

Reelection Incentives and Political Corruption: Evidence from Brazil's Municipal Audit Reports*

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Abstract

This paper uses a unique dataset of political corruption, constructed from municipal audit reports obtained from Brazil's randomized anti-corruption program, to test whether reelection incentives affect the level of rent extraction of incumbent politicians. In order to identify reelection incentives, we use the existence of a term limit in Brazil's municipal elections. We find that in municipalities where mayors are in their second and final term, there is significantly more corruption compared to similar municipalities where mayors are in their first-term. In particular, in municipalities with second-term mayors there is, on average, R\$188,431 more diversion of resources and the incidence of irregularities is 23% higher. We also find more pronounced effects where the costs of rent-extraction are lower (municipalities without media and judicial presence), and the density of pivotal voters is higher (more political competition). Finally, we show that first-term mayors, while less corrupt, have a larger incidence of poor administration suggesting that there may exist a trade-off between corruption and quality in public good provision.

Key words: Political Agency, Corruption, Reelection, Public Goods. JEL: D72, D78, H41,O17.

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1 Introduction

An important role of elections is to hold incumbent politicians accountable for poor performance. The possibility of reelection provides politicians with incentives to exert more effort and refrain from rent-seeking behavior. Political economy agency models, such as Barro (1970), Ferejohn (1986) and Banks and Sundaram (1993), predict that incumbent politicians will refrain from maximum rent-extraction in their first electoral term in order to get reelected and enjoy future rents.¹ However, the extent to which reelection incentives affect rent extraction in practice remains an open question. The scarcity of empirical tests stems, in large part, to the difficulties in measuring rent-appropriation due to its illicit nature.

This paper tests whether re-election incentives affect the level of political corruption.² In order to do so, we construct measures of corruption using audit reports from an anti-corruption program started by the Brazilian federal government in April 2003. The program audits the receipts of federal funds in approximately 50 randomly chosen municipalities each month throughout Brazil. We use these reports to construct two objective measures of corruption at the municipal level: the share of resources misappropriated and the number of corrupt irregularities. The audit reports also list irregularities associated with the provision of public goods and services which we use to create a measure of the quality of the public administration. This allow us to further test whether re-election incentives affect the quality of public good provision.

To identify the effect of re-election incentives, we exploit variation in the distribution of first and second-term mayors across municipalities induced by the existence of a two-period term limit. We show that in municipalities with second-term mayors the share of resources misappropriated is, on average, R\$188,431 (approximately US\$70,000) larger than in municipalities with first-term mayors. Also, second term mayors have a larger incidence of corruption- in particular, they commit 31 percent more irregularities related to corruption, compared with first term mayors. Our findings complement studies that examine how reelection incentives through term-limits affect government policies (see Besley and Case (1995) and List and Sturm (2004)).

We further exploit the interactions between re-election incentives and institutional features of municipalities. Previous literature has shown that variation in institutional differences is an important determinant of the variation in corruption levels across countries (see for example Traisman

¹See Persson and Tabellini (2000) and Besley (2005) for reviews of political agency models.

²We define political corruption as the abuse of entrusted power by political leaders for private gain, with the objective of increasing power or wealth (see Transparency International (2004)).

(2000); Mocan (2004); Adsera, Boix, and Payne (2003); Kunicova and Rose-Ackerman (2003); Lederman, Loayza, and Soares (2005); Persson, Tabellini, and Trebbi (2003)). However, unlike these studies that rely on cross-country comparisons, we examine how political incentives and local institutions influence the extent of political corruption within a single-country. This has the advantage of controlling for unobserved differences in formal institutions that arise in cross-country regressions.

We test whether the lack of institutions such as a local judge or media attenuate the re-election incentives created by term limits. We find significant variation comparing municipalities with and without a media source and municipalities with and without a judiciary district. Among municipalities with a radio or a local judge, we find little differential effect between first and second-term mayors. Conversely, for the municipalities *without* a permanent judge, reelection incentives reduce political corruption by 7 percentage points, which is almost double the average effect. We also find the effect of reelection incentives to be more pronounced in municipalities where mayor elections were close, suggesting that a higher share of pivotal voters induce first-term mayors to reduce rent-extraction in order to guarantee reelection for a second term.³

Although we find a higher level of corruption in municipalities where mayors are “lame ducks”, voters may not be necessarily worse-off. It might be the case that second-term mayors, while more corrupt, are able to supply a higher quality of public goods. In fact, this tradeoff has even been used in a political campaign in Brazil. An ex-mayor of São Paulo during the 1950’s campaigned on the slogan “Rouba, mas faz” (Steals but get things done).⁴ Hence, we investigate whether there is a difference in the quality of public good provision among first and second-term mayors. We show that second-term mayors commit, on average, 17 percent fewer violations associated with public administration. To assure that this is not driven by the potential selection of better politicians into a second-term, we estimate the model restricting the sample of first-term mayors to those reelected in the 2004 election and find similar results.

We conclude that voters may have to chose between electing a mayor that can be held accountable or one that will provide a higher level of public goods. This important trade-off has received little attention in the political economy literature. Hence, we provide a simple political economy model consistent with these results.

³Conversely, mayors who dictate a municipality will extract maximal rent in the first term since reelection is almost assured.

⁴See Laranjeira (1999).

The remainder of the paper is organized as follows. Section 2 presents a theoretical framework that links corruption to reelection incentives. It is within this context that we interpret our empirical results. Section 3 then provides some basic background information on corruption in Brazil and describes the data. Our empirical strategy is discussed in section 5, and the results follow in section 6. Section 7 concludes the paper.

2 Theoretical Framework

In section, we present a simple political economy model to help interpret our empirical findings. Based on Persson and Tabellini (2000) and Stromberg (2004), we formulate a two-period probabilistic voting model that allows politicians to benefit specific groups of the population with targeted redistribution, in addition to providing public goods and extracting rent. The fact that politicians target transfers to specific groups reflects the importance of clientelistic practices in Brazilian politics (See for example Hagopian (1996) and Mainwaring (1999)).

The basic intuition for the model is as follows. Faced with the possibility of reelection, the incentives to engage in redistributive transfers towards groups with more swing voters is strong, and comes at the cost of less public provision and rent extraction. Without reelection incentives and thus absent the need to buy votes, lame duck politicians spend more on public goods, while extracting more rent.⁵

The Model

Consider a two period model where society consists of N distinct groups denoted $i = 1, \dots, N$. Individuals from group i in period $t \in \{1, 2\}$ have preferences given by an additively separable utility function defined over the consumption of private and public goods,

$$u(c_t^i) + H(g_t) = u(y(1 - \tau) + f_t^i) + H(g_t),$$

where g_t is the supply of public goods and consumption c_t^i is determined by disposable income $y(1 - \tau)$ and private transfers from the government f_t^i . The tax rate τ is an exogenous parameter and $H(\cdot)$ is a concave monotonically increasing function.

⁵Alternative political economy models of clientelism include Keefer and Vlaicu (2004), Medina and Stokes (2002), and Robinson and Verdier (2002).

Besides preferences over government policy, voters possess an ideological preference in favor of the incumbent mayor composed of a group specific component η_i and a parameter δ that measures the incumbent's average popularity. In effect, an individual's total utility consists of a trade off between economic benefits and ideology when deciding to vote,

$$W_t^i = u(y(1 - \tau) + f_t^i) + H(g_t) - (\eta_i + \delta).$$

Individuals from group i then vote according to a rule v_i which requires that an incumbent meet a minimum welfare requirement \bar{v}_i in order to receive support, otherwise the vote goes for a challenger,

$$v^i = \begin{cases} 1 & \text{if } W(f, g; \eta^i, \delta) > \bar{v}^i, \\ 0 & \text{otherwise.} \end{cases}$$

Each politician can extract rents r_t while in office which they value according to a well-behaved, concave function $R(r_t)$. In period 1, with the possibility of reelection, their expected private utility is given by $R(r_1) + \beta Pr_I R(r_2)$ where $\beta \in (0, 1)$ is a discount factor and Pr_I is the probability of reelection, which is endogenously determined. In the second and final period, the absence of re-election incentives simplifies the politician's private utility function to $R(r_2)$.

Besides their own private utility, politicians care about voter's welfare. Their overall utility function is then a weighted sum of their own private utility and voters' welfare:

$$\alpha(R(r_1) + \beta R(r_2) Pr_I) + (1 - \alpha) \sum_{i=1}^N \theta^i u((y(1 - \tau) + f_1^i) + H(g_1)) \quad (1)$$

where $\alpha \in [0, 1]$ is an exogenous parameter measuring the weight the incumbent places on his own private utility relative to social welfare. The parameter θ_i denotes group i 's proportion in the population which sum to one.

The incumbent mayor, constrained by a balanced budget, allocates tax revenues $Ny\tau$ in each period between public goods g_t , private transfers f_t , and rent extraction, r_t ,

$$Ny\tau = r_t + g_t + \sum_{i=1}^N f_t^i \quad (2)$$

Each policy instrument is nonnegative by assumption, and to insure that voters have the incentive to reelect incumbent mayors, we assume a maximum level of rent extraction \bar{r} that is strictly below the total available tax revenue.

