Corruption in Public Good Provision: Measuring Theft and Bribery

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Abstract

Corruption in the provision of public goods can occur from both the revenue and the expenditure side – a public official can steal government revenues or receive bribe payments in exchange for spending those revenues. The marginal rents from theft and those from bribes can cancel each other out because additional revenues that are stolen are therefore not spent on providing more public goods and services from which additional bribe payments could have been extracted. Thus, without decomposing total marginal rents into those from theft and those from bribery, it might appear that there is no change in corruption, even when the rents from theft have increased. To provide evidence of this, I propose a structural approach in which the direct effect of government revenues on the public official's accumulated wealth measures the marginal rents from theft, while its indirect effect through spending measures the marginal rents from bribery. I demonstrate the method using municipal-level data from the Philippines. Results initially suggest that an increase in government revenues has a negative impact on corruption. However, decomposition of this effect reveals that higher revenues actually increase marginal rents from theft, but the foregone spending decreases marginal bribe payments to a sufficiently large extent such that total marginal rents decrease.

1 Introduction

This paper measures two kinds of corruption in the government provision of public goods - the theft of government revenues, and bribe payments from public spending. Both of these qualify as grand corruption, not only because the public official who has discretion over the government budget typically occupies a high-level position, but also because the social welfare losses from the misallocation of public funds can be quite large.[1] In fact, the OECD (2013) estimates that about 20 to 25 percent of procurement budgets, equivalent to about USD 2 trillion or 2 percent of global GDP, are lost annually to corruption, while the IMF (2017) suggests that such an amount captures the annual cost of bribery alone. The cost of theft is also likely to be large. Global Financial Integrity (2015) calculates that between 2004 to 2013, developing countries lost USD 7.8 trillion from illicit financial outflows due to trade misinvoicing and leakages in the balance of payments. British online newspaper The Independent reports in 2014 that a corruption study by anti-poverty group ONE estimates that about USD 1 trillion a year is siphoned away from developing countries through money laundering, tax evasion, and embezzlement.[2] Indeed, Khan (2006) claims that theft and primitive accumulation is "the most pernicious type of corruption in developing countries".

To my best knowledge, no methodology yet exists for simultaneously measuring theft and bribery. The consequences are that the incidence of grand corruption in public good provision is likely understated, and that the true effect of revenues on corruption can remain undetected. This is because when a corrupt official has discretion over the allocation of public funds, the marginal rents she earns from theft and those from bribes from an increase in government revenues can appear to cancel each other out. If the official steals the additional public funds, she foregoes additional bribe payments she could have extracted from the private sector by spending those funds. Conversely, if she accepts more bribes in exchange for providing more public goods and services, she then spends those additional government revenues that she could have stolen instead. Since an additional amount of stolen revenues foregoes some additional amount of bribe income (and vice versa), total marginal rents would appear to be small or close to zero, even if the marginal rents from theft or from bribery have increased.

The political economy literature has heretofore ignored the simultaneity of theft and bribery by separately analyzing these two kinds of corruption. In the formal literature, bribery is

[1]Transparency International has developed the following legal definition: "Grand corruption occurs when: a public official or other person deprives a particular social group or substantial part of the population of a State of a fundamental right; or causes the State or any of its people a loss greater than 100 times the annual minimum subsistence income of its people; as a result of bribery, embezzlement or other corruption offence". See https://www.transparency.org/news/feature/what_is_grand_corruption_and_how_can_we_stop_it

[2]See http://www.independent.co.uk/news/world/politics/criminals-and-corrupt-politicians-steal-1trn-a-year-from-the-worlds-poorest-countries-9707104.html.

depicted as a common agency game in which principals from the private sector offer bribes to their common political agent in exchange for higher public spending. (See, e.g., Grossman and Helpman (2001) and its origins - Bernheim and Whinston (1986a, 1986b), Dixit, Grossman, and Helpman (1997), and Grossman and Helpman (1994).) Meanwhile, in the canonical principal-agent models of Barro (1973), Ferejohn (1986), and Persson and Tabellini (2000), and the selectorate theory of Bueno de Mesquita et al. (1999, 2003, 2010), the political agent engages in the theft of public funds by appropriating some of it for herself and/or her patrons, instead of spending all the revenues on public good provision. This latter type of models has been used to depict the political resource curse, in which revenues in the form of windfall from, e.g. oil and natural resources, foreign aid, remittances, and federal transfers to the local government, appear to increase corruption.[3]

Most empirical studies on corruption adopt a reduced-form approach to identifying the losses from corruption and are therefore unable to distinguish between the specific mechanism - bribery and/or theft, by which those losses are generated.[4] Some papers, e.g. Mauro (1998), Tanzi and Davoodi (2001), Gupta, de Melo, and Sharan (2001), Arvate et al. (2010), and Hessami (2014), reveal a positive association between corruption and public spending, which suggest that government officials earn bribe payments and kickbacks from such spending. (If the source of corruption were theft, then corruption and public spending would be negatively associated, since what is stolen is therefore not spent.) Others attempt to uncover leakages from public projects. For instance, Olken (2006) calculates that 18% of the expenditures on a rice-subsidy program in Indonesia disappeared. Olken (2007) compares the amount spent by the Indonesian government on rural roads with an engineering estimate of the actual cost of the roads to show that 24% went 'missing'. Reinikka and Svensson (2004) show that 86% of the educational grants spent by the central government of Uganda did not reach schools. Niehaus and Sukhtankar (2013) compute the difference in official wage expenditure and the reported wages in a survey in India to show that 79% of expenditures on the National Rural Employee Guarantee Scheme were stolen. These papers arguably measure theft since the funds

[3]For papers on the political resource curse, see, e.g. Abdih et al. (2012), Ahmed (2012), Brollo et al. (2013), Robinson et al. (2006), and Smith (2008). A survey of the formal political resource curse literature is provided in Desierto (2018a).

[4]Avis et al. (2017) estimate a structural model, not to identify the specific types of corruption, but to reveal the mechanism by which independent audits in Brazil reduce corruption, which is that audits raise the reputational and legal costs of corruption.

had already been allocated for spending on the particular project, and any subsequent rents can only be earned by siphoning off some portion of those allocated funds.

Thus, the key difference between theft and bribery is that bribes are earned in exchange for allocating government funds to public spending, whereas the rents from theft are obtained by a direct appropriation of those funds. The theoretical implication is that the equilibrium amount of bribes that can be extracted from the private sector depends on the marginal social benefit of the public goods on which government revenues are spent - a dollar of revenues may then generate more than (or less than) a dollar of social benefit and, hence, of bribes. In contrast, theft is simply a dollar-for-dollar transfer of revenues from public coffers to the official's private rents. The empirical implication is that government revenues affect the public official's rents from bribery only indirectly, i.e. through spending, whereas revenues affect the rents from theft directly.

Thus, to measure the marginal rents from theft and those from bribery that are generated by an increase in government revenues, I develop a structural model of public good provision by a political agent who obtains rents by stealing government revenues and/or accepting bribe payments in exchange for public spending, from which the direct, indirect, and total effects of government revenues on total rents are formally derived. I then demonstrate the empirical estimation of these effects using data from the Philippines.

The Philippines is an ideal test case, since instances of grand corruption in the allocation of public funds appear to abound, both in the form of theft and bribery. Anecdotal evidence suggest that between 20 to 40 percent of the cost of road construction projects are routinely spent on public officials as bribes and kickbacks. (See Batalla (2000).) Theft also appears to be rampant. In fact, between 1979 to 2016, over 10,000, or almost 30 percent of all corruption cases filed against high-level public officials were cases involving the malversation of public funds.[5] Lastly, the Philippine experience suggests that natural resources might not only increase corruption through the (direct) appropriation of those revenues, but also through illicit payments involving the allocation of those revenues to certain public projects. Note, in partic-

[5]The figures are based on the following article in Philippine news network Rappler that reports on the number of corruption cases filed in the Sandiganbayan: https://www.rappler.com/newsbreak/159148-biggest-corruption-cases-sandiganbayan-graft-plunder-malversation. The Sandiganbayan is a special court, established in 1978 by Presidential Decree (PD) No. 1486, which has jurisdiction over all cases involving high-level public officials in the exercise of their duties. Malversation of public funds involves the appropriation of public funds by a public official who is accountable for such funds. (See the Philippine Revised Penal Code (Title VII, Ch. 4, Art. 217) for the complete legal definition).

ular, that in March 2017, 159 criminal charges were filed against 41 officials, including a former Provincial Governor, for allegedly using USD 30 million in royalties from the Malampaya gas field off the province of Palawan to fund infrastructure projects in ways that violated the Government Procurement Reform Act, including the non-submission of bidding documents.[6]

I conduct the empirical analysis at the level of the municipality. In the Philippines, a sizeable portion of the municipal government's total revenues is the Internal Revenue Allotment (IRA), which is a share in national government revenues that is fixed and mandated by law. The IRA thus provides exogenous variation in the municipality's revenues. Brollo et al. (2013) similarly use federal transfers to municipal governments in Brazil as an exogenous source of rents for municipal mayors. They find that federal transfers increase corruption in the municipality, where corruption is a measure that is constructed using data from fiscal audits. However, their findings do not distinguish rents from bribe payments and from theft, as the corruption index combines all kinds of violations that have been reported in the audits such as illegal procurement, irregular bidding, fraud, favoritism, and diversion of funds. (While they also run regressions for each type of violation, this does not properly identify bribery and theft since these two may be simultaneously determined.)

Another advantage to using Philippine data is that the municipal mayor's rents can be directly quantified using asset declarations - the Statement of Assets, Liabilities, and Net Worth (SALN), which all public employees and elected officials are required to submit for each year in office. While, in principle, data from SALNs can be accessed by private individuals, large-scale statistical analyses of the reported assets in the SALNs have not been done before, and understandably so, since only hard (paper) copies of the SALNs can be requested from the government repository. Thus, for this study, I have had to collect, digitize, and encode the data from all the SALNs submitted by mayors in multiple years.[7]

The empirical analyses proceed as follows. I first demonstrate that, on average, mayors' reported wealth on their SALNs are implausibly high to have only come from legitimate incomes, by comparing the growth in their assets, liabilities and net worth to macroeconomic

[6]See, e.g., http://newsinfo.inquirer.net/877690/malampaya-scam-ex-gov-41-others-charged.

[7]Asset disclosure statements have only recently been used to identify the rents from public office in other countries. In particular, Eggers and Hainmueller (2011) and Ziobrowski et al. (2011), among others, use the Financial Disclosure Reports of members of the US Congress to estimate the value of holding public office in the US. Meanwhile, Fisman et al. (2015) use disclosure affidavits of candidates in state assembly elections in India to compute the difference in the change in the net worth of election winners and losers.

trends. This suggests that some mayors' accumulated wealth includes (illicit) rents. To isolate any rents a mayor might have acquired from the provision of public goods, I obtain reduced-form estimates of the effect of the IRA on the mayor's accumulated wealth. Results show that higher IRAs are associated with *lower*, and not higher, accumulated wealth. In other words, a reduced-form approach would lead one to believe that there is no corruption in public good provision. However, using the structural method that I propose in the paper, I am able to decompose the effect of the IRA on the mayor's accumulated wealth into a direct and an indirect effect through public spending. I then find that the direct effect is positive and the indirect effect is negative, which suggest that an increase in revenues simultaneously induces an increase in the marginal rents from theft and a decrease in marginal bribe payments. The magnitude of the indirect effect is sufficiently large such that it outweighs the direct effect, which would explain why the reduced-form effect of the IRA on accumulated wealth is negative.

This paper thus makes several important contributions to the corruption literature. It is the first to simultaneously measure theft and bribery in the government provision of public goods. With the exception of Avis et al. (2017) - recall footnote 4, this paper is the first to apply a structural approach to estimating corruption. It is also one of the few papers to date that use asset disclosure statements to measure the public official's rents. Finally, it provides additional insight and results pertaining to the political resource curse by showing that revenues can have direct and indirect effects on corruption through public spending.

The rest of the paper is organized as follows. Section 2 provides some context by highlighting some cases of grand corruption in the Philippines. Sections 3 and 4 present the structural model by first proposing a deterministic model of theft and bribery in public good provision, and subsequently adding stochastic errors and introducing assumptions that enable identification of the direct and indirect effects of revenues on rents. Section 5 discusses the data that are used in estimating these effects, while section 6 presents the results and performs robustness checks. Section 7 concludes.

2 The Philippine Context

The Philippines is a democratic republic with a presidential form of government, where power is divided between the executive branch, the (bi-cameral) legislature, and the judiciary. It is a unitary state with administrative divisions at the local level, called local government units (LGUs), which are, from highest to lowest division, the provinces, municipalities, and barangays. These LGUs are respectively headed by governors, mayors, and barangay chairmen/captains, who are all elected into three-year terms of office and can serve up to a maximum of three consecutive terms.[8] The empirical analysis in this paper is conducted at the level of the municipality. (See section 5 for details.)

