*)

  ['no proof/receipt' AND ('expenditure' OR 'aplication')]
- (*pagamento* OR *despesa* OR *aplicação*) AND (*sem comprovação/comprovante* OR *sem documentação comprobatório*)

  [('payment' OR 'expenditure' OR 'application' (of resources)) AND ('without proof/receipt' or 'without supporting documentation')]
- *não apresentação* AND (*documentos comprobatórios* OR *comprovação/comprovante*) AND (*pagamento* OR *despesa* OR *aplicação*)

  ['no presentation' AND ('proving documents' OR 'proof/receipt') AND ('payment' OR 'expenditure' OR 'application')]
- (*pagamento* OR *despesa* OR *aplicação*) AND (*sem documento fiscal* OR *sem suporte documental*)

  [('payment' OR 'expenditure' OR 'application') AND ('without fiscal documents' OR 'without documental support')]
- (*fiscal* OR *fiscais*) AND (*falsa* OR *inidônea* OR *fria*)

[('fiscal' OR 'fiscals') AND ('false' OR 'disreputable' OR 'cold')] ('cold notes' in portuguese are false fiscal notes)

- *utilização* AND *recursos* AND *sem* AND *comprovação/comprovante* AND *despesa*

  ['utilization' AND 'resources' AND 'without' AND 'proof/receipt' AND 'expenditure']

- *ausência* AND *comprovação/comprovante* AND (*despesa* OR *pagamento*) AND length of description less than 75 characters

  ['absence' AND 'proof/receipt' AND ('expenditure' OR 'payment') AND length of description less than 75 characters]

Note: The character restriction on the last bullet point is because there were some irregularities with very long descriptions that included all of the chosen words, but on inspection, were clearly not corruption.