Equilibrium

Since the game ends in period 2, the elected politician, absent reelection incentives, will set his preferred policy to maximize the following welfare function:

$$\text{Max}_{r_2, g_2, \{f_2^i\}_{i=1}^N} \alpha R(r_2) + (1 - \alpha) \sum_{i=1}^N \theta^i (u(y(1 - \tau) + f_2^i) + H(g_2)), \quad (3)$$

subject to the government budget constraint (2), to the usual nonnegativity constraints, and the upper bound on rents (\bar{r}).

Assuming an interior solution, the elected politician will extract positive rents and allocate the rest of the budget between public goods and private transfers. Private transfers will be distributed between groups based on their proportion in the population $\theta^i u_f(c_2^i) = \theta^j u_f(c_2^j)$ for $i \neq j$, where $u_f(\cdot)$ is the marginal utility of consumption. Public goods are provided to the extent that the marginal utility of public goods equals the marginal utility of consumption, $H_g(g_2) = \theta^i u_f(c_2^i)$.

In period 1 the incumbent politician faces a trade-off between rent extraction and reelection incentives. In order to increase the probability of re-election, the incumbent has the incentive to target transfers towards specific groups with more swing voters at the cost of more public good provision and rent extraction. Hence the incumbent maximizes his utility function given by equation (1), subject to the government budget constraint (2), to the nonnegativity constraints, and the upper bound on rents (\bar{r}).

While uncertain about the voters' ideological preferences, the politician correctly realizes that $\eta^i + \bar{v}^i$ is uniformly distributed with mean μ_i and density ψ^i . Hence he can infer the probability of re-election Pr_I . Given the voting rule v^i , the share of votes that the incumbent receives conditional on his choice of policy is given by,

$$\pi_I = \frac{1}{2} + \sum_i \theta^i \psi^i (W_1^i(f_1, g_1) - \delta - \mu^i).$$

Given that δ is uniformly distributed with mean 0 and density ϕ , the probability that the incumbent wins simply follows,

$$Pr_I = Pr\left(\pi_I \geq \frac{1}{2}\right) = \frac{1}{2} + \frac{\phi}{\sum_i \theta^i \psi^i} \left(\sum_i \theta^i \psi^i (W_1^i(f_1, g_1) - \mu^i)\right). \quad (4)$$

From the maximization of the politician's objective function (1) where the probability of re-election is given by equation 4, we obtain the first-period optimal policy choices. Comparing the levels of rent-extraction and public goods between periods one and two we derive the following proposition:

PROPOSITION 1

Suppose voter's have quasi-linear preferences over consumption and public goods, $u(c_t^i) + H(g_t) = y(1 - \tau) + f_t^i + H(g_t)$. Then rents and the supply of public goods are larger in the second period compared to the first period, i.e. $r_2 > r_1$ and $g_2 > g_1$.

Proof: See appendix

3 Institutional Background

Brazil provides the ideal setting to test whether political incentives affect corruption levels. Reelection incentives were introduced in 1997 through a constitutional amendment that allowed mayors to run for a second consecutive term. This amendment allow us to test the effects of reelection incentives by comparing the corruption levels between municipalities where mayors are in their first term to those where mayors are in their second and final term. A unique anti-corruption program introduced by the Controladoria Geral da União (CGU) in 2003 provides municipal audit reports that allow us to construct a unique database of corruption.

Municipal corruption has become an overarching concern for Brazil.⁶ After the constitution of 1988, municipal governments became responsible for a substantial share of the provision of public goods and services, particularly in the areas of education and health. With the devolution of public service delivery to local governments, the federal government transferred large amounts of resources to municipalities.

Currently, the 5,560 Brazilian municipalities receive on average \$35 billion per year from the federal government, which represents approximately 15 percent of federal government's revenue.⁷ The influx of federal funds increased the potential for local capture.⁸ The rest of this section provides descriptive evidence on the most common forms of corruption found in Brazil's municipalities and then describe Brazil's recent anti-corruption audit program.

3.1 Corruption Schemes in Brazil's Municipalities

With a series of well-publicized federal corruption scandals, including the one that lead to the impeachment of ex-President Collor de Mello, much of our understanding of corruption and its

⁶For a detailed article on municipal corruption see VEJA (2004).

⁷For comparison, fiscal decentralization in the world is on average 6 percent, while in other similar developing countries such as Mexico, for example, it is only 3 percent.

⁸On decentralization and local capture see Bardhan and Mookherjee (2005).

institutional sources in Brazil has been limited to the national scale (see for example Ames (1987), Fleischer (2002); Geddes and Neto (1992)). Corruption at the municipal level, although potentially increasing due to Brazil's decentralization, has received much less attention.

Municipal corruption assumes a variety of forms. Frauds in procurement processes, diversion of funds, and over-invoicing for goods and services are among the most common ways local politicians find to appropriate resources.⁹ Other common irregularities include incomplete public works (paid for but unfinished); the use of fake receipts ("notas frias") and phantom firms (a firm that only exists on paper).

A common corruption scheme used to deviate public resources in the municipalities of Eldorado dos Carajés and Porto Seguro, for example, include the creation of phantom firms, simulation of procurement processes and payments made in the form of kickbacks to government officials.¹⁰ In other contracts, although existing firms did win the bid, none of them were even aware that they had participated in the bidding process. The local administration used these firm's names in fake receipts to appropriate resources for public goods that were never provided.

Another irregular practice, common in several municipalities, is a non-competitive procurement process. While the Brazilian law requires a competitive bidding process with at least three participants for any project in excess of R\$80,000 per year, the municipality of Itapetinga in the state of Bahia, for example, highlights one of the many ways local politicians have manipulated the public procurement process. In 2002 and 2003, the federal government transferred to Itapetinga R\$ 389,000 (US\$110,000) for the purchase of school lunches. In 12 out of the 16 calls for bids, only one bid was ever supplied. It was later discovered that each call for bids was posted only one hour prior to its deadline, and not surprisingly only a firm owned by the mayor's brother posted within the time limit. This same scheme was uncovered for other social programs in the areas of education and health.

In other procurement bids, irregularities appear because friendly or family firms have either benefitted from insider information on the value of the project, or certain restrictions have been imposed to limit the number of potential bidders. An example from Cacule, Bahia, illustrates this. The call for bids on the construction of a sports complex specified as a minimum requirement for participation that all firms needed to have at least R\$100,000 in capital and a specific quality control certification. Only one firm called Geo-Technik Ltda., which was discovered to have provided

⁹For a description of municipal corruption schemes in Brazil see Trevisan, Antoninho M. et al. (2003).

¹⁰These descriptions are based on several CGU reports and press releases available at: www.presidencia.gov.br/cgu.

kickbacks to the mayor, met these qualifications.

Another common form of corruption is for mayors to divert funds intended for education and health projects towards the purchase of cars, fuel, apartments, or payment of their friends' salaries. In some cases, the mayor himself is a direct beneficiary. For example, in *Paranhos*, Mato Grosso do Sul, R\$189,000 was paid to implement a rural electrification project. As it turns out, one of the farms benefitted by the project was owned by the mayor.

3.2 Brazil's Anti-Corruption Program: an Overview

In May 2003 the government of Luiz Inácio Lula da Silva started an unprecedented anti-corruption program based on the random auditing of municipal government's expenditures.¹¹ The program, which is implemented through the Controladoria Geral da União (CGU), aims at discouraging misuse of public funds among public administrators and fostering civil society participation in the control of public expenditures. One of the main mechanisms to meet these objectives is the release of the audit findings on the internet and to media sources. The following quote from President Lula, extracted from the program inaugural speech, emphasizes this: "I think the Brazilian society needs to understand once and for all, that we are only going to be able to truly fight corruption when the civil society, with the instruments made available, can act as a watch dog."¹²

The program started with the audit of 26 randomly selected municipalities, one in each state of Brazil. The program has since expanded to auditing 50 and later 60 municipalities per lottery, from a sample of all Brazilian municipalities with less than 450,000 inhabitants.¹³ The lotteries, which are held on a monthly basis at the Caixa Econômica Federal in Brasilia, are drawn in conjunction with the national lotteries. To assure a fair and transparent process, representatives of the press, political parties, and members of the civil society are all invited witness the lottery.

Once a municipality is chosen, the CGU gathers information on all federal funds transfers to the municipal government from 2001 onwards. Approximately 10 to 15 CGU auditors are then sent to the municipality to examine accounts and documents, to inspect for the existence and quality of public work construction, and delivery of public services. Auditors also meet members of the local community, as well as municipal councils in order to get direct complaints about any

¹¹In Portuguese the program is called *Programa de Fiscalização a partir de Sorteios Públicos*.

¹²The translation is ours. The speech is available at www.presidencia.gov.br/cgu.

¹³This excludes approximately 8 percent of Brazil's 5500 municipalities, comprising mostly of the state capitals and coastal cities.

malfeasance.¹⁴ After approximately one week of inspections, a detailed report describing all the irregularities found is submitted to the central CGU office in Brasilia. The reports are then sent to the Tribunal de Contas da União (TCU), to public prosecutors and to the legislative branch of the municipality. For each municipality audited, a summary of the main findings is posted on the internet and disclosed to main media sources. It is from these reports that we construct an objective measure of corruption.