Public corruption continues to be a formidable problem in the Philippines. While the country has seen some improvement in its cross-country corruption scores since 2008, the downward trend appears to have reversed since 2013 or 2014. Based on the Corruption Perceptions Index (CPI), the Philippines was the 141st least corrupt nation out of 180 countries in 2008, 85th out of 175 in 2014, and 101st out of 176 in 2016, which puts the country consistently below the bottom (approx.) 50 percent. The World Bank Governance Indicators also show a similar pattern. According to the Control of Corruption Indicator (CCI), the country was at the 25.2 percentile rank in 2008 - only 25.2 percent of countries fared better than the Philippines. Its rank decreased to 43.6 in 2013, before going up to 34.1 in 2016.[9]

Grand corruption in the allocation of public funds seems particularly pernicious. In a 2000 study, Batalla reveals, based on interviews and news reports, that about 20 to 60 percent of public works contracts are lost to corruption. He notes that many road projects are divided into smaller projects, each worth less than Php 10 million (approx. USD 195,000) - in such cases, it is the LGU, instead of the central government through the Department of Public Works and Highways (DPWH), that awards and implements each contract. This, he claims, ensures that the projects are given to 'favored' contractors of the local government. Citing a focus group discussion in 2000 with an NGO (the Concerned Citizens of Abra for Good Government (CCAGG)) that used to observe bidding procedures in the province of Abra, Batalla notes that "though the papers of the bidding participants were submitted, it seemed that a contractor getting a particular project was already known". He also discloses that in exchange for the contract, contractors spend about 20 to 40 percent of the project cost

[8] Other elected officials in the LGUs include vice-governors and (provincial) councilors, vice-mayors and councilors, and barangay kagawads. Provinces can be further grouped into regions, and regions into the island groups of Luzon, Visayas, and Mindanao. However, neither regions nor island groups have their own budgets.

[9] See https://www.transparency.org/research for CPI data. The CCI can be downloaded from: http://databank.worldbank.org/data/reports.aspx?source=worldwide-governance-indicators#

as kickbacks. In addition, during the implementation stage, some 20 to 30 percent are lost by deviating from the original Program of Work, e.g. using substandard materials, payroll padding, and overpricing.

This does not imply that corruption only occurs at the local level. While Batalla indicates that almost 3,000 cases were filed against LGU officials between 1990-1995 involving the total amount of about PhP 2.3 billion (USD 45 million) before the anti-corruption court Sandiganbayan, he also shows that between 1990-1998, 10,615 cases were filed against officials in line agencies of the central government, involving PhP 7.8 billion (USD 150 million).

Such a trend appears to have continued up to the present. In fact, the Aquino administration (2010-2016) cancelled many allegedly anomalous infrastructure projects as part of its "Matuwid Na Daan" (*straight path*) anti-corruption strategy, including 900 contracts at the DPWH in the first year alone, the USD 350 million flood control project with Belgian firm Baagerwerken Decloedt En Zoon (BDZ), and the USD 400 million NAIA 3 airport terminal contract with PIATCO and German firm Fraport.[10] Philippine news network Rappler reports that between 1979 to 2016, a total of 33,772 corruption cases have been filed before the Sandiganbayan.[11] The total amount of public funds involved in the 15 largest cases that are still pending as of November 2016 is approximately USD 750 million.

In many instances, it is difficult to isolate particular forms of corruption involved in a contract or transaction, in which case the official is charged with multiple cases. Republic Act No. 3019, or the Anti-Graft and Corrupt Practices Act, enumerates 11 acts that constitute graft or corrupt practices, including "directly or indirectly requesting or receiving any gift, present, share, percentage, or benefit, for himself and for any other person, in connection with any contract or transaction between the Government and any other party, ..." In addition, under the Revised Penal Code (Title VII), a public official can also be penalized specifically for bribery (ch. 2, sec. 2), frauds against the public treasury (ch. 3, art. 213), and the malversation of public funds (ch. 4, art. 217). Lastly, Republic Act No. 7080 defines the crime of plunder by which a public official accumulates ill-gotten wealth of at least PhP 50 million (USD 1

[10]Information on the number of cancelled DPWH contracts is from a speech by a Cabinet member of Pres. Aquino - see Desierto (2012). For the BDZ and Fraport contracts, see, e.g., http://www.manilatimes.net/world-court-rules-aquinos-2011-cancellation-belgian-dredging-project-illegal/309961/ and http://newsinfo.inquirer.net/720841/what-went-before-the-naia-3-saga.

[11]https://www.rappler.com/newsbreak/159148-biggest-corruption-cases-sandiganbayan-graft-plunder-malversation

million) through the misappropriation of funds, receipt of kickbacks, and similar corrupt acts listed in sec. 1d. The penalty for plunder ranges from *reclusion perpetua* (life imprisonment) to death. Among the 33,772 corruption cases reported in the Rappler article, 10,094 (approx. 30 percent) are cases of malversation, while 7,968 (approx. 24 percent) are cases of graft. Note that these do not perfectly map into individual persons or distinct anomalous transactions, since an official can be charged both with malversation and graft involving the same public funds. For instance, out of the 15 largest cases pending at the court, 4 include both charges of graft and malversation, 6 involve multiple counts of graft, and one case includes the specific charge of direct bribery (along with graft and malversation).

While the crime of malversation legally defines the direct appropriation of public funds, graft covers a number of practices. It is especially worth noting that illicit transactions involving kickbacks from public spending and irregular bidding of projects are not necessarily charged with direct bribery, even though such transactions suggest that an illicit exchange has taken place between the public official and private sector contractors. The reason is that the evidentiary standards to establish such quid pro quo arrangements are high - it has to be clearly shown that the official performs an act, e.g. award a contract, specifically *in consideration of* a gift/benefit to herself.[12] Thus, from a legal standpoint, receiving a kickback does not necessarily imply that bribery took place unless it can be shown that the official purposely committed an act in order to receive the kickback, and nor can irregularities in the bidding process be taken as evidence of bribery unless the official can be shown to have willingly participated in the irregularities in exchange for some gift/benefit.

However, the purpose of this paper is not to identify the types of crimes of corruption involved in the allocation of public funds but, rather, to measure the rents associated with such corrupt acts. Now, a public official who has authority and discretion over a government budget can extract rents from the revenue side and the expenditure side. That is, she can steal the revenues, and/or obtain bribes and kickbacks by spending those revenues on public goods and services. The implication is that, while theft involves a transfer of revenues from public coffers to the public official, bribes and kickbacks are associated with some positive

[12] Personal interview with former Ombudsman Aniano Desierto on Oct. 18, 2017. The Office of the Ombudsman investigates complaints against public officials and employees, and prosecutes them in court. It has "primary jurisdiction over cases cognizable by the Sandiganbayan..." (Rep. Act. 6770).

social benefit from public goods and services.[13]

Sandiganbayan cases of malversation of public funds would thus generally fall under theft, whereas cases of bribery and/or graft that involve kickbacks from government projects would tend to map into bribery, provided that the latter generates some positive social benefit while the former does not. The following examples present some of the most controversial corruption cases in the Philippines in recent times.[14] Examples 1 and 2 fall neatly under bribery and theft, respectively, while the classification of examples 3 and 4 may seem unorthodox. In these latter instances, the deciding factor is whether the corrupt acts are associated with some positive social benefit.

Example 1 (NBN-ZTE deal). In 2007, the central government, through the Department of Transportation and Communications (DOTC) Secretary Leandro Mendoza, signed a USD 329.5 million contract with Chinese firm ZTE to build a National Broadband Network (NBN). Allegations were made that then Commission on Elections Chairman Benjamin Abalos went to China to broker the deal and demand kickbacks from ZTE officials. This led to investigations in the Senate, during which whistleblower Rodolfo Lozada testified that Abalos and Mike Arroyo, the husband of then Pres. Gloria Macapagal-Arroyo, orchestrated and received the kickbacks. Pres. Arroyo was eventually charged with 2 counts of graft, one in which her co-accused were Mendoza, Abalos, and Mike Arroyo. The Sandiganbayan dismissed the charges in 2016.

If true, the allegations would illustrate a case of bribery, since the kickbacks appear to have been obtained in exchange for the contract, and a national broadband network could have potentially generated large positive social benefits.

Example 2 (Fertilizer Fund scam). In 2004, then Department of Agriculture Undersecretary Jocelyn Bolante was alleged to have diverted PhP 728 million (USD 14 million) allocated for the purchase of farm fertilizers into the campaign funds of Pres. Arroyo. Several charges were filed against Bolante and other officials, including plunder, malversation, and graft. The plunder case against Bolante was dropped in 2016.

This instance would constitute theft. The funds were already intended for the purchase of farm fertilizers and, hence, no (illicit) payment was made in exchange for such allocation.

[13] This does not mean that bribery increases net social welfare. After the cost of the bribes are taken into account, the (net) social welfare loss from bribery may even be larger than the direct welfare loss from theft. (See Desierto (2018b) for a formal exposition).

[14] Detailed accounts of such controversies can be readily found in many Philippine news reports.

Instead, the allocated funds were appropriated for 'private' use - campaign funds are a personal benefit to the candidate and does not generate positive social benefits.

Example 3 (PDAF scam). The Philippine Development Assistance Fund (PDAF) essentially refers to discretionary 'pork barrel' funds assigned to each member of Congress, which the latter are supposed to allocate to development projects on their own discretion. In 2013, a scam was exposed by news network Philippine Daily Inquirer in which the PDAF was allegedly used to fund projects that were supposed to be implemented by businesswoman Janel Lim-Napoles. It turns out, however, that such projects were ghost projects. The funds would be allocated to fictitious foundations and NGOs under the holding company of Napoles. Napoles would allegedly offer a 40 to 50 percent kickback to the legislator, and a commission of 10 to 15 percent to the LGUs of the province and municipality in which the fictitious project is located. Napoles and 37 others including 3 Senators and 5 Congressmen were charged with various cases of plunder, malversation, graft, and direct bribery, involving the total amount of PhP10 billion (USD 200 million).

These illicit transactions may thus seem to be a case of bribery, since there appears to be quid pro quo arrangements between the public official and private entities through Napoles. Also, the legislator has discretion and authority over the allocation of her share in the PDAF. However, since the projects are fictitious, the associated payments are more aptly classified as rents from theft since ghost projects have no social value. That is, in spite of having been coursed through private firms and entities, the kickbacks are ultimately just transfers from the PDAF to the public official.

Example 4 (Malampaya Gas Royalties). A total of PhP 900 million (USD 17.4 million) of royalties from the Malampaya gas field off the province of Palawan were also allegedly diverted into Napoles' companies. Rents associated with these royalties would thus be classified as theft, since the companies have no social value. However, some of the Malampaya revenues were also used to fund infrastructure projects, from which kickbacks were allegedly received. Former Palawan Governor Joel Reyes and 41 others were charged with graft and falsification of documents involving some PhP 1.5 billion (USD 30 million) in royalties. Such funds were allegedly allocated to contracts in anomalous ways, including the non-submission of bidding documents. Irregularities in the implementation of the projects were also alleged, from the falsification of inspection reports and the non-completion of projects. Note, however, that while the latter were left unfinished, some parts of the projects are still visible, in which case some positive social benefit could still arguably be attached to them.

The allocation of the Malampaya royalties thus appears to provide both instances of theft and bribery. In this respect, it provides a counterfactual to the empirical findings and theoretical results in the political resource curse literature in which resource revenues increase corruption only through theft.[15]

The next section formalizes the distinction between theft and bribery in the provision of public goods by a public official who is in charge of the government budget.

3 Theft and Bribery in Public Good Provision

In related work (see Desierto (2018b)), I analyze a common agency model of public good provision in which the political agent derives rents from bribe payments in exchange for higher spending, and/or by stealing government revenues. The following summarizes the model and presents key results.

There are two principals for which government revenues T can be spent by a (common) political agent. Let the amount of spending that the agent allocates to principals 1 and 2 be denoted by g_1 and g_2, respectively. Principal 1 offers the agent bribe b in exchange for g_1, and derives net benefit $V(g_1) - b$ from spending. (Principal 2 does not offer bribes and derives benefit $V(g_2)$ from spending.) Let $V'(\cdot) > 0, V''(\cdot) < 0$.

Faced with a bribe offer, the agent then chooses (g_1, g_2), and keeps any unspent revenues for herself. The agent's total rents R thus consist of stolen revenues and the bribe payment, i.e. $R = T - g_1 - g_2 + b$. Let the agent also care about social welfare such that her utility is given by $U = \lambda[V(g_1) + V(g_2)] + (1 - \lambda)(T - g_1 - g_2 + b)$, where $\lambda \in (0, 1)$ is the weight it attaches to social welfare.

An equilibrium allocation is a solution to the following problem:

[15] An exception is the model of Bulte and Damania (2008) where rent-seeking by the government is in the form of bribery.

$$\max_{g_1,g_2,b} V(g_1) - b$$

$$s.t.\ \lambda[V(g_1) + V(g_2)] + (1-\lambda)(T - g_1 - g_2 + b) \geq \overline{U} \quad (a)$$

$$g_1 + g_2 - T \leq 0 \quad (b),$$

where $\overline{U}$ is the agent's reservation utility - what it would obtain if it rejects principal 1's offer. Thus, (a) is the agent's participation constraint. Meanwhile, constraint (b) captures the possibility of theft. If (b) holds with equality, i.e. the constraint is binding, then no theft is possible. Thus, call (b) the 'no-theft constraint'. If it is non-binding, the amount $T - g_1 - g_2 > 0$ can be stolen. Notice, then, that theft involves a direct transfer of (unspent) government revenues to the agent. In contrast, the equilibrium amount of bribes is that which maximizes principal 1's net benefit from public spending and, thus, depends on $V(g_1)$, and not merely on the amount spent, i.e. g_1.

Proposition 3.1. *Let $d = 1$ indicate that the no-theft constraint is binding, and $d = 0$ that it is non-binding. If:*

1. *$d = 1$, then:*
   (a) $g_1^* = f_1(\lambda, T)$
   (b) $g_2^* = T - g_1^* = T - f_1(\lambda, T)$
   (c) $R^* = b^* = \frac{\lambda}{1-\lambda}[2V(\frac{T}{2}) - V(g_1^*) - V(T - g_1^*)] = f_2(\lambda, T, g_1^*)$
2. *$d = 0$, then:*
   (a) $g_1^* = f_3(\lambda)$
   (b) $g_2^* = f_4(\lambda)$
   (c) $R^* = b^* + T - g_1^* - g_2^* = \frac{\lambda}{1-\lambda}[2V(g_1^0) - V(g_1^*) - V(g_2^*)] - 2g_1^0 + T = f_5(\lambda, T, g_1^*, g_2^*, f_6(\lambda))$, *where* $g_1^0 = f_6(\lambda)$.

Proof. See Appendix 1. ■

The equilibrium of the model is thus described by the following system of conditional equations:

$$g_1^* = \begin{cases} f_1(\lambda, T) & \text{if } d = 1 \\ f_3(\lambda) & \text{otherwise} \end{cases}$$

$$g_2^* = \begin{cases} T - f_1(\lambda, T) & \text{if } d = 1 \\ f_4(\lambda) & \text{otherwise} \end{cases} \tag{1}$$

$$R^* = \begin{cases} f_2(\lambda, T, g_1^*) & \text{if } d = 1 \\ f_5(\lambda, T, g_1^*, g_2^*, f_6(\lambda)) & \text{otherwise} \end{cases}$$

Define total equilibrium spending as $S \equiv g_1 + g_2$. Then:

$$g_1^* = \begin{cases} f_1(\lambda, T) & \text{if } d = 1 \\ f_3(\lambda) & \text{otherwise} \end{cases}$$

$$S^* = \begin{cases} T & \text{if } d = 1 \\ f_3(\lambda) + f_4(\lambda) & \text{otherwise} \end{cases} \tag{2}$$

$$R^* = \begin{cases} f_2(\lambda, T, g_1^*) & \text{if } d = 1 \\ f_5(\lambda, T, g_1^*, f_4(\lambda), f_6(\lambda)) & \text{otherwise} \end{cases}$$

Dividing by S^*, one can form a system of two equations that determine equilibrium $((\frac{g_1}{S})^*, (\frac{R}{S})^*)$:

$$(\frac{g_1}{S})^* = \begin{cases} \frac{f_1(\lambda, T)}{T} & \text{if } d = 1 \\ \frac{f_3(\lambda)}{f_3(\lambda) + f_4(\lambda)} & \text{otherwise} \end{cases}$$

$$(\frac{R}{S})^* = \begin{cases} \frac{f_2(\lambda, T, g_1^*)}{T} & \text{if } d = 1 \\ \frac{f_5(\lambda, T, g_1^*, f_4(\lambda), f_6(\lambda))}{f_3(\lambda) + f_4(\lambda)} & \text{otherwise} \end{cases} \tag{3}$$

This can be expressed more generally as:

$$(\frac{g_1}{S})^* = \begin{cases} h_1(\lambda, T) & \text{if } d = 1 \\ h_2(\lambda) & \text{otherwise} \end{cases}$$

$$(\frac{R}{S})^* = \begin{cases} h_3(\lambda, T, g_1^*) & \text{if } d = 1 \\ h_4(\lambda, T, g_1^*) & \text{otherwise} \end{cases} \tag{4}$$

Lastly, note the following:

Proposition 3.2. *Let $\overline{T}$ denote the (unobservable) threshold level of revenues, at and below which theft is not possible. Then the probability that the no-theft constraint binds is* $\Pr(d = 1) = Pr(T \leq \overline{T}) = Pr(\overline{T} - T \geq 0)$, *which is a function of λ and T.*

Proof. See Appendix 1. ■

In this model, since theft is not possible at or below $\overline{T}$, the threshold $\overline{T}$ captures, as it were, the implicit demand for public spending that has to be met. Above this threshold, theft is now possible (i.e. the no-theft constraint is non-binding, or $d = 0$), but because only $\overline{T}$ has to be met, the agent is able to steal *all* additional revenues above $\overline{T}$. Thus, because they are all stolen, (the size of) additional revenues above $\overline{T}$ is irrelevant to the level of public spending, which is why, in equation (4), $\frac{g_1}{S}$ is independent of T when $d = 0$. In contrast, when revenues are below $\overline{T}$, the agent is constrained to satisfy the demand for public spending, and is thus unable to steal (i.e. $d = 1$). In this case, the size of revenues determines the equilibrium amount of public spending.

Thus, the effect of revenues T on total rents (per spending) $\frac{R}{S}$ occurs via the following channels. In a jurisdiction in which the no-theft constraint is binding, equilibrium public spending depends on revenues, and public spending determines the equilibrium amount of bribes which, in this case, is equal to total rents (since there is no theft). Thus, T affects $\frac{R}{S}$ through $\frac{g_1}{S}$ (and also through its effect on bribes and, hence, total rents inasmuch as it affects the agent's reservation utility - see Desierto (2018b) for details). In contrast, in a jurisdiction in which the no-theft constraint is non-binding, public spending is independent of revenues since all additional revenues are stolen. Thus, T only determines the amount of theft and, hence, directly affects $\frac{R}{S}$. The problem is that the type of jurisdiction is unknown because whether or not the no-theft constraint is binding is unknown – one can only determine the probability that it is binding. (The jurisdiction type would be known if the 'true' demand for public spending, $\overline{T}$, can be known with certainty – it is the very fact that this is not possible which gives the agent the opportunity to steal.) Now the probability that the no-theft constraint is binding in turn depends on T. That is, given some implicit demand $\overline{T}$, larger revenues T make it more likely that it exceeds $\overline{T}$ and, thus, make it more possible for the agent to steal (while satisfying the demand for public spending). That is, with a large T, the probability that the no-theft constraint is binding is lower.

Given data on multiple jurisdictions, one can then estimate the probability that the jurisdiction is one in which the no-theft constraint is non-binding and thus infer from that jurisdiction-type the equilibrium amount of theft. Meanwhile, since bribery can occur in both jurisdiction-types, one can then use parameter estimates from both types (weighted by the probability of being one type or the other) to infer the equilibrium amount of bribes. The next section explicitly demonstrates the procedure.

4 Measuring Theft and Bribery

To complete the structural model, I parameterize (4) and include a vector of error terms $\mathbf{u}$ which are necessary for two reasons. One is that there may be other variables that can possibly affect $\frac{g_1}{S}$, $\frac{R}{S}$, and d that are unobservable (to the econometrician). The other is that $\frac{R}{S}$ and d may be prone to measurement errors - reports of rents derived by the agent could be unreliable since the agent would want them hidden, while d might not perfectly indicate whether $\overline{T} - T \geq 0$, threshold $\overline{T}$ being latent/unobservable.

Thus, let $\mathbf{y} = (\frac{g_1}{S}, \frac{R}{S})$ and d be the dependent variables in the system, $\mathbf{x} = (1, \lambda, T)$ the independent variables, $\mathbf{u}$ the error term, and θ a vector of parameters. Assume a finite population of jurisdictions $\{Z\}$, with $|Z| = Z$. For jurisdiction $i \in \{Z\}$, the system can be expressed as

$$\mathbf{g}(\mathbf{y}_i, d_i, \mathbf{x}_i, \mathbf{u}_i|\theta) = \mathbf{0}. \tag{5}$$

Consider the following assumptions:

ASSUMPTIONS

1. There exists a unique solution for $\mathbf{y}_i$ for every $(\mathbf{x}_i, d_i, \mathbf{u}_i)$ such that $\mathbf{y}_i = \mathbf{f}(\mathbf{x}_i, d_i, \mathbf{u}_i|\pi)$, where π is a vector of parameters that are functions of θ.

2. $\mathbf{f}$ is additively separable in $(\mathbf{x}_i, d_i)$ and $\mathbf{u}_i$.

3. (a) $E(\mathbf{u}_i|\mathbf{x}_i, d_i) = E(\mathbf{u}_i)$ and (b) $\mathbf{u}_i \sim \mathcal{N}(\mathbf{0}, \boldsymbol{\sigma^2})$.

4. $\pi = (\alpha, \beta^{\mathbf{1}}, \beta^{\mathbf{2}})$.

5. $Pr(d_i = 1|\mathbf{x}_i) = \Phi(\mathbf{x}_i\alpha)$, where Φ is the standard normal cdf.

6. $E(\mathbf{y}_i|\mathbf{x}_i, d_i = 1) = \mathbf{x}_i\beta^{\mathbf{1}}$ and $E(\mathbf{y}_i|\mathbf{x}_i, d_i = 0) = \mathbf{x}_i\beta^{\mathbf{2}}$.

Under assumptions 1 and 2, one can write equation (1) as:

$$\mathbf{y}_i = \mathbf{g}(\mathbf{x}_i, d_i|\pi) + \mathbf{u}_i = E(\mathbf{y}_i|\mathbf{x}_i, d_i) + \mathbf{u}_i. \tag{6}$$

Taking the expectation of $E(\mathbf{y}_i|\mathbf{x}_i, d_i)$ over d_i:

$$\mathbf{y}_i = Pr(d_i = 1|\mathbf{x}_i)E(\mathbf{y}_i|\mathbf{x}_i, d_i = 1) + (1 - Pr(d_i = 1|\mathbf{x}_i))E(\mathbf{y}_i|\mathbf{x}_i, d_i = 0) + \mathbf{u}_i, \tag{7}$$

which, under assumptions 4, 5, and 6, can be written as:

$$\mathbf{y}_i = \Phi(\mathbf{x}_i\alpha)\mathbf{x}_i\beta^{\mathbf{1}} + (1 - \Phi(\mathbf{x}_i\alpha))\mathbf{x}_i\beta^{\mathbf{2}} + \mathbf{u}_i. \tag{8}$$

Lastly, rearranging gives:

$$\mathbf{y}_i = \mathbf{x}_i\gamma_i + \mathbf{u}_i, \tag{9}$$

where $\gamma_i \equiv \Phi(\mathbf{x}_i\alpha)\beta^{\mathbf{1}} + (1 - \Phi(\mathbf{x}_i\alpha))\beta^{\mathbf{2}}$.

4.1 Decomposing the Marginal Effect of Revenues on Total Rents

To identify the marginal rents from theft and those from bribery, it is not necessary to recover estimates of θ from estimates of the reduced-form parameters. What is important is the comparative statics from changing T, particularly, the effect of T on $\frac{R}{S}$. To see this, note that (4) implies that the total derivative of $\frac{R}{S}$ with respect T is (i) $\frac{d\frac{R}{S}}{dT} = \frac{\partial h_3()}{\partial T} + \frac{\partial h_3()}{\partial g_1}\frac{\partial g_1}{\partial T}$ if $d = 1$ and (ii) $\frac{d\frac{R}{S}}{dT} = \frac{\partial h_4()}{\partial T} + \frac{\partial h_4()}{\partial g_1}\frac{\partial g_1}{\partial T} = \frac{\partial h_4()}{\partial T}$ if $d = 0$.

Recall that total rents consist of stolen revenues and bribe payments. Thus, for a jurisdiction with $d = 1$ such that theft cannot occur, a change in rents per total spending, i.e. $\frac{R}{S}$, as a response to a change in T would be all due to a change in the amount of bribes per total spending which, according to (i), operates through a change in g_1. In contrast, for a jurisdiction with $d = 0$ such that theft is possible, (ii) shows that there is no change in g_1 as a response to a change in T. This implies that a change in T does not induce a change in bribes per total spending and, thus, any change in $\frac{R}{S}$ as a response to a change in T would be due to a change in theft, or the amount of stolen revenues, per total spending.[16]

The difficulty, however, is in identifying the overall, or average, change in theft and bribery if some jurisdictions have $d = 1$ while others $d = 0$, given that $Pr(d = 1)$ is also affected by T. I thus derive these parameters.