4 Measuring Corruption

This section summarizes different measures of corruption used in the literature and then describes the methodology used in this paper to quantify political corruption. We finish by providing summary statistics of the corruption measures and municipal characteristics used in the empirical analysis.

4.1 Related Literature on Corruption

In a recent volume that focuses on the history of corruption in the United States, Glaeser and Goldin (2005) define corruption to have three central elements: (1) payments to public officials beyond their salaries; (2) an action associated with these payments that violates either explicit laws or implicit social norms; and (3) losses to the public either from that action or from a system that renders it necessary for actions to arise only from such payment.

As with any illegal activity, obtaining data on corruption is a difficult task. Several empirical studies that focus on illegal behavior have used indirect evidence to analyze its determinants and consequences (see for example Duggan and Levitt (2002); Fisman (2002); Fisman and Wei (2004)). However, a small, but growing body of literature has tried to assess corruption more directly focusing on two forms: bribery of public officials and the theft of public resources.

Svensson (2003) uses a dataset of Ugandan firms to explain which firms pay bribes and why the payments vary across firms. He finds that firms typically have to pay bribes when dealing with public officials whose actions directly affect the firms business operations. Moreover, the amount paid to depend's on the firms' bargaining power which is mainly determined by the alternative return to their capital. In a related paper, Henderson and Kuncoro (2004) uses data from a survey

¹⁴These auditors are hired based on a public examination, and prior to visiting the municipality receive extensive training on the specificities of the sampled municipality. Also, there is a supervisor for each team of auditors.

of firms that pay bribes in Indonesia to analyze how fiscal capacity of local jurisdictions relates to corruption.

A second strand of the literature estimates corruption focusing on the theft of public resources. Di Tella and Schargrotsky (2003), using data from hospital audits in the city of Buenos Aires, compare prices paid by public hospitals for basic supplies such as ethyl alcohol and hydrogen peroxide. They argue that corruption is reflected in the price differences of these homogeneous inputs. Reinikka and Svensson (2004) analyze rent capture in a large educational transfer program in Uganda. They collect data on grants received by schools using an expenditure tracking survey and measure rent capture as the proportion of the grants received by schools with respect to the total amount of resources transferred from the center. Olken (2004) conducts a randomized field experiment in 608 Indonesian villages. He measures corruption in road construction using a team of engineers and surveyors who estimate the quantity and prices of materials and interviewed villagers to determine the wages paid. Stolen funds are estimated by comparing the amount each project cost with the village's reported expenditures. An alternative measure is used by Engerman and Sokoloff (2005), who study the building of the Erie canal and other canals in New York during the antebellum period. They use the ratio of actual expenditures of public works relative to the original projected cost as a proxy for corruption.

4.2 Measuring Corruption using Audit Reports

Our approach, although related to the above cited studies, uses a new methodology made possible by the availability of audit reports from Brazil's anti-corruption program. We read each report classifying the irregularities found by auditors into corruption indicators and estimate the amount of public resources deviated for each irregularity. Audit reports are available in the beginning of 2004 for the 376 municipalities randomly selected across the first 8 lotteries of the anti-corruption program.¹⁵ Contained in each report is the total amount of federal funds audited for the current administration, as well as, an itemized list describing each irregularity, in what sector it occurred (e.g. health, education, etc.), and in most cases the amount of funds involved.

Based on our readings of the reports, we codified the irregularities listed into several categories; some indicating corruption while others simply exposing poor administration.¹⁶ For the purpose of

¹⁵Only 26 municipalities were selected in the first lottery. In May of 2004, starting with the tenth lottery, the CGU increased the number of municipalities sampled to 60.

¹⁶We also used an independent research assistant to code the reports in order to provide a check on our coding.

coding irregularities, we define political corruption to be any irregularity associated with fraud in procurements, diversion of public funds, and over-invoicing. Specifically, we define a *procurement to be irregular* if: i) a required procurement was not executed; ii) the minimum number of bids was not attained; iii) there was evidence of fraud in the procurement process (e.g. use of bids from non-existing firms). We categorize *diversion of public funds* as any expenditure without proof of purchase or provision and/or direct evidence of diversion provided by the CGU. Finally, we define *over-invoicing* as any evidence that public goods and services were bought for a value above the market price.

These practices have not only been shown to be the most common forms local politicians find to appropriate resources, but in many instances they are not necessarily mutually exclusive (see Trevisan, Antoninho M. et al. (2003)). In effect, over-invoicing and illegal procurement practices often serve as complementary vehicles for funds diversion. To give a better sense of the irregularities found and the procedure used to code corruption, we present in the appendix some specific examples from the audit reports.

Based on the coding of reports, we define two measures of corruption at the municipal level: the total amount of resources related to corrupt activities (expressed as a share of the total amount of resources audited) and the count of the number of irregularities related to corruption. There are at least two reasons why we calculate the second measure. First, although correlated with our first measure (the correlation coefficient is 0.51), the number of corrupt irregularities helps to distinguish whether second-term mayors also engage in more corrupt transactions. Second, in coding the amount of resource deviated or involved in an illegal procurement, a dollar amount was not available in all of the irregularities reported.¹⁷ While coding these cases as zero underestimates the amount of corruption, this could create a bias for testing reelection incentives if the cases occurred disproportionately for first-term mayors. By using this count measure we include these irregularities and thus avoid the potential bias.¹⁸

In addition to the irregularities classified as corruption, the CGU audits also uncover evidence associated with mismanagement of public resources and inadequate public administration. There is a large incidence of incomplete public works (unpaid for), non-existent or non-functioning social councils, mismanagement of social programs, abandoned projects, and failure to spend the allocated

¹⁷Only 11 percent of the incidences of illegal procurement practices and funds diversion did not have a value.

¹⁸If anything we are underestimating the effect of reelection incentives on the share of total resources associated with corruption, because the proportion of these irregularities is 6 percentage points higher for second-term mayors.

budget.¹⁹ We classified these items as maladministration and for each irregularity we distinguish the sector in which it occurred. For the empirical analysis, we use a measure of poor administration defined as the number of irregularities associated with incomplete public works, non-existent or non-functioning social council, mismanagement of a social programs, abandoned projects, and failure to spend allocated budget. In the appendix we provide specific examples of maladministration as they appear in the audit reports.

4.3 Summary Statistics on Corruption and Government Irregularities

Summary statistics for each one of the three corruption categories and the overall corruption indicator are displayed in Panel A of Table 1.²⁰ As seen in column 1, 54 percent of the municipalities have performed an illegal procurement practice, and at least 48 percent of the municipalities have diverted some type of funds. Over-invoicing, another source of corruption, is found much less frequently, occurring in only 6 percent of our sample. After combining these indicators, we see that 73 percent of the municipalities have had at least one incidence of corruption. Moreover, those administrations that commit an act of corruption average around 2.36 corrupt violations. The average amount of resources diverted is R\$135,000 per violation which represents 9.1 percent of the total amount audited.

In Panel B, we present summary statistics for the other government irregularities. An incidence of inadequate public administration is found in over 68 percent of the municipalities. Among the specific irregularities found, the misuse or mismanagement of social programs and unfinished public works appear to be important problems. Approximately 39 percent of the municipalities have mismanaged at least one of its federally-funded social program while unfinished public works are found in 25 percent of the municipalities.

Table 2 displays the primary sectors over which these irregularities are distributed. Both in aggregate and for the corruption indicator, we see that over 50 percent of these irregularities occur in the areas of education and health: sectors that were decentralized during of the late 1980s. Though this table cannot distinguish whether corruption occurs relatively more in health and education

¹⁹During the decentralization process, several municipalities created municipal councils comprised of members of civil society to monitor the use of federal resources and the management of programs such as Fundef (education fund) and Merenda escolar (school meals).

²⁰Summary statistics are computed for the 367 municipalities that constitute our estimation sample. Thirteen municipalities were excluded for not having a full set of explanatory variables.

because the federal funds are concentrated in these areas or because the activities within these sectors are easier to corrupt, there does appear to be a lack of oversight. Of the 30 percent of the municipalities that do not have a functioning or existent council, roughly 50 percent of these dysfunctional councils are related to health or education. We also find that abandoned projects (or white elephants), which are found in 10 percent of the municipalities, are mostly associated with agriculture.

To get a sense for how reelection incentive may affect these various irregularities, Table 3 compares these indicators between municipalities with mayors in their first-term to those with mayors in their second-term. The number of irregularities found in each of our 3 categories of corruption (diversion of funds, illegal procurement practices, and over-invoicing) is higher in municipalities governed by second-term mayors (see Panel A). On average, second-term mayors commit 0.23 more irregularities in both diversion of funds and illegal procurement practices, although only procurement practices are measured with much precision. A comparison of our aggregated indicator of corruption provides some preliminary evidence in support of our theoretical predictions. Mayors in their final term of office commit 0.48 more irregularities related to corruption than first-term mayors, a difference that is significant at 90 percent confidence. When we measure corruption using the share of the transfers audited, Panel B of Table 3 tells a similar story. Second-term mayors are on average 3.7 percent more corrupt than first-term mayors, a difference which is significant at a 95 percent level of confidence.

Panel A also shows that while more corrupt, second term mayors are on average better administrators than first-term mayors. Municipalities with a second-term mayors commit fewer irregularities in tending to administrative matters, and to a lesser extent have less dysfunctional councils and better-managed social programs.