To proceed, note that from (9), one can express the equation for $\frac{R}{S}_i$ as:

$$\frac{R}{S}_i = \gamma_{R0_i} + \gamma_{R\lambda_i}\lambda_i + \gamma_{RT_i}T_i + u_{R_i}, \tag{10}$$

where:

$\gamma_{R0_i} = \Phi(\mathbf{x}_i\alpha)\beta^1_{R0} + (1 - \Phi(\mathbf{x}_i\alpha))\beta^2_{R0}$,

$\gamma_{R\lambda_i} = \Phi(\mathbf{x}_i\alpha)\beta^1_{R\lambda} + (1 - \Phi(\mathbf{x}_i\alpha))\beta^2_{R\lambda}$,

$\gamma_{RT_i} = \Phi(\mathbf{x}_i\alpha)\beta^1_{RT} + (1 - \Phi(\mathbf{x}_i\alpha))\beta^2_{RT}$,

$\beta^{\mathbf{1}} = [\beta^1_{R0} \quad \beta^1_{R\lambda} \quad \beta^1_{RT}]$ and $\beta^{\mathbf{2}} = [\beta^2_{R0} \quad \beta^2_{R\lambda} \quad \beta^2_{RT}]$, or

$$\frac{R}{S}_i = \Phi(\mathbf{x}_i\alpha)[(\beta^1_{R0} - \beta^2_{R0}) + (\beta^1_{R\lambda} - \beta^2_{R\lambda})\lambda_i + (\beta^1_{RT} - \beta^2_{RT})T_i] + \beta^2_{R0} + \beta^2_{R\lambda}\lambda_i + \beta^2_{RT}T_i + u_{R_i}. \tag{11}$$

By assumption 3, the expected value of $\frac{R}{S}_i$ given $\mathbf{x}_i$ is:

$$E[(\frac{R}{S}_i)|\mathbf{x}_i] = \Phi(\mathbf{x}_i\alpha)[(\beta^1_{R0} - \beta^2_{R0}) + (\beta^1_{R\lambda} - \beta^2_{R\lambda})\lambda_i + (\beta^1_{RT} - \beta^2_{RT})T_i] + \beta^2_{R0} + \beta^2_{R\lambda}\lambda_i + \beta^2_{RT}T_i. \tag{12}$$

One can then get the following derivative with respect to revenues:

$$\frac{dE[(\frac{R}{S}_i)|\mathbf{x}_i]}{dT_i} = [\Phi(\mathbf{x}_i\alpha) + \phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta^1_{RT} - \beta^2_{RT}) + \phi(\mathbf{x}_i\alpha)\alpha_T[(\beta^1_{R0} - \beta^2_{R0}) + (\beta^1_{R\lambda} - \beta^2_{R\lambda})\lambda_i] + \beta^2_{RT}, \tag{13}$$

where $\phi(\mathbf{x}_i\alpha)\alpha_T$ is the marginal effect of T_i on $Pr(d = 1)$ - with α_T as the marginal effect of

[16] See Desierto (2018b) for a more detailed and formal exposition.

T_i on the index function $\mathbf{x}_i\alpha$ and $\phi(\cdot)$ the standard normal pdf.

Thus, for jurisdiction $i \in \{Z\}$, the total effect of revenues on its expected rents (per spending) is the sum of a direct effect (a) β^2_{RT} and an indirect effect (b) $[\Phi(\mathbf{x}_i\alpha)+\phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta^1_{RT}-\beta^2_{RT})+\phi(\mathbf{x}_i\alpha)\alpha_T[(\beta^1_{R0}-\beta^2_{R0})+(\beta^1_{R\lambda}-\beta^2_{R\lambda})\lambda_i]$ through spending g_1. That is, (a) is unaffected by g_1 whereas (b) is. To see this, note that by symmetry, one can get the following expression:

$$\frac{dE[(\frac{g_1}{S}_i)|\mathbf{x}_i]}{dT_i} = [\Phi(\mathbf{x}_i\alpha)+\phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta^1_{gT}-\beta^2_{gT})+\phi(\mathbf{x}_i\alpha)\alpha_T[(\beta^1_{g0}-\beta^2_{g0})+(\beta^1_{g\lambda}-\beta^2_{g\lambda})\lambda_i]+\beta^2_{gT} \tag{14}$$

Re-writing this as $\Phi(\mathbf{x}_i\alpha) + \phi(\mathbf{x}_i\alpha)\alpha_T T_i = \frac{\frac{dE[(\frac{g_1}{S}_i)|\mathbf{x}_i]}{dT_i}-\phi(\mathbf{x}_i\alpha)\alpha_T[(\beta^1_{g0}-\beta^2_{g0})+(\beta^1_{g\lambda}-\beta^2_{g\lambda})\lambda_i]-\beta^2_{gT}}{\beta^1_{gT}-\beta^2_{gT}}$ and substituting into (13) obtain:

$$\frac{dE[(\frac{R}{S}_i)|\mathbf{x}_i]}{dT_i} = \Big(\frac{\frac{dE[(\frac{g_1}{S}_i)|\mathbf{x}_i]}{dT_i} - \phi(\mathbf{x}_i\alpha)\alpha_T[(\beta^1_{g0}-\beta^2_{g0}) + (\beta^1_{g\lambda}-\beta^2_{g\lambda})\lambda_i] - \beta^2_{gT}}{\beta^1_{gT}-\beta^2_{gT}}\Big)(\beta^1_{RT}-\beta^2_{RT})+\beta^2_{RT}, \tag{15}$$

where the first term is determined by spending, whereas the second term is not.

Thus, to summarize, the following are the population parameters of interest:

Definition The **direct effect** of jurisdiction i's revenues, T_i, on its expected rents (per spending), $E[\frac{R}{S}|\mathbf{x}_i]$, is $D = \beta^2_{RT}$, while the **indirect effect** is $I_i = [\Phi(\mathbf{x}_i\alpha) + \phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta^1_{RT} - \beta^2_{RT})+\phi(\mathbf{x}_i\alpha)\alpha_T[(\beta^1_{R0}-\beta^2_{R0})+(\beta^1_{R\lambda}-\beta^2_{R\lambda})\lambda_i]$. The **total effect** is $W_i = [\Phi(\mathbf{x}_i\alpha)+\phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta^1_{RT}-\beta^2_{RT}) + \phi(\mathbf{x}_i\alpha)\alpha_T[(\beta^1_{R0}-\beta^2_{R0}) + (\beta^1_{R\lambda}-\beta^2_{R\lambda})\lambda_i] + \beta^2_{RT}$.

In turn, these parameters identify the marginal rents from theft, from bribery, and the total change corruption:

Proposition 4.1. *Parameter D identifies the expected change in rents from theft (as a proportion of total spending) in jurisdiction i as a response to a change in its revenues T_i, parameter I_i the expected change in rents from bribes (as a proportion of total spending), and parameter W_i the expected change in total rents (as a proportion of total spending).*

Proof. See Appendix A. ■

4.2 Estimating the Direct, Indirect and Total Effects

The following two-step procedure obtains estimates for the direct effect ($\hat{D}$), indirect effect ($\hat{I}_i$), and total effect ($\hat{W}_i$) of revenues on the expected rents (per spending) in jurisdiction i, using a random sample $S \subset Z$, with $|S| = S$.

1. Estimate $Pr(d_i = 1)|\mathbf{x}_i)$ by probit regression to get $\hat{\alpha_T}$ and, for each municipality i in sample S, $\hat{\Phi}_i$ and $\hat{\phi}_i$.

2. Using the subset of the data for which $d_i = 1$, regress $\mathbf{y}_i$ on $\mathbf{x}_i$ by OLS to get $\hat{\beta}^1$. Do the same for the subset for which $d_i = 0$ to get $\hat{\beta}^2$.

Using these estimates, one can then compute $\hat{D}, \hat{I}_i, \hat{W}_i$ according to the definition of the population parameters D, I_i, W_i.

This procedure yields consistent estimates of D, I_i, W_i, under assumptions (5) and (6). To see this, note that $\text{plim}\, \hat{D} = D$, or $\text{plim}\, \widehat{\beta^2_{RT}} = \beta^2_{RT}$ since, under assumption (6), OLS gives a consistent estimate of β^2_{RT}. As for the estimate of the indirect effect, note that under assumption (6), OLS gives consistent estimates of $\beta^1_{RT}, \beta^2_{RT}$, while under assumption (5), the probit (MLE) regression gives consistent estimates of α and, hence, of $\Phi(\cdot)$ and $\phi(\cdot)$. Thus, $\text{plim}\, \hat{I}_i = I_i$, or $\text{plim}[\hat{\Phi}(\mathbf{x}_i\hat{\alpha}) + \hat{\phi}(\mathbf{x}_i\hat{\alpha})\hat{\alpha_T}T_i](\widehat{\beta^1_{RT}} - \widehat{\beta^2_{RT}}) + \hat{\phi}(\mathbf{x}_i\hat{\alpha})\hat{\alpha_T}[(\widehat{\beta^1_{R0}} - \widehat{\beta^2_{R0}}) + (\widehat{\beta^1_{R\lambda}} - \widehat{\beta^2_{R\lambda}})\lambda_i] = [\Phi(\mathbf{x}_i\alpha) + \phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta^1_{RT} - \beta^2_{RT}) + \phi(\mathbf{x}_i\alpha)\alpha_T[(\beta^1_{R0} - \beta^2_{R0}) + (\beta^1_{R\lambda} - \beta^2_{R\lambda})\lambda_i]$. Finally, it follows that $\text{plim}\, \hat{W}_i \equiv \hat{D}_i + \hat{I}_i = D_i + I_i \equiv W_i$.

Note that while $\hat{D}$ is the same for any i, the indirect effect I_i varies across i. (After performing the two-step procedure, one then computes $\hat{I}_i, \hat{W}_i$ by choosing some value of λ_i, T_i. Thus, in getting $\text{plim}\, \hat{I}_i$, I have 'fixed' the value of λ_i and T_i which are thus treated as constants.) One can also summarize across sample S by taking the respective averages $S^{-1}\Sigma\hat{I}_i$ and $S^{-1}\Sigma\hat{W}_i$. These are consistent estimates of the average indirect and total effects for that subset S of the entire population of jurisdictions Z, since $\text{plim}(S^{-1}\Sigma\hat{I}_i) = S^{-1}\Sigma I_i$ and $\text{plim}(S^{-1}\Sigma\hat{W}_i) = S^{-1}\Sigma W_i$.

In section 6, I report $\hat{D}$, as well as $\hat{I}_i$ and $\hat{W}_i$ for a jurisdiction with mean $\mathbf{x}$. Standard errors are obtained by bootstrapping the procedure. (In Appendix 2, I use the Delta method to formally derive the standard errors of the sample averages of the indirect and total effects, i.e. $S^{-1}\Sigma\hat{I}_i$ and $S^{-1}\Sigma\hat{W}_i$).

5 Data

Statistical analyses are conducted at the level of the municipality. As of 2017, there are 1,634 municipalities in the Philippines, 145 of which are classified as cities. These are grouped into 81 provinces, and which can be further aggregated into 18 regions, 8 of which are geographically located in the northern group of islands known as Luzon, 4 in the middle Visayan islands, and 6 in the southern part, Mindanao.[17]

A municipal government is managed by an elected mayor, while a provincial government is managed by an elected provincial governor. Regions are managed by the national government, through national government agencies, e.g. Department of Public Works and Highways, Department of Education, Department of Health, whose funding comes solely from the national budget and whose projects are administered by the agencies' regional offices. Regional officers are thus appointed by the central government, and not elected.

In contrast, local government units (LGUs) - municipal and provincial governments, have some degree of autonomy in that they can provide public goods and services within their locality. While they can also raise additional revenues, the primary source of revenues of an LGU - comprising 50 to 90 percent of total municipal government revenues, is the Internal Revenue Allotment (IRA), which is the LGU's share of national government revenues. The IRA is determined according to a fixed formula that is based on the LGU's land area and population, and is automatically remitted to the LGU, as specified in Sec. 285 of Republic Act 1760.

Recall that to estimate the structural model, one needs proxies for the government agent's accumulated rents per total government spending $\frac{R}{S}$, the proportion of total spending allocated to (any) rent-generating expenditures $\frac{g_1}{S}$, a dummy variable d indicating whether the "no-theft constraint" is binding, government revenues T, and the weight λ that the politician attaches to social welfare. Below I describe the proxies I have constructed, grouped according to data source.

BLGF. From the Bureau of Local Government Finance (BLGF), I have collected statements

[17] The island groupings are made only on the basis of geographical, and not administrative, divisions. Luzon is the largest and most populous, and contains the 17 municipalities of the capital, Metro Manila/National Capital Region (NCR). For the main analyses, I exclude the NCR as it is a clear outlier, being the most densely populated, urbanized, and developed region in the country. (See Appendices 3, 4, and 5 for a more detailed discussion of the data.) Section 6.3 and Appendix 10 present results using a sample that includes the NCR.

of tax receipts and expenditures for each municipality from the years 2011 to 2014. On the revenue side, the statement shows the municipality's revenues from each source, including the IRA. Apart from the IRA, other external sources of revenues include grants, donations, and aid. Internal sources include municipal taxes (on real estate and business) and municipal non-tax revenues such as regulatory fees and service charges. On the expenditure side, amounts are shown for each broad type of public spending, such as on education, health, social services, and economic services. There is also a separate entry for capital expenditures, which cover the purchase of property, plant and equipment, and public infrastructure. Lastly, the statement also includes the cost of debt that the municipality holds.

I have taken the averages of each of the revenue, expenditure, and debt components over the period 2011 to 2014. As a proxy for total spending S, I use total expenditures, and for T, I use the Internal Revenue Allotment. The latter is arguably an exogenous proxy for revenues as it is automatically allocated out of national revenues according to a fixed, legally-mandated, formula. I use expenditures on construction, public services, education, health, labor and employment, housing, social welfare, and economic services, and divide each of these by S to obtain several proxies for $\frac{g_1}{S}$.

To construct a proxy for whether or not the no-theft constraint is binding, I assign $d = 1$ to municipalities that have no debt - their cost of debt is zero, and $d = 0$ otherwise. The proxy is thus called *No Debt*. Note that the corruption literature has only begun to uncover a positive (reduced-form) relationship between government debt and corruption, and the mechanism is still unclear. (See Cooray et al. (2016), Benfratello et al. (2017), and Liu et al. (2017).) By using *No Debt* as a proxy for the no-theft constraint, the structural approach in this paper posits that the incurrence of debt would allow corrupt government officials to siphon off public funds since debt-financed government projects rely on credit markets, whereas those funded solely by tax revenues are more-directly paid for by taxpayers. In this manner, the presence of debt obscures the accountability of the government toward their constituents.[18]

[18] This is not to say, however, that creditors cannot also make the government accountable. For instance, historical evidence (e.g. North and Weingast (1989), Stasavage (2010), Scheve and Stasavage (2012)) suggest that the government can increase its ability both to raise tax revenues and gain access to credit when institutional reforms are made to curb the abuse of authority. It remains an empirical question, however, whether debt or taxation induces greater accountability. I argue that in the case of the Philippines, the local government is more accountable - specifically, it is more difficult to steal revenues, if taxes were the only source of public funds, than if both debt and taxes finance spending. See subsequent discussion.

In the Philippines, the municipality can indeed "contract loans, credits, and other forms of indebtedness" in order to finance additional spending on public goods and services.[19] Note, however, that there is no objective way of verifying whether such projects are necessary and/or whether the municipality has to take out loans to fund such projects. In fact, there is no external project audit, and all terms and conditions of the loan are simply agreed upon by the municipality and the lender. Because of the weak requirements for accountability to municipality constituents and to national authorities for incurring debt, the additional spending that are supposed to justify the loans can be potentially used to cover for theft. Thus, theft would be relatively easier when the municipality incurs debt than when it does not, which makes the no-theft constraint *non*-binding when $d = 0$. In contrast, the municipality would arguably find it harder to engage in theft if it relies solely on revenues to finance spending, since raising municipal taxes and charging fees make the municipality more accountable to its constituents - the latter are more likely to be more vigilant in verifying that the additional revenues are used for legitimate spending. Thus, when $d = 1$, the no-theft constraint is binding.

While *No Debt* is the main proxy for d, as it is closely tied to the empirical literature on debt and corruption, I also consider two other proxies - *city* and *urban* (taken from the Philippine Statistics Authority), which indicate that the municipality is a city, and is classified as urban, respectively. In these types of municipalities, the no-theft constraint is binding to the extent that public projects therein may be subject to more scrutiny.

PSA. I obtained 2010 Census data from the Philippine Statistics Authority (PSA), which contains, among other variables, population data as of 2010, that is, prior to the period 2011-2014. From this I calculated the proportion of the population aged 15 to 24, to proxy for λ. Recall that λ measures the extent to which the politician values social welfare over rents. Thus, in effect, λ captures the degree of 'control' that citizens have over a rent-seeking politician. When the youth population is large, the more the politician has to care about social welfare - otherwise, either she is likely to lose in elections where a lot of voters are idealistic and cannot be bought, and/or likely to be reported to the media or authorities for corruption.

[19] Local Government Code, RA 7160, Title IV, Sec. 297: "A local government unit may contract loans, credits, and other forms of indebtedness with any government or domestic private bank and other lending institutions to finance the construction, installation, improvement, expansion, operation, or maintenance of public facilities, infrastructure facilities, housing projects, the acquisition of real property, and the implementation of other capital investment projects, subject to such terms and conditions as may be agreed upon by the local government unit and the lender. The proceeds from such transactions shall accrue directly to the local government unit concerned."

I also use other data from the Census to construct the following alternative proxies for λ: the proportion of school-age youth who are enrolled in school; the proportion of the population who are employed; the proportion of the population who are employed in managerial and professional jobs; the proportion of all households who have at least one cellphone; and the proportion of the population who are registered voters. These can proxy for λ to the extent that they capture the vigilance and capability of the municipality to monitor the performance of the politician.

Other data from the 2010 Census and the Philippine Standard Geographic Code (PSGC) have also been obtained from the PSA to construct the following control variables: the log of the land area of the municipality, and the log of its average population between 2010 and 2015, and various measures of economic development: the proportion of total households that have electricity; the proportion of total households who own the land they occupy; the proportion of total households who own the house they occupy; and the income classification of the municipality ranging from 1 to 6, where 6 is the highest level possible.

SALN. Finally, I construct a measure of rents R using data reported by the mayor in her Statement of Assets, Liabilities, and Net Worth (SALN). All public employees and elected officials are mandated by law to submit a SALN annually - i.e. one SALN for each year of office. The SALN lists all assets owned, with separate categories for real properties and other personal assets, and acquisition costs and market values. It also lists each liability held, sources and amount of gross income, personal and family expenses, income taxes paid, business interests and financial connections, and any relatives who hold positions in government.

Currently, only paper copies of SALNs can be requested. I thus obtained from the Office of the Ombudsman copies of the SALNs of each municipal mayor in the years 2011 and 2014, and digitized and encoded the entries from each SALN.

To capture rents earned by the mayor between the years 2011 and 2014, I compute the change in the net worth of the mayor by taking the difference of the net worths she reported in her 2014 and 2011 SALNs. I similarly calculate the changes in her real assets, personal assets and liabilities. I then divide each of these changes by S to construct proxies for $\frac{R}{S}$. While the main proxy is the change the mayor's net worth (per spending), using its components should reveal consistent results, with the change in real assets and in personal assets following the same pattern as the change in net worth since they increase the latter, and the change in liabilities moving in the opposite direction since they decrease networth.

I also take the averages of the 2011 and 2014 reported values of the mayor's net worth, real assets, personal assets, liabilities, as well as their percentage growth.

An important issue is whether the SALNs are a reliable source of information. A corrupt politician might want to conceal any illegally-gotten wealth by not submitting the SALN and/or by misreporting items thereof. Note, however, that failure to submit the SALN, and false declarations in the SALN, are offenses that carry criminal and administrative penalties. In fact, Fisman et al. make a similar argument in justifying the use of the asset disclosure affidavits in India. In the Philippines, even the highest public officials have been prosecuted for failure to submit and/or report all items in the SALN, including a former President who was convicted of plunder charges, a former Chief Justice of the Supreme Court who was impeached, and the current Chief Justice who has just been removed from office. Because the penalties are non-trivial, it would be rational for a mayor to submit a SALN at least once, or at certain years, during her term.[20] To the extent that the mayor's choice of specific years in which to submit is random, the particular sample I use (which consists of only the 2011 and 2014 SALNs) is thus random.

The consequence is that while attrition rates are expected to be high and the sample size small (since not all mayors would choose the same year/s in which to submit), this would not likely generate any selection bias.

To demonstrate the plausibility of this claim, I construct a placebo sample and show that 'untreated' mayors, had they been treated, would have been selected into the main sample at the same rate as the 'treated' mayors are. That is, in the following, I show that the hypothetical rate of selection is equal to the actual rate of selection into the sample.

First note that I have been able to obtain fiscal data from 1,620 municipalities, or 99% of all municipalities in the Philippines. The analysis covers the period between 2011 and 2014, and

[20] Although the law clearly requires submission of the SALN for every year in public office, the official might appear less culpable of violating the law if she submits a SALN a few times. In fact, in the impeachment trial of the current Chief Justice of the Supreme Court, the Chief Justice argued that the fact that some of her SALNs are missing does not imply that she did not submit them as she did the others. She cites the Doblado case in which the Supreme Court ruled that "one cannot readily conclude that respondent failed to file his sworn SALN for the years...simply because these documents are missing in the files of the OCA..." (For the complete audio recording of the oral arguments, go to http://sc.judiciary.gov.ph/microsite/quo-warranto/index.html. For newspaper coverage, see, e.g., https://www.google.com/amp/newsinfo.inquirer.net/981451/sereno-de-castro-butt-heads-over-saln.amp.)

there was an election in 2013.[21] Out of the 1,620 municipalities, 1,014 experienced a turnover, such that their mayor in 2011 was different from their mayor in 2014. Meanwhile, the other 606 did not experience a turnover - their mayor was re-elected. The sample of interest thus consists of these 606 municipalities because one can only compute the change in assets of a mayor between 2011 to 2014 if she served in the two terms. (Only elected officials are required to file the SALN - candidates do not file it.) Only for these mayors could one show how much, if any, of their accumulated assets could have included rents from theft and/or bribery. The 1,014 municipalities are placebos - the difference in the 2014 assets and the 2011 assets cannot constitute accumulated rents simply because they belong to different mayors.

However, as indicated in Figure 1 below, among the 606 treated municipalities/mayors, only 232 mayors submitted a SALN in 2011, and only 231 of these 232 submitted again in 2014. Thus, the main sample consists of these 231 municipalities for which the mayor's accumulated assets can be computed. This implies that the actual rate of selection into the sample is the joint probability $\frac{232}{606} \times \frac{231}{232} = 38\%$. To obtain the hypothetical rate of selection, note that the 1,014 municipalities that experienced a turnover actually had 2,028 mayors in the sample period - 1,014 in 2011 and a different set of 1,014 mayors in 2014. Each of these mayors could only submit once, that is, either in 2011 or in 2014. Figure 1 shows that 621 of the 2011 mayors submitted a SALN, whereas only 167 of the 2014 mayors submitted.[22] Now assume that any of these mayors who submitted, if re-elected, would submit a second time at the same rate at which the mayors who were actually re-elected submitted a second time, i.e. with probability $\frac{231}{232}$. Then the probability that a 2011 mayor would have been selected into the sample had she been the mayor in 2014 is $\frac{621}{1{,}014} \times \frac{231}{232}$, while the probability that a 2014 mayor would have been selected into the sample had she been the 2011 mayor is $\frac{167}{1{,}014} \times \frac{231}{232}$. The (overall) hypothetical rate of selection is simply the average $\frac{(\frac{621}{1{,}014} \times \frac{231}{232}) + (\frac{167}{1{,}014} \times \frac{231}{232})}{2} = 38.6\%$, which is approximately equal to the actual rate of selection.

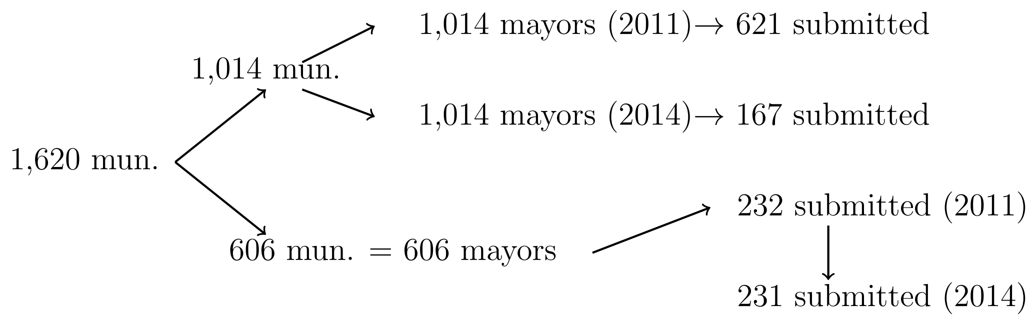
[21] Local elections are held every three years, and officials can be elected up to three times in succession. Local governments in the Philippines are largely run by family networks and political dynasties. (See Querubin (2016) and Cruz, Labonne and Querubin (2017).) It is not uncommon for a mayor who has served for three consecutive terms to be replaced by a family member. The mayor is also not barred from holding the same office again after the three-term limit is reached, provided that there is a gap of at least one term.

[22] As shown in Appendix 3, 166 municipalities out of the 1,014 had both their mayors submit a SALN. Only for these 166 can the difference in 2014 and 2011 assets can be computed, although the assets are from different mayors. Thus, while there are potentially 1,014 placebo municipalities, only 166 of them actually constitute a placebo sample which can be used to estimate the model.

Appendices 3 and 4 provide greater detail and further statistical analyses to show that the sample, albeit small, is likely to be a random one. Appendix 6 proposes a selection model that shows that even if the sample were non-random - specifically, even if the mayor's probability of submitting the SALN and/or her probability of accurately reporting items in the SALN were to vary systematically with the mayor's rents, this would still not bias the results under certain conditions.