4.4 Data on Municipal Characteristics

Three other data sources, obtained from the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística (IBGE)) and the Tribunal Superior Eleitoral (TSE), complement our political corruption variables. The richness of these data allows us to control for several municipal characteristics, whose absence might otherwise confound our estimates.

Our measures of per capita income and income inequality are obtained from the 2000 population census. Per capita income is simply measured as total household income divided by household size.

Using sampling weights, we then constructed for each municipality average per capita income and a Gini coefficient.

Our second complementary data source from IBGE is a municipality survey, *Perfil dos Municípios Brasileiros: Gestão Pública*, conducted in 1999. These data characterize various aspects of the municipality and its public administration, including the existence of laws which govern its budgetary and planning procedures and characterizing judiciary districts. The survey also provides structural features of the municipality such as whether it has a daily newspaper, radio or municipal police.

Finally, results from 2000 mayor elections are available from the Tribunal Superior Eleitoral (TSE). These data contain vote totals for each candidate by municipality, along with various individual characteristics, such as the candidate's gender, education, occupation, and party affiliation. We use this information to construct the mayor's winning margin and various other measures of electoral performance.

Table 4 compares differences in mean characteristics of municipalities with a first-term mayor and municipalities with a second-term mayor. Despite our lack of experimental design and need to assume selection on observable characteristics, it is useful to understand if determinants of corruption are significantly different across the municipalities with first-term and second-term mayors. Along several observable characteristics, there appear to be few differences between municipalities with second and first-term mayors. Out of 43 observable characteristics of municipalities, only 3 are significantly different at a 95 percent level of confidence.²¹ There is a significant difference in the margin of victory in the 2000 municipal elections between first and second-term mayor. This is not too surprising given that incumbents tend to have an advantage in elections. The other differences between municipalities with first and second-term mayor are the proportion of the population that is literate and per capita income, which are presumably correlated. Municipalities with second term mayors have a lower per capita income of roughly R\$27, which is only 10 percent of the monthly minimum wage.

5 Empirical Strategy

Our main objective is to test whether the reelection incentives created from allowing mayors to be reelected for a second term affect the level of political corruption in a municipality. Exploiting the

²¹For the sake of space, we only report the 13 most important variables.

fact that mayors are limited to two consecutive terms in office, we compare the corruption level between first-term mayors and second-term mayors. Our theoretical model predicts that first-term mayors who still face reelection incentives should on average be less corrupt than second-term mayors. Here, we present the empirical specification used to test this hypothesis, and discuss the assumptions needed for a causal interpretation of our results.

We estimate the effects of reelection incentives using the following econometric specification,

$$r_{ij} = \beta I_{ij} + X_{ij}\delta + Z_{ij}\gamma + \eta_j + \varepsilon_{ij}, \quad (5)$$

where r_{ij} is the level of corruption for municipality i in state j , and I_{ij} indicates whether the mayor is in his second and final term. The vector X_{ij} is a set of municipal characteristics and the vector Z_{ij} is a set of mayor characteristics that determine the municipality's level of corruption. The term η_j represents state intercepts, and ε_{ij} denotes unobserved (to the econometrician) municipal and mayor characteristics thought to determine corruption. Assuming that $E[I_{ij}\varepsilon_{ij}] = 0$, the coefficient β measures the true effect of reelection incentives on corruption levels.

The intuition underlying this identification assumption and our estimate of β can be had by considering the ideal research design. Imagine a controlled experiment that randomly assigns the possibility of reelection to a second term across politicians before the start of their first administration and then records corruption levels after the first term. To be concrete, suppose that without the possibility of reelection lame duck mayors commit a level of corruption equal to \bar{r} (maximum rent extraction). Thus, after two periods corruption in these municipalities will be equal to $2\bar{r}$.

In municipalities that allow for reelection to a second term, corruption in the first term is equal to r_1 (where $r_1 \leq \bar{r}$) and equal to \bar{r} in the second period.²² In this randomized experiment, the simple difference between corruption under the two regimes is equal to $\bar{r} - r_1$, which captures the average effect of being able to be reelected to a second and final term on the level of corruption.

What this experiment illustrates is that the coefficient β measures exactly this difference under the following two counterfactual assumptions. First, second-term mayors behave similarly to mayors who face a single-term limit. And secondly, conditional on observed characteristics, first-term mayors behave similar to second-term mayors when they were in their first term.

Note that we are not measuring a term limit effect as in Besley and Case (1995) since our counterfactual is not the absence of term limits. We could however interpret β as a term-limit effect under the strong assumption that corruption among mayors in their first term is equal to

²²Note that if reelected to the second term the mayor by assumption commits a level of corruption equal to \bar{r} .

the corruption level of mayors in the absence of term limits. But this assumption is violated in most political agency models precisely because reelection incentives for first-term mayors are higher in municipalities with a term limit than those without. Hence, because reelection incentives are higher among these municipalities, first-term mayors have the incentive to lower their corruption level relative to mayors in municipalities without term limits.

6 Empirical Results

This section provides evidence consistent with our theoretical model. Our results show that mayors who face a binding term limit are associated with higher levels of corruption, measured in both the share of resources appropriated and the number of corrupt irregularities. These findings are robust to various specifications and estimation techniques. We also explore variation in the effects of reelection incentives and find that it is larger among municipalities where the cost of rent extraction is lower, and where the density of pivotal voters is higher; again all consistent with our theoretical predictions. We conclude this section with a discussion of potential threats to our identification assumptions.

Basic Results on Corruption

Table 5 presents estimates of the effects of reelection incentives on the share of resources that were corrupted.²³ Column 1 reports the unadjusted relationship between whether the mayor is in his second-term and the share of funds appropriated, and the remaining columns correspond to specifications that include additional sets of controls. Our base specification presented in column 2 controls for mayor characteristics, demographic characteristics of the municipality, and a measure of political competition. Whereas column 3 simply extends this specification to include municipal institutions that are thought to constrain the practice of corruption in a municipality. Our full specification reported in column 4, which also corresponds to equation 5, simply adds state intercepts to the specification reported in column 3. Sample sizes and R^2 are reported below. The sample has been restricted to the non-missing observations of the various control variables, so as to keep its size constant across specifications; this adjustment does not affect the general results.

From the bivariate relationship in column 1, we see that second-term mayors are associated with

²³Unless specified all the results presented in the following tables use weighted least squares to account for the different probability of municipalities being selected for the audit across states.

a 3.4 percentage point increase in corruption. At a baseline of 0.062, this estimate represents an effect of 54.8 percent. Alternatively if we consider that on average R\$5,542,210 were transferred to these municipalities, lame-duck mayors appropriate R\$188,431.4 more than first-term mayors. As seen in the other columns, the inclusion of additional controls has virtually no effect on the point estimate. For example in column 4, which controls for state intercepts and various mayor and municipal characteristics, the estimated effect while slightly larger is statistically indistinguishable from the estimate of the unadjusted regression.²⁴

For our second measure of corruption, Table 6 reports the estimates of the effect of reelection incentives on the number of irregularities found to be corrupt.²⁵ Column 1 in Table 6 presents the bivariate relationship between reelection incentives and the number of corrupt irregularities. Although we find that second-term mayors are more corrupt than first-term mayors, an underlying concern would be that municipalities with second-term mayors may have had more items audited. Without knowing this information, we proxy for this scale-effect in column 2 by controlling for the total number of irregularities (i.e. poor administration, poor functioning councils, etc.) found in the municipalities.²⁶ Compared to column 1, the estimated effect remains statistically indistinguishable and significant at a 95 percent level of confidence. The estimate in column 2 implies that second-term mayors are associated with a 0.534 increase in the number of corrupt irregularities. At a baseline of 1.73 corrupt violations, this represents a 31.4 percent increase. This estimate is robust to the inclusion of other controls, specifically mayor characteristics, municipal demographics, political competition, municipal institutional characteristics, party and state fixed-effects. For example, under the most robust specification (column 4), the estimated effect is 0.544 (standard error=0.232).

As a test of the robustness of our estimates, Table 7 presents the estimated effect of reelection incentives using a bias-adjusted matching estimator (Abadie and Imbens 2005). The flexibility of the matching estimator allows us to compare first-term mayors to second-term mayors with

²⁴Without any evidence of corruption in 31 percent of the sample, we also estimate a Tobit model to account for the left censoring at zero. Estimate of the marginal effects are reported in the appendix in Table A1. Conditional on the censoring, the marginal effects for the Tobit are similar to the OLS estimates.

²⁵Given that our dependent variable is constructed from count data, we also estimate a poisson model. Estimates of the marginal effects can be found in the appendix in Table A2. The marginal effects for the bivariate regression, column 1, are in fact similar to the weighted least squares estimates. However as we add more explanatory variables, the marginal effects from the Poisson differ slightly from the linear estimates since in the Poisson model they are functions of the other control variables. As reported in columns 3-5, the marginal effects are stable across specifications.

²⁶The fundamental assumption is that total number of irregularities is a weakly monotonic function of total number of items audited.

similar observable characteristics. Although compared to the regression analysis the identification assumptions are similar, the matching estimator does not assume a functional form and does not extrapolate over areas of uncommon support in the observable characteristics.