Appendix 5 presents summary statistics.

Figure 1: **SALN submission by mayors in 2011 and 2014**



6 Results

In Appendices 7 and 8, I argue that the proxies I use for $\frac{R}{S}$ - i.e the change in net worth, in real assets, and in liabilities (per spending), indeed capture, or at least include, rents, by showing that their values are implausibly high for legitimate wealth accumulation over the sample period. On average, mayors' net worth grew by about $27,000$ percent between 2011 and 2014. Even for a restricted sample that includes about 70 percent of the sample, the growth rate of mayors' assets over the period still amounts to 160 percent. As Table 1 shows, such growth vastly outstrips most macroeconomic indicators, from GDP per capita and wages to consumer spending, vehicle sales, and real estate values.

To estimate the amount of total rents acquired (only) through the allocation of government revenues, I first run reduced-form regressions of the different proxies for $\frac{R}{S}$ on ira, a (exogenous) proxy for revenues. (In partialling out the effect of ira, this would then exclude not only legitimate wealth accumulation, but also other sources of (illicit) rents, e.g. gambling, drug-trafficking.) I then measure the amount of rents accumulated through the theft of revenues,

Table 1: Percentage growth of various Philippine economic indicators, and of mayors' net worth (2011-2014)

GDP per capita	18%
Minimum wages	20%
GDP from Public Administration	14%
Consumer spending	26%
Vehicle sales	50%
Mining sector	115%
Construction	50%
Real estate	20%
(Annual) yield, 10-yr gov't. bonds	4%-8%
(Annual) CB benchmark interest rate	3.5% - 4.5%
Phil. Stock Exchange Index	100%
Mayors' net worth (full sample - 231 municipalities)	**27,535%**
Mayors' net worth (restricted sample - 166 municipalities)	**160%**

This table presents the percentage growth between 2011 and 2014 of several Philippine economic indicators, computed using data from tradingeconomics.com, as well as the percentage growth of Philippine mayors' net worth, computed using data from each mayor's Statement of Assets, Liabilities, and Net Worth (SALN) in 2011 and in 2014. For the full sample of 231 municipalities for which both the 2011 and 2014 SALNs of its mayor are available, the mean percentage growth of the mayors' net worth is 27,535 percent. For a restricted sample of 166 municipalities, the mean percentage growth of the mayors' net worth is 160 percent, which is still higher than the percentage growth of any of the economic indicators. See Appendices 7 and 8 for details.

and those from bribe payments, by decomposing the marginal effect of ira on total rents into its direct effect, and its indirect effect through public spending.

6.1 Reduced-Form Estimates

Because of the plausible exogeneity of the IRA, one could get a reduced-form estimate of the marginal effect of the IRA on the proxies for $\frac{R}{S}$. This could serve as a benchmark to which the estimate of the total effect of the IRA from the structural model can be compared. Table 2 presents results from a quantile regression of each of the proxies for $\frac{R}{S}$ on the IRA. I employ quantile regression to get estimates that are robust to outliers. (See Appendices 7 and 8 for the distributions of the growth in net worth, real assets, and liabilities. Appendix 9 reports results from OLS and nonparametric regressions.)

Table 2 implies that government revenues significantly reduce the rate at which a politician's

Table 2: Reduced-form effect of municipal revenues on mayor's accumulated net worth, real assets, and liabilities, by quantile regression

	(1)	(2)	(3)	(4)	(5)	(6)
	Change in NET WORTH per Spending		Change in REAL ASSETS per Spending		Change in LIABILITIES per Spending	
Proportion of Population Aged 15-24		-0.0217		-0.00524		-0.00360
		(0.139)		(0.0375)		(0.0448)
Internal Revenue Allotment	-2.30e-05*	-2.29e-05**	0	3.03e-08	0	-7.99e-08
	(1.31e-05)	(8.83e-06)	(5.63e-07)	(4.39e-06)	(3.54e-06)	(4.31e-06)
Constant	0.00916***	0.0136	0	0.00110	0	0.000744
	(0.00260)	(0.0270)	(0.000587)	(0.00725)	(0.000892)	(0.00869)
Observations	231	198	231	198	231	198
Sum of absolute deviations	12.32	10.31	4.424	3.753	2.644	2.153
Sum of raw deviations	12.35	10.33	4.424	3.754	2.644	2.153

This table presents the effect of the municipality's Internal Revenue Allotment on the change in the mayor's net worth (columns 1 and 2), real assets (columns 3 and 4) and liabilities (columns 5 and 6) per total public spending in the municipality, as estimated by quantile regression. Pseudo R^2 can be computed as: $1 - \frac{sum\ of\ absolute\ deviations}{sum\ of\ raw\ deviations}$. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

assets increase. For every 1-unit increase in the IRA - equivalent to PhP 1 million, the change in the mayor's net worth as proportion of total spending in her municipality appears to drop by 0.000023. This implies that accumulated rents change by $S \times (-0.000023)$ for every 1-unit increase in ira. Thus, for a municipality with sample mean S, its mayor's accumulated rents is expected to drop by PhP$145.72m \times 0.000023 =PhP3,351.56$. This is roughly equivalent to a deceleration of 0.04 percent of the mean change in the net worth (as proportion of total spending) of mayors in the sample following a 1 percent increase in mean IRA.[23]

While the IRA does not appear to significantly affect the change in the mayor's real assets and liabilities (per spending), one can note that the estimated coefficients of the IRA in the regression for the change in real assets and for the change in liabilities (per spending) have opposing signs, which is to be expected as real assets increase net worth while liabilities decrease it.

Table A.44 in Appendix 11 shows that the same signs of the estimated coefficients are obtained when some control variables are added, specifically the log of the land area of the municipality and the log of the average population (2015-2015). However, the estimated co-

[23]From Table A.7 in Appendix 5, the mean change in the net worth of mayors in the sample as proportion of total spending ($networth$) is 0.054, while the mean IRA in the sample is 98.52 (in million pesos). Thus, for approximately a 1-unit change or 1-percent increase in mean ira (i.e. $\approx$ PhP1million), the change in net worth (per spending) decreases by $\frac{0.000023}{0.054} \times 100 = 0.04$ percent of the mean change in net worth (per spending).

efficients of *ira* expectedly lose statistical significance, as the IRA is largely determined by the land area and population of the municipality, which makes *ira* highly correlated with the latter.

The estimated effect of the IRA on the change in net worth per spending also appears robust to using other proxies for λ. Table A.45 shows that, with one exception, the estimated coefficient of the IRA remains statistically significant and close to the value obtained from Table 2.[24]

Finally, note from Table A.46, which presents regression results using the placebo sample of municipalities that had a different mayor in 2011 and in 2014, that the IRA appears to have no effect on the change in net worth, in real assets, and in liabilities (per spending) of these mayors.

To what extent can these results be taken as evidence that the IRA affects (decreases) the rents of the mayor? As argued earlier (and discussed extensively in Appendices 7 and 8), it is highly plausible that the growth in the mayor's assets includes accumulated rents. To further isolate the illicit from any legitimate asset growth, the regressions partial out the effect of government revenues on the mayor's (total) asset growth. Note, first of all, there seems to be no reason why revenues would *decrease* legitimate asset growth, for this would imply that an increase in revenues actually worsens economic conditions. Appendix 7 shows in detail that not only have economic conditions significantly improved in the country over the sample period, but that most mayors in the sample also experienced high (positive) net growth. Secondly, the estimated coefficient of the IRA is statistically insignificant in the placebo sample. To the extent that government revenues improve the economy, one would expect that, on average, the 2014 mayor's net worth would be larger (or at least no smaller) than the 2011 mayor's net worth, and that the difference in their net worth would be positively associated with government revenues. However, Table A.9 from Appendix 5 shows that the mean change in net worth (per spending) in the placebo sample is negative - on average, the 2014 mayors that replaced the 2011 mayors after the elections had lower net worth, while Table 2 implies that government revenues have had no effect on this difference.

[24] The variable capturing the proportion of the population who are registered voters is suspicious as there are some municipalities whose reported number of registered voters in 2010 is greater than their reported population in 2010, which is why the maximum value of this variable is greater than one. See summary statistics in Appendix 5.

Thus, that the IRA is negatively associated with the change in net worth (per spending) suggests that government revenues decrease rents. In turn, this seems to imply that there is no political resource curse but, rather, a blessing. However, this reduced-form estimation can only capture the marginal effect of the IRA on total rents, and can thus be misleading. When there are two sources of rents associated with the revenues - theft, or the direct appropriation of the revenues, and bribe payments in exchange for spending those revenues, the marginal effect of revenues on total rents could be small or negative because the marginal rents from theft and those from bribes would tend to cancel each other out. This is because revenues that are stolen are, therefore, not spent on public goods and services from which bribe payments could have been extracted. Conversely, revenues that are spent to generate bribes cannot be stolen and, thus, forego rents from theft. The (net) marginal effect of revenues on total rents would thus depend on the marginal rate of transformation between rents from theft and rents from bribery.

Concretely, suppose that, in equilibrium, fraction a of every peso of revenues is stolen. Then, a one-peso increase in revenues increases rents from theft by the amount a, and rents from bribes by $(1-a)b$, where $(1-a)$ is the additional public spending, and b captures, as it were, the bribe technology, in that it specifies how much additional bribes can be generated for an additional peso of spending. Since what is spent is therefore not stolen, then the additional public spending is equal to the foregone rents from theft. One could thus interpret $\frac{1}{|b|}$ as the marginal rate of transformation MRT_{tb} between stolen revenues and bribe payments - how much rents from theft have to be foregone in order to generate an extra rent in the form of bribes.

That it is necessary to take the absolute value of b to obtain MRT_{tb} (which is always non-negative) implies that the bribe technology is such that b can be negative. As I show formally in Desierto (2018b), b actually depends on a - for a sufficiently low value $\underline{a}$ such that additional revenues already induce a sufficiently large amount of additional public spending, there is less need to induce the politician to spend by offering bribes, and the equilibrium amount of bribes decreases. This implies that at $a \geq \underline{a}$, $b < 0$.[25]

Thus, while the marginal effect (a) of revenues on the rents from theft is non-negative, the marginal effect ($(1-a)b$) on the rents from bribes may be negative. In this case, if the

[25] See Proposition 2.2 in Desierto (2018b).

(absolute) magnitude of the latter were at least as large as that of the former, then the net marginal effect of revenues on total rents would be non-positive. This would not mean that revenues do not induce corruption, nor would it imply that there is no political resource curse. It might only be that the decrease in rents from bribe payments offset, and therefore mask, the increase in stolen revenues.

Since the regressions thus far only estimate a reduced-form equation for rents, the estimated coefficient of ira only captures the net marginal effect of revenues on total rents. That such coefficient is negative suggests that, if there is indeed corruption, the increase in theft is outweighed by the decrease in bribe payments.

Thus, in order to provide better evidence of corruption, one could decompose the net marginal effect of revenues on total rents into its marginal effect on the rents from theft and the marginal effect on the rents from bribery. The structural model in section 4 proposes how such decomposition is done. Intuitively, the marginal effect of revenues on the rents from theft is the direct effect of revenues on total rents when the "no-theft constraint" is non-binding, that is, when the politician is not constrained from stealing revenues. Meanwhile, the marginal effect of revenues on bribe-rents is the indirect effect of revenues on rents through public spending, since bribes can only be paid if the revenues are spent (whereas stolen revenues are directly appropriated).

Thus, the net marginal effect of revenues on total rents is the sum of the direct and the indirect effect, which may be negative if the latter is negative and sufficiently large in absolute value. The next subsection estimates these parameters.

6.2 Using a Structural Approach

The direct and indirect effects are estimated using the procedure presented in section 4. Table 3 presents the results using the IRA as proxy for revenues T, construction spending as proxy for $\frac{g_1}{S}$, the proportion of the population aged 15-24 as proxy for λ, *No Debt* as proxy for d, and the change in net worth, in real assets, and in liabilities (per spending) as different proxies for $\frac{R}{S}$.

First note that, as in the reduced-form regressions, the estimated total effect of the IRA on the change in net worth (per spending) is negative. However, the magnitude is larger. A drop

Table 3: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through construction spending

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	1.281	0.307	-0.32
(95% CI)	(-1.576, 4.138)	(-1.067, 1.679)	(-0.799, 0.159)
Indirect Effect	-1.902	-0.4	0.232
(95% CI)	(-6.798, 3.00)	(-1.475, 0.675)	(-0.211, 0.676)
Total Effect	-0.621	-0.094	-0.088
(95% CI)	(-5.738, 4.496)	(-1.101, 0.914)	(-0.575, 0.398)
Observations	198	198	198

This table presents the direct, indirect, and total effects of the municipality's Internal Revenue Allotment on the change in the mayor's net worth (column 1), real assets (column 2), and liabilities (column 3) per total public spending in the municipality, as derived from the structural model. The indirect and total effects vary across observations, and are here evaluated at the means. 95% confidence intervals (in parentheses) are constructed from bootstrapped standard errors. The direct, indirect, and total effects and confidence intervals are multiplied by 10,000 for readability.