The first three columns of Table 7 correspond to effects of reelection incentives on the share of resources related to corruption. Whereas, the second set of columns, columns 4-6, report the estimated effect for the incidence of corruption-related irregularities. For each measure of corruption, the table presents three different specifications which differ in the variables that are matched. For both measures of corruption, the point estimates are consistent with those presented in the regression analysis and measured much more precisely. For example with the full set of control, the effect of term-limits on corruption-related expenditure is 0.035 percentage points, compared to 0.040 percentage points in our regression analysis.

Local Context and Reelection Incentives

In Table 8, we explore the extent to which this second-term effect varies according to local context. We expect second-term mayors to be more corrupt, relative to first term mayors, in municipalities where the cost of rent extraction is lower and political competition is higher. We measure the cost of rent extraction through two channels. The first is the probability of the mayor getting caught in a corruption scheme proxied by the existence of the number of local radio stations in the municipality.²⁷ The second is the probability of getting punished measured by the presence of a judge.²⁸ To proxy for political competitions we borrow a commonly used measure from the political science literature: the mayor's margin of victory in the previous election (see for example Ansolabehere and Jr. (2003)).

Table 8 presents the second-term effect and its interactions with radio, presence of a judge, and the mayor's margin of victory in the previous election. Column 1 controls for mayor characteristics, municipal demographics, and party fixed-effects, whereas the specification presented in column 2 includes state fixed-effects.

The presence of a permanent judge reduces the corruption differential between first-term and second-term mayors. This suggests that an increase in the cost of corruption, measured by the presence of a judge, will increase corruption among first-period mayors because of the reduction

²⁷For other studies that link media to public policy choices see Besley and Burgess (2002) and Stromberg (2004).

²⁸Since not all municipalities have their own judge, judges from larger municipalities are in charge of presiding over the cases for smaller locations.

in reelection incentives. We also find that in municipalities without a radio, reelection incentives reduce corruption by 12.3 percentage points which corresponds, on average, to R\$616,000. This result is consistent with a model where a reduction in the cost of corruption will make second-term rent appropriation more attractive inducing first-term mayors to refrain from corruption to increase their probability of getting reelected.

We also test how the second-term effect varies with the degree of political competition in the municipality. Among municipalities where 2000 elections were highly competitive, which corresponds to a win margin value of 0.021 (10 percent of the sample), the second-term effect is .064, which is 1.6 times the average estimate. And if we consider the other 10 percent of the municipalities where the elections were less competitive, given by a win margin of 0.35, the second term effect is 0.001. This result shows that municipalities characterized by low competition exhibit no differential effect in rent-extraction between first and second-term mayors. First-term mayors with an extreme electoral advantage can afford to be as corrupt as a lame-duck mayor since his reelection is practically guaranteed.²⁹

A Trade-off between Public Good Provision and Corruption

We have provided suggestive evidence that second-term mayors, who no longer face reelection incentives, tend to be more corrupt than first-term mayors. And yet, more corruption does not necessarily imply less provision of public goods. The descriptive statistics presented in Table 3 indicate that second-term mayors, while more corrupt, are also better public administrators. This complementarity presents an interesting trade-off. Voters must consider reelecting a mayor into a position of low accountability in exchange for more or better quality public goods. Here we examine this association between second-term mayors and better public administration more closely.

Table 9 presents the estimates for the effect of being a second-term mayor on the number of violations associated with mismanagement. We define mismanagement as the number of violations associated with poor administration, mismanagement of a social program, failure to spend allocated budget, and unfinished public works.

For each specification there is a strong negative association between being a second-term mayor and the number of violations associated with mismanagement. For example, in our most general specification (column 5) second-term mayors are associated with 0.41 less violations than first-term

²⁹The inclusion of state fixed-effect, as seen in column 2, do not significantly change the coefficients, although decreases the precision of the estimates.

mayors.³⁰ At a baseline of 2.37 violations, this effect represents a 17.5 percent difference between first and second-term mayors.

Hence, even though second-term mayors are associated with a 31.4 percent increase in corrupt violations, with second-term mayors providing, on average, better social programs, more complete public works, and better overall administration, a tradeoff clearly exists. As predicted by the theoretical model, voters must decide between reelecting a mayor that has the incentive to extract maximum rent, but on the other hand, does not need to engage in clientelistic practices in order to get reelected.

Although these results are consistent with our model, we may be simply capturing a selection bias associated with the fact that second-term mayors are reelected politicians. In the results presented in Table 10, we re-estimate each specification with a sample that only includes first-term mayors that do get reelected in the 2004 elections. We would expect, conditional on observable characteristics, that these mayors would have similar administrative abilities as the group of second-term mayors. The results in Table demonstrates that even using this restricted sample, second-term mayors are still associated with less violations in the provision of public goods. Compared to first-term mayors, lame duck mayors commit .454 fewer violations (see column 5) which is statistically undistinguishable to the previous estimate of -.414 in Table 9. This provides suggestive evidence that voters do face a trade-off between more potential corruption and reelecting a mayor that with fewer clientelistic incentives will offer more public goods.

Robustness Checks

Even though our general results are consistent with our theoretical model, mayors are unfortunately not randomly assigned to one or two term limits. As such, omitted-variable bias remains a central concern, and any unobserved characteristic of the municipality or its mayor that both determines corruption and is correlated with reelection will bias our results. Here, we describe and test some alternative explanations for our results.

One potential source of bias is the unobserved competency or ability of a mayor. If in an alternative theoretical framework a mayor's competency increases his reelection probability and enables him to be more corrupt, then our estimate, is capturing the mayor's competency, would be biased upwards. However, there are at least two reasons why unobserved competency may not be

³⁰The marginal effects estimated from a Poisson model provide very similar results. Results are available upon request.

driving our results. First, as seen in tables 5 and 6 the second-term effect is robust to the inclusion of several mayor characteristics, such as: age, education, party affiliation, civil status, and gender. The second reason is provided in Table 11 where we include the number of irregularities associated with poor administration, misuse of a social program, nonexistent/dysfunctional councils, and unfinished public works as proxies for a mayor's competency or administrative abilities. Columns 1-4 present the effect of reelection incentives on the share of resources found to be corrupt. All four types of administrative irregularities are negatively associated with corruption, but only the misuse or mismanagement of social programs is significant at a 90 percent level of confidence. And while these estimates do lend some support to idea that a mayor's ability may affect the level of corruption, our estimates of the second-term effect are in general unaffected. Only in the bivariate regression, column 1, do we lose some precision.

A related source of potential bias is the possibility that politicians learn or establish networks over time that allow them to become more corrupt. If this were the case, our estimates would not necessarily reflect the lack of reelection incentives for second-term mayors but rather the corruption knowhow that they have accumulated. Without more data it is difficult to test our model against this learning model. Nonetheless, we can control for changes that occur while the mayor is in office that are likely to change his potential corruption networks such as a new governor from the same party or the proportion of the local legislation chamber (camara de vereadores) that have the same political party as the mayor. Table 12 presents the corruption regression controlling for these variables. We also include an indicator if the mayor changed party during the term in office (with respect to the party that elected him). We find the results for both measures of corruption to be robust to the inclusion of these political control variables. The coefficient of the second-term dummy is 0.044 (s.e.=0.021) for the share of corruption and 0.54 (s.e.=0.23) for the incidence measure.

Our inability to control for informal institutions maybe another source of bias. If for example differences in the degree of clientelism or patronage within municipality are not captured in the differences of the various municipal characteristics controlled for, then our estimated second-term effect maybe upwardly biased. This notwithstanding, we would like to note that our estimates are robust to the inclusion of state fixed-effects, and in the context of Brazil, there is undoubtedly much more variation in informal institution across states, than within states.

Finally, there is at least two reasons to believe that our estimates represent lower bounds. First,

lame duck mayors may have aspirations for other political offices. And second, as in Alesina and Spears (1988) lame-duck mayor may also consider the reelection probabilities of their own party or a candidate that they have indicated. In both cases, lame duck mayors would have an incentive to refrain from complete rent extraction and consequently our results would be biased downward.

7 Conclusions

In April 2003, Brazil launched an ambitious anti-corruption program designed to audit the application and execution of federal funds transferred to municipalities. We exploit the reports of these randomly audited municipalities to quantify corruption and examine the link between reelection incentives and the extent of political corruption.

Using the variation in electoral incentives provided by term limits, we find that second-term mayors are associated with significantly more political corruption than first-term mayors, both in terms of the share of resources misappropriated and a simple count of the number of corrupt irregularities found in the municipality.

Furthermore, we show that reelection incentives vary according to the institutional features such as the presence of a judge, the existence of radio, and political competition. For instance, among municipalities with a judge or a radio, characteristics that increase the cost of rent-extraction, the corruption levels of first and second-term mayors are similar. This is consistent with a model where the increase in the cost of corruption will make second-term rent appropriation less attractive inducing first-term mayors to increase first-period corruption. Hence, under the presence of reelection incentives, the effectiveness of these types of institutions in combating corruption can be limited.³¹

While the empirical results provide valuable evidence in support of a fairly general political economy model, our findings also highlight a critical complementarity that is absent in most of these models. We find that second-term mayors, while more corrupt, are also better providers of public goods. The theoretical model presented in the paper provides one possible explanation for this complementarity. Consequently, it maybe the case that voters are willing to accept some amount of corruption in exchange for a mayor that is able to provide a higher level of public goods.

³¹Similarly Besley and Smart (2003) show that improving voter's information in a model with adverse selection and moral hazard might improve the selection of politicians, but reduce voter's ability to discipline politicians and hence increase first period rent seeking.

A Coding the Audit Reports

This appendix explains how we used the audit reports to code the corruption and poor administration variables. We provide the definition used for each type of irregularity and include an illustrative example drawn from the reports.³²

A.1 Examples of Political Corruption

Health related purchases without procurement using false receipts: The ministry of Health transferred to the municipality R\$ 321,700 for the Programa de Atenção Bsica. The municipal government used fake receipts valued at R\$ 166,000 to provide proof of purchase. Furthermore, there is no proof that the good were purchased since there were no registered entries of the merchandize in the stock. Also, in 2003 the municipality bought medicines valued at R\$253,300 without procurement. In 2004, the value was R\$113,700, also without procurement. We classified this violation as an incidence of irregular procurement and diversion of public funds in the area of health. We valued this irregularity as a diversion of R\$166,000. This irregularity occurred in Capelinha, Minas Gerais, drawn by lottery number 9.

Evidence of irregularities in well construction: The Ministry of National Integration transferred R\$117,037 to the municipality for the maintenance of water infra-structure. The working plan specified the maintenance of ten wells and four dams. None of these repairs were made. Instead, the dam Henrique Dantas, located inside a private farm was repaired. We classified this violation as an incidence of diversion of public funds in the area of water and sanitation. We valued this irregularity as a diversion of R\$117,037. This irregularity occurred in Santa Cruz, Rio Grande do Norte, drawn by lottery number 9.

Over-invoice of more than R\$3 million in road construction: The firm Mazda was hired, without procurement, to build approximatly nine kilometers of a road. The cost of the construction was estimated at R\$ 1 million based on similar constructions. The receipts presented by Mazda and paid by the government totalled R\$ 5 million. No further documentation was shown by the municipal government proving the need for the additional amount of resources. The auditors found that the firm Mazda, did not have any experience with construction and had sub-contracted the firm CTE for R\$ 1.8 million to do the construction. Hence, the project

³²For access to the summary of the audit reports, see www.presidencia.gov.br/cgu.

was over paid by more than R\$ 3 million. As evidence of corruption, it was late found that the firm Mazda gave an apartment for the mayor and his family valued at R\$600,000 suggesting a kickback. We classified this violation as an incidence of over-invoice in the area of infrastructure. We valued this irregularity as a diversion of R\$3.2 million. This irregularity occurred in São Francisco do Conde, Bahia, drawn by lottery number 6.

A.2 Examples of Bad Administration

Unfinished construction of sanitation system: The ministry of health transferred to the municipality R\$ 2 million, for the construction of a sanitation system. The auditors analyzed the documentation and visited the construction site. They saw that the construction was stopped and abandoned, although the construction did not reach even 30% of the original project. This irregularity occurred in Rorainópolis, Roraima, drawn in lottery 7.

Municipal councils do not execute their activities: the municipal councils of Fundef and School Lunches (Conselho de Alimentação Escolar- CAE) do not execute their activities. This implies that the application of the federal resources to both programs are not accompanied and inspected by the respective municipal council. This irregularity occurred in Malhada das Pedras, Bahia, drawn in lottery 5.

The family health program is not functioning properly: According to interviews with patients, the auditors found that the medical team was not visiting families regularly. Based on the information from the interviews, the auditors concluded that the number of visits is not compatible with what was registered in the program's database (Sistema de Identificação de Atenção Básica (SIAB)). The auditors emphasized that the municipality only provided one doctor to attend the entire population. This irregularity occurred Viosa, RN, drawn in lottery 4.

B Math Appendix

The first order conditions from equation 3 are:

$$\begin{aligned}
\alpha R_r(r_2) + v_{r_2} - v_{\bar{r}_2} &= 0 \\
(1 - \alpha)H_g(g_2) + v_{g_2} &= 0 \\
(1 - \alpha)\theta^i u_f(c_2^i) + v_{f_2^i} &= 0, \forall i = 1, \dots, N \\
v_{r_2} r_2 &= 0 \\
v_{g_2} g_2 &= 0 \\
v_{f_2^i} f_2^i &= 0, \forall i = 1, \dots, N \\
v_{\bar{r}_2}(r_2 \leq \bar{r}_2) &= 0 \\
\lambda, v_{r_2}, v_{g_2}, v_{f_2^1}, \dots, v_{f_2^N}, v_{\bar{r}_2} &\geq 0 \\
r_2 + g_2 + \sum_{i=1}^N f_2^i &= Ny\tau \\
0 \leq r_2, 0 \leq g_2, 0 \leq f_2^i, \forall i = 1, \dots, N \\
r_2 &\leq \bar{r}
\end{aligned}$$

As for period 1, the first-order conditions are:

$$\begin{aligned}
\alpha R_r(r_1) + v_{r_1} - v_{\bar{r}_1} &= 0 \\
(\alpha\phi\beta R(r_2) + (1 - \alpha))H_g(g_1) + v_{g_1} &= 0 \\
\left(\frac{\alpha\phi\psi^i\theta^i\beta R(r_2)}{\sum_i \theta^i\psi^i} + (1 - \alpha)\theta^i \right) u_f(c_1^i) + v_{f_1^i} &= 0, \forall i = 1, \dots, N \\
v_{r_1} r_1 &= 0 \\
v_{g_1} g_1 &= 0 \\
v_{f_1^i} f_1^i &= 0, \forall i = 1, \dots, N \\
v_{\bar{r}_1}(r_1 \leq \bar{r}_1) &= 0 \\
\lambda, v_{r_1}, v_{g_1}, v_{f_1^1}, \dots, v_{f_1^N}, v_{\bar{r}_1} &\geq 0 \\
r_2 + g_2 + \sum_{i=1}^N f_2^i &= Ny\tau \\
0 \leq r_2, 0 \leq g_2, 0 \leq f_2^i, \forall i = 1, \dots, N \\
r_2 &\leq \bar{r}
\end{aligned}$$

Without loss of generality suppose that $\psi_1 > \{\psi_i\}_{i=2}^N$. Assuming quasi-linear preferences the

optimal level of public goods in period 1 is given by the following relationship,

$$H_g(g_1) = \frac{\left(\frac{\alpha\phi\psi_1\beta R(r_2)}{\sum_i \theta_i \psi_i} + (1 - \alpha) \right)}{(\alpha\phi\beta R(r_2) + (1 - \alpha))} \theta^1. \quad (6)$$

Similarly the optimal level of public in period 2 is determined by:

$$H_g(g_2) = \theta^1. \quad (7)$$

Given our assumption of quasi-linear preferences,

$$\alpha\phi\beta R(r_2) + (1 - \alpha) < \left(\frac{\alpha\phi\psi^1\beta R(r_2)}{\sum_i \theta^i \psi^i} + (1 - \alpha) \right). \quad (8)$$

It follows that $H_g(g_2) < H_g(g_1)$, which given our assumptions about $H(\cdot)$ implies that $g_2 > g_1$.

To see that $r_2 > r_1$, consider each of the following cases.

Case 1

Suppose $r_2 < \bar{r}$ and $r_1 < \bar{r}$. Then

$$\begin{aligned} \alpha R_r(r_2) &= (1 - \alpha) H_g(g_2) \\ \alpha R_r(r_1) &= (\alpha\phi\beta R(r_2) + (1 - \alpha)) H_g(g_1) \end{aligned}$$

Given that $H_g(g_2) < H_g(g_1)$ and $\alpha\phi\beta R(r_2) > 0$ it follows that $R_r(r_2) < R_r(r_1)$ and hence $r_2 > r_1$.

Case 2

Suppose that $r_1 = \bar{r}$ and $r_2 < \bar{r}$. Then

$$\begin{aligned} \alpha R_r(r_2) &= (1 - \alpha) H_g(g_2) \\ \alpha R_r(r_1) &= (\alpha\phi\beta R(r_2) + (1 - \alpha)) H_g(g_1) + v_{\bar{r}_1} \end{aligned}$$

Given that $H_g(g_2) < H_g(g_1)$, $\alpha\phi\beta R(r_2) > 0$, and $v_{\bar{r}_1} \geq 0$ it follows that $R_r(r_2) < R_r(r_1)$ and hence $r_2 > r_1$. However, this contradicts the assumption that $r_1 = \bar{r}$ and $r_2 < \bar{r}$.

Case 3

Suppose that $r_1 = \bar{r}$ and $r_2 = \bar{r}$. Then

$$\begin{aligned} \alpha R_r(r_1) &= v_{\bar{r}_1} \\ \alpha R_r(r_2) &= v_{\bar{r}_2} \end{aligned}$$

Since $r_1 = r_2 = \bar{r}$, $v_{\bar{r}_1} = v_{\bar{r}_2}$, and

$$\begin{aligned}\alpha R_r(r_2) &= (1 - \alpha)H_g(g_2) \\ \alpha R_r(r_1) &= (\alpha\phi\beta R(r_2) + (1 - \alpha))H_g(g_1)\end{aligned}$$

but as we saw in case 1 this implies that $r_2 > r_1$, which contradicts the assumption that $r_1 = r_2 = \bar{r}$.