Figure 2: The effect of increasing the Internal Revenue Allotment (ira) by PhP 1 million on theft, public spending, and bribe payments, simulated for a municipality with mean ira

$$1,000,000 = \begin{cases} 18,666.73 \ stolen \\ 981,333.27 \ spent \rightarrow 27,715.94 \ bribes \ foregone \end{cases}$$

$$Total \ rents \ change \ by \ (18,666.73 - 27,715.94) = -9,049.21$$

of 0.0000621 in the change in the mayor's net worth (per spending) for every 1-unit increase in the IRA implies a $\frac{0.0000621}{0.054} = 0.1$ percent decrease in the mean change in net worth (per spending) following a 1-percent increase in mean IRA. This means that for a municipality with mean total spending S, an additional PhP 1 million in revenues is expected to decrease the mayor's rents by PhP $145.72m \times 0.0000621 =$PhP $9,049.21$ - almost three times that of the size implied by the reduced-form estimates. The estimated direct and indirect effects reveal that PhP $145.72m \times 0.0001281 =$PhP $18,666.73$ of the PhP 1million are stolen, which in turn foregoes bribe payments equal to PhP $145.72m \times 0.0001902 =$PhP $27,715.94$, which could have been obtained had those stolen revenues been spent instead. Thus, on net, the (total) marginal rents generated by an additional PhP1million of revenues is PhP $18,666.73 - 27,715.94 =$PhP $-9,049.21$. (See Figure 2.)

The total effect alone may not give a clear indication of the presence of corruption in the allocation of government revenues since, after all, the estimated total effect shows a drop in the change in net worth (per spending). However, decomposing the total effect into the direct and indirect effects provides a clearer picture.

First of all, a decrease in the change in net worth following an increase in revenues already suggests that the change in net worth captures something other than a change in legitimate wealth. Changes in the IRA generate very little, if any, changes in the mayor's tax burden, since the IRA is a share in national revenues. Moreover, income tax rates have been fixed at the same level over the period. One other possibility could be that revenues are spent inefficiently such that larger revenues actually worsen economic conditions and thereby decrease (legitimate) asset growth. In this case, however, the IRA should affect the change in net worth (per spending) only indirectly through spending - there should be no direct effect. Yet Table 3 shows that the total effect is not equal to the indirect effect.

The results, in fact, cannot support the alternative interpretation that revenues affect (decrease) the legitimate wealth accumulation of mayors. If revenues somehow adversely affect economic conditions, they can only do so through (inefficiencies in) public spending, in which case the direct effect should be zero. If revenues directly decrease assets by increasing the tax burden, then the direct effect should be negative. Thus, while a negative indirect effect could indicate inefficiencies in the use of government revenues, the fact that there is also a positive direct effect suggests that such inefficiencies are not benign.

Indeed, the results appear consistent with the interpretation that the allocation of revenues generate rent-seeking, in a manner proposed by the structural model. That is, the IRA increases the marginal rents from theft - the direct effect is positive, and decreases marginal rents from bribe payments - the indirect effect is negative. Note that this pattern is obtained even when the change in real assets is used to proxy for rents. That the reverse pattern is shown for the change in liabilities also supports the interpretation, since larger (smaller) liabilities implies lower (higher) net worth. Thus, while the total effect of the IRA on the change in liabilities (per spending) is negative and would thus seem counterintuitive given that the total effect on the change in net worth (per spending) is also negative, the decomposition into the direct and indirect effects reveals a consistent explanation. One material difference, however, is that when the change in net worth and in real assets are used to proxy for rents, the (absolute) magnitude of the indirect effect is larger than the direct effect, but it is smaller when the change in liabilities is used as proxy, which explains why the total effect of the IRA on the change in liabilities (per spending) is negative instead of positive.

Further corroborating evidence can be obtained when examining the estimates of particular parameters that go into the calculation of the direct and indirect effects. Recall from the formal derivations in section 4 that the direct effect is equal to β^2_{RT} - the marginal effect of revenues on rents in jurisdictions (e.g. municipalities) in which the no-theft constraint is non-binding and, thus, in which the politician is able to engage in theft. This is estimated in our sample as $\widehat{\beta^2_{RT}}$ - the marginal effect of the IRA on the change in net worth (per spending) among municipalities that have debt, i.e. for which $No\ Debt = 0$. One can also compare this to β^1_{RT} - the marginal effect of revenues in jurisdictions in which the no-theft constraint is binding and, thus, in which the politician is compelled to spend all revenues and not steal them. This is estimated in the sample as $\widehat{\beta^1_{RT}}$ - the marginal effect of the IRA on the change in net worth among municipalities that have no debt, i.e. for which $No\ Debt = 1$. Necessary for $\widehat{\beta^2_{RT}}$ to be taken as evidence of rents from theft are that $\widehat{\beta^2_{RT}} \geq 0$ and $\widehat{\beta^1_{RT}} \leq 0$. That is, if theft is indeed occurring, then revenues cannot directly decrease the accumulated wealth of politicians who are able to steal those revenues, and cannot directly increase the accumulated wealth of politicians who cannot steal them.

The results in Tables 4 to 6 confirm this pattern. When the change in net worth is used as proxy for rents (Table 4), $\widehat{\beta^1_{RT}}$ is equal to $-6.67e(-05)$, while $\widehat{\beta^2_{RT}}$ is equal to 0.000128 (the same as the direct effect in Table 3). Table 5 shows the same pattern when the change in real assets (per spending) is used instead. Results are also consistent when using the change in liabilities (per spending) in that the signs are reversed (Table 6): $\widehat{\beta^1_{RT}} = 8.68e(-06)$, and $\widehat{\beta^2_{RT}} = -3.20e(-05)$.

As for the indirect effect, the formal derivation in section 4 shows that it is a function of the parameters that govern rent-seeking in the two kinds of jurisdictions - those in which the no-theft constraint is binding and those in which it is non-binding, and the parameters that determine the probability that the jurisdiction is one in which the constraint is binding.

The intuition is as follows. Since the indirect effect of revenues on rents is generated through public spending, it thus depends on the equilibrium amount of spending and, hence, the equilibrium amount of stolen revenues. Now the latter is determined by the action of

Table 4: Effect of municipal revenues on public spending on construction and on the mayor's accumulated net worth (by system OLS regression), in municipalities in which the no-theft constraint binds, and in municipalities in which it does not bind

	No Debt = 1		*No Debt* = 0	
	(1)	(2)	(3)	(4)
	Construction spending	Change in NET WORTH per spending	Construction spending	Change in NET WORTH per spending
Proportion of Population Aged 15-24	34.47	2.043	-207.6	-0.900
	(75.46)	(6.753)	(341.1)	(2.186)
Internal Revenue Allotment	0.166***	-6.67e-05	0.270***	0.000128
	(0.0161)	(0.00144)	(0.0284)	(0.000182)
Constant	-11.36	-0.229	34.75	0.146
	(14.63)	(1.310)	(65.80)	(0.422)
Observations	68	68	130	130
R-squared	0.624	0.001	0.419	0.004

This table presents estimates from a system OLS regression of the municipality's construction spending, and of the mayor's accumulated net worth per total public spending, on the Internal Revenue Allotment. Columns (1) and (2) use data on municipalities in which the no-theft constraint binds, as proxied by $No\ Debt = 1$, while columns (3) and (4) use data on municipalities in which the constraint does not bind ($No\ Debt = 0$). Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Effect of municipal revenues on public spending on construction and on the mayor's accumulated real assets (by system OLS regression), in municipalities in which the no-theft constraint binds, and in municipalities in which it does not bind

	No Debt = 1		*No Debt* = 0	
	(1)	(2)	(3)	(4)
	Construction spending	Change in REAL ASSETS per spending	Construction spending	Change in REAL ASSETS per spending
Proportion of Population Aged 15-24	34.47	-0.0197	-207.6	-0.350
	(75.46)	(0.442)	(341.1)	(1.221)
Internal Revenue Allotment	0.166***	-6.13e-05	0.270***	3.07e-05
	(0.0161)	(9.42e-05)	(0.0284)	(0.000102)
Constant	-11.36	0.0142	34.75	0.0566
	(14.63)	(0.0857)	(65.80)	(0.236)
Observations	68	68	130	130
R-squared	0.624	0.007	0.419	0.001

This table presents estimates from a system OLS regression of the municipality's construction spending, and of the mayor's accumulated real assets per total public spending, on the Internal Revenue Allotment. Columns (1) and (2) use data on municipalities in which the no-theft constraint binds, as proxied by $No\ Debt = 1$, while columns (3) and (4) use data on municipalities in which the constraint does not bind ($No\ Debt = 0$). Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Effect of municipal revenues on public spending on construction and on the mayor's accumulated liabilities (by system OLS regression), in municipalities in which the no-theft constraint binds, and in municipalities in which it does not bind

	No Debt = 1		*No Debt* = 0	
	(1)	(2)	(3)	(4)
	Construction spending	Change in LIABILITIES per spending	Construction spending	Change in LIABILITIES per spending
Proportion of Population Aged 15-24	34.47	0.00978	-207.6	0.129
	(75.46)	(0.222)	(341.1)	(0.368)
Internal Revenue Allotment	0.166***	8.68e-06	0.270***	-3.20e-05
	(0.0161)	(4.74e-05)	(0.0284)	(3.06e-05)
Constant	-11.36	-0.00567	34.75	-0.0113
	(14.63)	(0.0431)	(65.80)	(0.0710)
Observations	68	68	130	130
R-squared	0.624	0.001	0.419	0.008

This table presents estimates from a system OLS regression of the municipality's construction spending, and of the mayor's accumulated liabilities per total public spending, on the Internal Revenue Allotment. Columns (1) and (2) use data on municipalities in which the no-theft constraint binds, as proxied by *No Debt* = 1, while columns (3) and (4) use data on municipalities in which the constraint does not bind (*No Debt* = 0). Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

politicians who are able to steal (i.e. for which the no-theft constraint is non-binding), but this ability is, in turn, endogenous to revenues and λ (the weight that the politician attaches to social welfare). The larger the revenues, the greater the opportunity to steal, but the higher the weight attached to social welfare, the less likely the politician would want to steal. Thus, larger (smaller) revenues and a lower (higher) social-welfare weight would increase (decrease) the probability that the politician is able to steal (i.e. that the no-theft constraint is non-binding). Given the equilibrium amount of theft, the equilibrium amounts of public spending in both jurisdiction-types are determined, from which the equilibrium amount of bribes are obtained.

The results are consistent with this mechanism. From a probit regression (see Table 7) estimating the probability that the no-theft constraint is binding (i.e. $Pr(No\ Debt = 1)$), lower revenues (IRA) and higher social-welfare weight (proportion of population aged 15-24) appear to increase this probability of being in a jurisdiction in which the mayor is unable to steal revenues. Since what is not stolen is spent, these variables are thus associated with (construction) spending in the two types of jurisdictions, as reported in columns 1 and 3 of Tables 4 to 6. Finally, since bribes are earned by spending, the equilibrium effect of the IRA

Table 7: Estimating the probability (by probit regression) that the no-theft constraint binds, as proxied by *No Debt*

	No Debt
Proportion of Population Aged 15-24	4.667
	(6.013)
Internal Revenue Allotment	-0.00189**
	(0.000959)
Constant	-1.134
	(1.163)
Observations	198

This table presents estimates from a probit regression of *No Debt* on the municipality's Internal Revenue Allotment and on the proportion of its population aged 15 to 24. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

on bribe-rents - the indirect effect, is a combination of the estimated parameters determining the change in net worth (per spending) in both jurisdictions (columns 2 and 4 of Table 4), with the estimated parameters determining the probability of being in one jurisdiction-type or the other acting as weights.

From the exact formula for the indirect effect, one can deduce that the estimated indirect effects in Table 3 are negative because $\widehat{\beta^2_{R\lambda}}$ - the estimated coefficient of the proportion of the population aged 15-24 in municipalities where theft is more likely (row 1, column 4 of Table 4) is negative and sufficiently large. This suggests that the youth population limits the extent of rent-seeking in these municipalities such that even if the IRA appears to increase theft ($\widehat{\beta^2_{RT}} > 0$), the equilibrium amount of stolen revenues is sufficiently low. Recall from an earlier discussion that for sufficiently low marginal theft $\underline{a}$ (and sufficiently high marginal spending $1 - \underline{a}$), bribes decrease since since there is less need to induce politicians to spend by offering bribes. Note that the same pattern holds when using the change in real assets as proxy for rents - Table 5 shows that $\widehat{\beta^2_{R\lambda}}$ is negative. One can also get a consistent result with the change in liabilities, in which case $\widehat{\beta^2_{R\lambda}}$ is now positive (see Table 6).