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Table 1: Descriptive Statistics of Irregularity by Type

Type of irregularity	Municipalities with at least one irregularity	Average number of irregularities	Average value of irregularity (R\$)	Value of irregularities as a share of resources audited
<u>Panel A:</u>				
Diversion of funds	0.485 [0.500]	1.561 [0.879]	119,106.40 [311,037.2]	0.046 [0.090]
Illegal procurement	0.539 [0.499]	1.690 [0.948]	170,607.10 [253,024.1]	0.083 [0.104]
Over invoicing	0.057 [0.231]	1.048 [0.218]	88,674.59 [195,723.5]	0.030 [0.049]
Corruption indicator	0.733 [0.443]	2.357 [1.515]	134,983.80 [192,647.3]	0.091 [0.123]
<u>Panel B:</u>				
Poor administration	0.679 [0.467]	1.714 [0.922]	—	—
Unfinished public work	0.253 [0.436]	1.287 [0.598]	—	—
Non existent social council	0.307 [0.462]	1.167 [0.419]	—	—
Mismanagement of social programs	0.388 [0.488]	1.201 [0.452]	—	—
Abandoned project	0.108 [0.311]	1.125 [0.335]	—	—

Notes: Standard deviations reported in brackets. The sample consists on 367 municipalities.

Table 2: Descriptive Statistics of Irregularities by Sector

Type of irregularity	Health	Education	Water and Sanitation	Agriculture
<u>Panel A:</u>				
Diversion of funds	0.306	0.249	0.043	0.050
Illegal procurement	0.198	0.299	0.104	0.044
Over invoicing	0.409	0.136	0.045	0.045
Corruption indicator	0.253	0.271	0.075	0.047
<u>Panel B:</u>				
Poor administration	0.477	0.146	0.023	0.039
Failure to spend allocated budget	0.143	0.000	0.095	0.048
Unfinished public work	0.132	0.008	0.388	0.041
Non existent social council	0.165	0.316	0.000	0.008
Mismanagement of social programs	0.150	0.520	0.000	0.012
Abandoned project	0.222	0.000	0.178	0.311

Note: Each entry represents the proportion of irregularities for each type by sector. The sample consists on 367 municipalities.

Table 3: Descriptive Statistics of Irregularities by First and Second-Term Mayor

	First-term mayors	Second-term mayors	Difference
Panel A: Incidence of irregularities			
Diversion of funds	0.593 [0.074]	0.8 [0.131]	-0.207 [0.151]
Illegal procurement	0.871 [0.097]	1.133 [0.119]	-0.262 [0.153]*
Over invoicing	0.036 [0.013]	0.052 [0.02]	-0.016 [0.024]
Incidence of corruption	1.5 [0.140]	1.985 [0.219]	-0.485 [0.260]*
Poor administration	1.338 [0.107]	1.051 [0.131]	0.287 [0.169]*
Incomplete public work	0.232 [0.039]	0.232 [0.042]	0 [0.057]
Non existent social council	0.485 [0.069]	0.391 [0.059]	0.095 [0.091]
Mismanagement of social programs	0.449 [0.05]	0.405 [0.053]	0.045 [0.073]
Panel B: Share of Audited Resources			
Diversion of funds	0.018 [0.004]	0.022 [0.006]	-0.004 [0.007]
Illegal procurement	0.035 [0.005]	0.066 [0.015]	-0.031 [0.016]*
Over invoicing	0 [0.00]	0.002 [0.001]	-0.002 [0.001]
Share of corruption	0.053 [0.007]	0.09 [0.017]	-0.037 [0.018]**
Failure to spend allocated budget	0.002 [0.001]	0.005 [0.005]	-0.004 [0.005]
Unfinished public work	0.012 [0.004]	0.012 [0.004]	0 [0.005]

Notes: Standard deviations reported in brackets. The sample consists on 367 municipalities. * indicates significance at 10%, ** at the 5% and *** at 1%. There are 45% of municipalities with second-term mayors.

Table 4: Descriptive Statistics of Municipalities

	First-term mayors	Second-term mayors	Difference
<u>Mayor characteristics:</u>			
Male	0.963 [0.012]	0.957 [0.017]	0.007 [0.021]
Schooling	5.954 [0.177]	6.088 [0.198]	-0.134 [0.266]
Age	48.005 [0.788]	46.349 [0.904]	1.656 [1.199]
Married	3.011 [0.116]	3.155 [0.115]	-0.144 [0.163]
Win margin in 2000	0.126 [0.011]	0.196 [0.017]	-0.07 [0.020]**
<u>Municipal characteristics:</u>			
Log population	9.545 [0.088]	9.554 [0.117]	-0.009 [0.146]
Urban population (%)	0.646 [0.02]	0.591 [0.026]	0.055 [0.032]
Literate population (%)	0.827 [0.008]	0.79 [0.011]	0.037 [0.014]*
Per capita income	220.461 [8.666]	193.443 [9.423]	27.019 [12.801]*
Gini coefficient	0.535 [0.005]	0.529 [0.005]	0.006 [0.007]
Judiciary district	0.523 [0.045]	0.477 [0.05]	0.047 [0.067]
Radio (1/0)	0.551 [0.044]	0.505 [0.05]	0.046 [0.067]
Newspaper (1/0)	0.861 [0.03]	0.861 [0.034]	-0.001 [0.045]

Notes: Standard deviations reported in brackets. The sample consists on 367 municipalities. * indicates significance at 10%, ** at the 5% and *** at 1%.

Table 5: The Effect of Re-Election Incentives on the Share of Corruption

	Dependent variable: corruption as a share of audited resources			
	(1)	(2)	(3)	(4)
Mayor in second-term	0.034 [0.018]*	0.039 [0.019]**	0.036 [0.018]**	0.04 [0.020]**
Mayor characteristics	No	Yes	Yes	Yes
Municipal demographics	No	Yes	Yes	Yes
Municipal institutions	No	No	Yes	Yes
Party affiliation intercepts	No	Yes	Yes	Yes
State intercepts	No	No	No	Yes
Observations	367	367	367	367
R-squared	0.02	0.15	0.16	0.22

Notes: Robust standard errors in brackets. Observations are weighted by the probability that a municipality is randomly audited within a state. * indicates significance at 10%, ** at the 5% and *** at 1%. Mayor characteristics include gender, education, marriage status, age. Municipal demographics include % urban population, % literate population, log population, number of effective candidates in 2000 election, log per capita income and gini coefficient. Municipal institutions include an indicator for a district with a judge, radio, newspaper, treasury computerized.

Table 6: The Effect of Re-Election Incentives on the Incidence of Corruption

	Dependent variable: number of irregularities related to corruption				
	(1)	(2)	(3)	(4)	(5)
Mayor in second-term	0.484 [0.267]*	0.534 [0.213]**	0.516 [0.204]**	0.525 [0.211]**	0.544 [0.232]**
Number of irregularities audited	No	Yes	Yes	Yes	Yes
Mayor characteristics	No	No	Yes	Yes	Yes
Municipal demographics	No	No	Yes	Yes	Yes
Municipal institutions	No	No	No	Yes	Yes
Party affiliation intercepts	No	No	Yes	Yes	Yes
State intercepts	No	No	No	No	Yes
Observations	367	367	367	367	367
R-squared	0.02	0.39	0.5	0.5	0.56

Notes: Robust standard errors in brackets. Observations are weighted by the probability that a municipality is randomly audited within a state. * indicates significance at 10%, ** at the 5% and *** at 1%. Mayor characteristics include gender, education, marriage status, age. Municipal demographics include % urban population,% literate population, log population, number of effective candidates in 2000 election, log per capita income and gini coefficient. Municipal institutions include an indicator for a district with a judge, radio, newspaper, treasury computerized.

Table 7: The Effect of Re-Election Incentives on Corruption- Matching Estimator

	Dependent variables:					
	Corruption as a share of audited resources			Number of irregularities related to corruption		
	(1)	(2)	(3)	(4)	(5)	(6)
Mayor in second-term	0.037 [0.0146]**	0.032 [0.009]***	0.035 [0.0142]**	0.534 [0.172]***	0.397 [0.097]***	0.652 [0.153]***
Matching variables:						
Mayor characteristics:	No	Yes	Yes	No	Yes	Yes
Municipal characteristics:	No	Yes	Yes	No	Yes	Yes
Municipal institutions	No	No	Yes	No	No	Yes
State intercepts	No	No	Yes	No	No	Yes
Number of irregularities	Yes	No	Yes	Yes	No	Yes

Notes: Model estimated using a bias corrected matching estimator from Imbens and Abadie (2004). Robust standard errors are presented in brackets and are estimated using 6 matches for the point estimate and 3 matches for the standard errors. * indicates significance at 10%, ** at the 5% and *** at 1%.

Table 8: Heterogeneity in the Effect of Re-Election Incentives on Corruption

Dependent variable: corruption as a share of audited resources		
	(1)	(2)
Mayor in second-term	0.123 [0.042]***	0.13 [0.043]***
Judiciary district	0.007 [0.018]	0.003 [0.020]
Second-term*judiciary district	-0.054 [0.030]*	-0.052 [0.031]*
Radio	-0.001 [0.017]	-0.015 [0.020]
Second-term*radio	-0.051 [0.031]*	-0.048 [0.033]
Win margin	0.046 [0.073]	0.067 [0.077]
Second-term*win margin	-0.19 [0.098]**	-0.228 [0.109]**
Mayor characteristics	Yes	Yes
Municipal demographics	Yes	Yes
Party affiliation intercepts	Yes	Yes
State intercepts	No	Yes
F-test joint hypothesis	2.23 (p-value=0.07)	2.26 (p-value=0.06)
Observations	360	360
R-squared	0.21	0.26

Notes: Robust standard errors in brackets. Observations are weighted by the probability that a municipality is randomly audited within a state. * indicates significance at 10%, ** at the 5% and *** at 1%. Mayor characteristics include gender, education, marriage status, age. Municipal demographics include % urban population,% literate population, log population, number of effective candidates in 2000 election, log per capita income and gini coefficient. Municipal institutions include an indicator for a district with a judge, radio, newspaper, treasury computerized.

Table 9: The Effect of Re-Election Incentives on the Incidence of Poor Administration

	Dependent variable: number of irregularities related to poor administration				
	(1)	(2)	(3)	(4)	(5)
Mayor in second-term	-0.536 [0.226]**	-0.504 [0.202]**	-0.476 [0.191]**	-0.473 [0.194]**	-0.41 [0.210]*
Number of irregularities audited	No	Yes	Yes	Yes	Yes
Mayor characteristics	No	No	Yes	Yes	Yes
Municipal demographics	No	No	Yes	Yes	Yes
Municipal institutions	No	No	No	Yes	Yes
Party affiliation intercepts	No	No	Yes	Yes	Yes
State intercepts	No	No	No	No	Yes
Observations	367	367	367	367	367
R-squared	0.03	0.23	0.37	0.38	0.45

Notes: Robust standard errors in brackets. Observations are weighted by the probability that a municipality is randomly audited within a state. * indicates significance at 10%, ** at the 5% and *** at 1%. Mayor characteristics include gender, education, marriage status, age. Municipal demographics include % urban population, % literate population, log population, number of effective candidates in 2000 election, log per capita income and gini coefficient. Municipal institutions include an indicator for a district with a judge, radio, newspaper, treasury computerized.

Table 10: The Effect of Re-Election Incentives on the Incidence of Poor Administration Robustness Using First-Term Winning Mayors

	Dependent variable: number of irregularities related to poor administration				
	(1)	(2)	(3)	(4)	(5)
Mayor in second-term	-0.609 [0.266]**	-0.666 [0.234]***	-0.507 [0.220]**	-0.513 [0.226]**	-0.488 [0.221]**
Number of irregularities audited	No	Yes	Yes	Yes	Yes
Mayor characteristics	No	No	Yes	Yes	Yes
Municipal demographics	No	No	Yes	Yes	Yes
Municipal institutions	No	No	No	Yes	Yes
Party affiliation intercepts	No	No	Yes	Yes	Yes
State intercepts	No	No	No	No	Yes
Observations	246	246	246	246	246
R-squared	0.03	0.24	0.45	0.46	0.51

Notes: Robust standard errors in brackets. Observations are weighted by the probability that a municipality is randomly audited within a state. * indicates significance at 10%, ** at the 5% and *** at 1%. Mayor characteristics include gender, education, marriage status, age. Municipal demographics include % urban population, % literate population, log population, number of effective candidates in 2000 election, log per capita income and gini coefficient. Municipal institutions include an indicator for a district with a judge, radio, newspaper, treasury computerized.

**Table 11: The Effect of Re-Election Incentives on the Share of Corruption
Robustness Controlling for Incidence of Bad Administration**

	Dependent variable: corruption as a share of audited resources			
	(1)	(2)	(3)	(4)
Mayor in second-term	0.029 [0.020]	0.035 [0.020]*	0.032 [0.019]	0.036 [0.021]*
Poor administration	-0.007 [0.007]	-0.004 [0.008]	-0.004 [0.008]	-0.003 [0.007]
Mismanagement of social programs	-0.021 [0.011]*	-0.019 [0.011]*	-0.022 [0.011]**	-0.021 [0.012]*
Nonexistent social council	-0.015 [0.016]	-0.011 [0.015]	-0.012 [0.014]	-0.013 [0.015]
Unfinished public works	-0.007 [0.012]	-0.005 [0.013]	-0.005 [0.013]	-0.003 [0.015]
Mayor characteristics	No	Yes	Yes	Yes
Municipal demographics	No	Yes	Yes	Yes
Municipal institutions	No	No	Yes	Yes
Party affiliation intercepts	No	Yes	Yes	Yes
State intercepts	No	No	No	Yes
Observations	367	367	367	367
R-squared	0.04	0.16	0.18	0.23

Notes: Robust standard errors in brackets. Observations are weighted by the probability that a municipality is randomly audited within a state. * indicates significance at 10%, ** at the 5% and *** at 1%. Mayor characteristics include gender, education, marriage status, age. Municipal demographics include % urban population, % literate population, log population, number of effective candidates in 2000 election, log per capita income and gini coefficient. Municipal institutions include an indicator for a district with a judge, radio, newspaper, treasury computerized.

**Table 12: The Effect of Re-Election Incentives on the Share of Corruption
Controls for Additional Political Variables**

	Dependent variable:							
	Corruption as a share of audited resources				Corruption measured as incidence			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mayor in second-term	0.044 [0.021]**	0.041 [0.020]**	0.04 [0.020]**	0.044 [0.021]**	0.514 [0.232]**	0.549 [0.232]**	0.54 [0.229]**	0.543 [0.227]**
Proportion of local legislator same party as mayor	-0.065 [0.060]			-0.064 [0.061]	-0.303 [0.652]			0.022 [0.702]
Mayor changed party		0.028 [0.018]		0.03 [0.019]	—	0.169 [0.258]		0.195 [0.260]
Governor elected in 1998 same party as mayor			-0.007 [0.022]	-0.011 [0.023]	—		-0.105 [0.244]	-0.133 [0.248]
Mayor characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipal demographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipal institutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Party affiliation intercepts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State intercepts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	367	367	367	367	367	367	367	367
R-squared	0.22	0.22	0.22	0.23	0.52	0.56	0.56	0.56

Notes: Robust standard errors in brackets. Observations are weighted by the probability that a municipality is randomly audited within a state. * indicates significance at 10%, ** at the 5% and *** at 1%. Mayor characteristics include gender, education, marriage status, age. Municipal demographics include % urban population, % literate population, log population, number of effective candidates in 2000 election, log per capita income and gini coefficient. Municipal institutions include an indicator for a district with a judge, radio, newspaper, treasury computerized.

Table A1: The Effect of Re-Election Incentives on the Share of Corruption (Tobit Model)

	Dependent variable: corruption as a share of audited resources			
	(1)	(2)	(3)	(4)
Mayor in second-term	0.032 [0.015]**	0.033 [0.015]**	0.032 [0.014]**	0.033 [0.015]**
Mayor characteristics	No	Yes	Yes	Yes
Municipal demographics	No	Yes	Yes	Yes
Municipal institutions	No	No	Yes	Yes
Party affiliation intercepts	No	Yes	Yes	Yes
State intercepts	No	No	No	Yes
Observations	367	367	367	367
Pseudo Log-likelihood	4840	12255	13811	16760

Notes: The marginal effects reported for the Tobit model are conditional on the censoring. Robust standard errors in brackets. Observations are weighted by the probability that a municipality is randomly audited within a state. * indicates significance at 10%, ** at the 5% and *** at 1%. Mayor characteristics include gender, education, marriage status, age. Municipal demographics include % urban population, % literate population, log population, number of effective candidates in 2000 election, log per capita income and gini coefficient. Municipal institutions include an indicator for a district with a judge, radio, newspaper, treasury computerized.

Table A2: The Effect of Re-Election Incentives on the Incidence of Corruption (Poisson model)

	Dependent variable: number of irregularities related to corruption				
	(1)	(2)	(3)	(4)	(5)
Mayor in second-term	0.484 [0.266]*	0.464 [0.169]***	0.367 [0.154]**	0.418 [0.150]***	0.402 [0.148]***
Number of irregularities audited	No	Yes	Yes	Yes	Yes
Mayor characteristics	No	No	Yes	Yes	Yes
Municipal demographics	No	No	Yes	Yes	Yes
Municipal institutions	No	No	No	Yes	Yes
Party affiliation intercepts	No	No	Yes	Yes	Yes
State intercepts	No	No	No	No	Yes
Observations	367	367	367	367	367
Pseudo likelihood	-188130	-159718	-150186	-148806	-144272

Notes: Robust standard errors in brackets. * indicates significance at 10%, ** at the 5% and *** at 1%. Mayor characteristics include gender, education, marriage status, age. Municipal demographics include % urban population, % literate population, log population, number of effective candidates in 2000 election, log per capita income and gini coefficient. Municipal institutions include an indicator for a district with a judge, radio, newspaper, treasury computerized.