The same overall result - positive direct effect and negative indirect and total effects, is consistently obtained even when using alternative proxies for λ. Table A.47 in Appendix 11 shows that with one exception, all the estimated direct, indirect, and total effects are remarkably close in values. Moreover, the estimated total effects are similar to the estimated coefficient of the IRA in the reduced-form regressions (Table A.45), including the apparently aberrant case when the proportion of the population who are registered voters is used to proxy for λ. (In the latter, both the reduced-form and structural approach of estimating the total effect appear to suggest that the IRA increases total rents. This possibility cannot be ruled out through the decomposition of the total effect, since the estimated direct effect is positive, and a positive indirect effect is allowed in the model.)

Subsetting the sample by major geographical areas, Table A.48 shows that the result is likely driven by Luzon, rather than the combined Visayas and Mindanao regions (VisMin). Note that not only is the estimated direct effect in VisMin negative, but Table A.49 shows that $|\widehat{\beta^2_{RT}}| < |\widehat{\beta^1_{RT}}|$. In contrast, Table A.50 reveals that, in Luzon, $\widehat{\beta^2_{RT}} > 0$ while $\widehat{\beta^1_{RT}} < 0$. Notice also that while in Luzon, youth population appears to decrease the change in net worth (per spending) in municipalities in which theft is more likely (- see Table A.50), it appears to increase it in VisMin (- see Table A.49), which further casts doubt on the possibility that the $\widehat{\beta^2_{RT}}$ in VisMin actually captures captures rents from theft. That a pattern of corruption would be more apparent in Luzon is to be expected since the area contains the richest municipalities and enjoys higher levels of development and economic activity. There, opportunities for rent-seeking could very well be larger.

A final piece of evidence can be obtained when estimating the direct, indirect, and total effects in the placebo sample (in which the change in net worth, in real assets, and in liabilities (per spending) are the differences in net worth, real assets, and liabilities of the 2014 and the 2011 mayor). Table A.51 shows that the signs of the estimates are inconsistent across the different supposed proxies for rents. While from Table A.52, the IRA is still seen to decrease the probability of being in a municipality in which theft is less likely, the proportion of the population aged 15-24 now appears to decrease this probability. Lastly, the estimated parameters from the two jurisdiction-types cannot support the predictions of the model. When using the change in net worth (per spending) (see Table A.53), $\widehat{\beta^1_{RT}} > 0$, but when using the change in real assets (Table A.54), $\widehat{\beta^1_{RT}} < 0$. In the latter, $\widehat{\beta^2_{RT}}$ is also negative, which would imply that the IRA directly decreases the change in net worth (per spending) in municipalities in which theft is supposed to be more likely. Finally, when the change in liabilities is used (Table A.55), $\widehat{\beta^1_{RT}}, \widehat{\beta^2_{RT}} > 0$, which is consistent with the results from Table A.54 inasmuch as liabilities decrease, while real assets increase, net worth, but is then inconsistent with a rent-seeking interpretation.

6.3 Robustness Checks

Appendix 10 performs a number of robustness checks. The results are summarized below.

Other proxies for spending $\frac{g_1}{S}$

The structural model implies that the exact same direct, indirect and total effects should be obtained when using other components of total public spending, e.g. spending on health, education, etc., since these components are actually jointly determined. (See Appendix 10 for a formal exposition.) This artifact of the model is confirmed by the data - re-estimating the structural model using each of these other components of total spending as alternative proxies for $\frac{g_1}{S}$ produces exactly the same direct, indirect, and total effects.

Inclusion of NCR

When the municipalities of the National Capital Region (NCR)/ Metro Manila are included in the sample, the reduced-form regressions reveal the same pattern - *ira* decreases the change in net worth (per spending). However, the estimated total effect (from the structural model) of *ira* is now positive. For a municipality with mean IRA, a 1-unit increase in the IRA i.e. an additional PhP 1 million, increases a mayor's rents by PhP $145.72m \times (0.0000404) =$PhP $5,887.08$. Nevertheless, the direct effect is still positive, which reveals an increase in the rents from theft, while the indirect effect is still negative, which implies a decrease in bribe payments, albeit the latter is sufficiently small in absolute value such that it is exceeded by the latter. Figure 3 illustrates the effects for a municipality with mean IRA.

Figure 3: The effect of increasing the Internal Revenue Allotment (*ira*) by PhP 1 million on theft, public spending, and bribe payments, simulated for a municipality with mean *ira*; sample includes NCR

$$1,000,000 = \begin{cases} 15,271.46 \ stolen \\ 984,728.54 \ spent \rightarrow 9,398.94 \ bribes \ foregone \end{cases}$$

$$Total \ rents \ change \ by \ (15,271.46 - 9,398.94) = 5,872.52$$

Removal of Outliers

Among the municipalities outside the NCR, the estimated effects of the IRA on the change in net worth (per spending) appears to be (qualitatively) robust to the removal of outliers. The direct effect remains positive, and the indirect effect negative. However, Figure 4 shows that when the change in networth (per spending) is restricted to values between -3 and 3, the indirect effect is smaller in absolute magnitude than the direct effect, which generates a positive total effect. Figure 5 and 6 illustrates the case when the change in real assets (per spending) is restricted between -0.5 and 0.5, and when the change in liabilities (per spending) is between -0.2 and 0.2, respectively. In both cases, the the indirect effect is sufficiently large such that the total effects are negative.

Figure 4: The effect of increasing the Internal Revenue Allotment (ira) by PhP 1 million on theft, public spending, and bribe payments, simulated for a municipality with mean ira; sample includes only municipalities whose mayor's change in net worth per spending is between -3 and 3

$$1,000,000 = \begin{cases} 18,666.73 \ stolen \\ 981,333.27 \ spent \rightarrow 15,038.30 \ bribes \ foregone \end{cases}$$

$$Total\ rents\ change\ by\ (18,666.73 - 15,038.30) = 3,628.43$$

Figure 5: The effect of increasing the Internal Revenue Allotment (ira) by PhP 1 million on theft, public spending, and bribe payments, simulated for a municipality with mean ira; sample includes only municipalities whose mayor's change in real assets per spending is between -0.5 to 0.5

$$1,000,000 = \begin{cases} 3,395.28 \ stolen \\ 996,604.72 \ spent \rightarrow 20,342.51 \ bribes \ foregone \end{cases}$$

$$Total\ rents\ change\ by\ (3,395.28 - 20,342.51) = -16,947.24$$

When the sample is further restricted to municipalities whose mayor's change in net worth (per spending) is between -0.2 and 0.2 (which removes 46 municipalities - about 20 percent of the sample), it appears that revenues actually decrease (both types of) corruption. Both the direct and indirect effects are negative, which implies that the marginal rents from theft and from bribe payments decrease. From Figure 7, an additional PhP 1 million in IRA would induce the mayor to 'return' or spend previously acquired rents equal to PhP 2,506.38, such

Figure 6: The effect of increasing the Internal Revenue Allotment (*ira*) by PhP 1 million on theft, public spending, and bribe payments, simulated for a municipality with mean *ira*; sample includes only municipalities whose mayor's change in liabilities per spending is between −0.2 to 0.2

$$1,000,000 = \begin{cases} 17,500.97\ stolen \\ 982,499.03\ spent \rightarrow 27,613.94\ bribes\ foregone \end{cases}$$

$$Total\ rents\ change\ by\ (17,500.97 - 27,613.94) = -10,112.97$$

that additional spending equals PhP $1,002,506.38$. Such spending, in turn, foregoes bribe payments equal to PhP $3,016.40$. Total rents thus decrease by PhP $2,506.38 + 3,016.40$ =PhP $5,522.78$. The finding suggests that corruption is driven by the outliers in the sample. This, however, is to be expected, since accumulated net worths close to zero are likely to capture growth in *legitimate* wealth.

Figure 7: The effect of increasing the Internal Revenue Allotment (*ira*) by PhP 1 million on theft, public spending, and bribe payments, simulated for a municipality with mean *ira*; sample includes only municipalities whose mayor's change in net worth per spending is between −0.2 to 0.2

$$1,000,000 = \begin{cases} 2,506.38\ stolen\ revenues foregone \\ 1,002,506.38\ spent \rightarrow 3,016.40\ bribes\ foregone \end{cases}$$

$$Total\ rents\ change\ by\ (-2,506.38 - 3,016.40) = -5,522.78$$

Allocated IRA

The IRA data, as compiled by the Bureau of Local Government and Finance, are the amounts that are reported to have been *received* by the municipalities. As an alternative data source, the Department of Budget and Management (DBM) computes the IRA that the national government *allocates* to each municipality, according to a fixed formula specified by law. There are some discrepancies between the reported allocated and reported received amounts - among the 231 municipalities in the sample, the mean received IRA is PhP 98.52 million, while the mean allocated IRA is PhP 98.36 million. Nevertheless, re-running the reduced-form regressions using the allocated IRA data generates almost identical estimates. The estimated direct, indirect, and total effects are also very similar (See Figure 8.)

Figure 8: The effect of increasing the Internal Revenue Allotment (ira) by PhP 1 million on theft, public spending, and bribe payments, simulated for a municipality with mean ira; sample uses data on ira that has been allocated by the DBM

$$1,000,000 = \begin{cases} 18,666.73 \ stolen \\ 981,333.27 \ spent \rightarrow 27,715.94 \ bribes \ foregone \end{cases}$$

$$Total \ rents \ change \ by \ (18,666.73 - 27,715.94) = -9,049.21$$

Note, however, that there are 92 municipalities, or about 40 percent of the sample, whose received IRA is not equal to the allocated IRA. When these municipalities are dropped from the sample, the total effect becomes positive. (See Figure 9.)

Figure 9: The effect of increasing the Internal Revenue Allotment (ira) by PhP 1 million on theft, public spending, and bribe payments, simulated for a municipality with mean ira; sample includes only municipalities whose reported ira is exactly equal to the amount allocated by the DBM

$$1,000,000 = \begin{cases} 62,470.16 \ stolen \\ 937,529.84 \ spent \rightarrow 43,337.13 \ bribes \ foregone \end{cases}$$

$$Total \ rents \ change \ by \ (62,470.16 - 43,337.13) = 19,133.03$$

Other proxies for d

Lastly, I consider two other proxies for d - the variable that indicates whether the no-theft constraint is binding. One is *city*, an indicator for city-municipalities, and another is *urban*, an indicator for urban municipalities. It is reasonable to suppose that the no-theft constraint is binding in cities and urban areas because there would be greater accountability for public funds in these places. It would be harder to disguise theft since public projects are more visible and vulnerable to scrutiny in dense areas.[26] Using either of these proxies generates a positive total effect of the IRA on the change in net worth (per spending), with the direct effect still positive, and the indirect effect still negative. Figures 10 and 11 reveal that the direct and total effects are much larger than when $No \ Debt$ is used as proxy for d (recall Figure 2), which suggests that the latter is a more conservative proxy for measuring any increase in theft and

[26]Technically, however, these proxies do not/cannot be caused by revenues and λ, although they may be correlated with them. For this reason, $No \ Debt$ is still the most conceptually suitable proxy.

total corruption.

Figure 10: The effect of increasing the Internal Revenue Allotment (*ira*) by PhP 1 million on theft, public spending, and bribe payments, simulated for a municipality with mean *ira*; sample uses data on *city* as proxy for whether or not the no-theft constraint binds

$$1,000,000 = \begin{cases} 100,182.50 \ stolen \\ 899,817.50 \ spent \rightarrow 7,796.02 \ bribes \ foregone \end{cases}$$

$$Total \ rents \ change \ by \ (100,182.50 - 7,796.02) = 92,386.48$$

Figure 11: The effect of increasing the Internal Revenue Allotment (*ira*) by PhP 1 million on theft, public spending, and bribe payments, simulated for a municipality with mean *ira*; sample uses data on *urban* as proxy for whether or not the no-theft constraint binds

$$1,000,000 = \begin{cases} 312,409.11 \ stolen \\ 687,590.89 \ spent \rightarrow 29,566.59 \ bribes \ foregone \end{cases}$$

$$Total \ rents \ change \ by \ (312,409.11 - 29,566.59) = 282,842.52$$

7 Conclusions

In this paper, I have proposed a structural approach to measuring corruption in the provision of public goods. A rent-seeking public official who has discretion over the allocation of revenues can either steal, or directly appropriate, the revenues, or indirectly earn rents by spending the revenues on public goods in exchange for bribe payments. Thus, an increase in government revenues induces a direct and indirect effect on the public official's total rents (through spending). Since what is stolen is therefore not spent, an increase in stolen revenues, i.e. a positive direct effect, may be offset by a decrease in bribe payments, i.e. a negative indirect effect, in which case the net marginal effect of revenues on total rents may be close to zero.

Thus, a reduced-form approach to estimating the marginal effect of revenues on (total) rents can fail to detect a change in corruption - a zero effect would imply that revenues are not a source of rents, while a negative effect would suggest that increasing revenues would actually decrease corruption. In contrast, decomposing the effect into a direct and an indirect can reveal an increase in stolen revenues and/or bribe payments, even though total rents do not change or even decrease.

One might contend that only the change in total rents should matter, and that the source of such rents - whether theft and/or bribery is therefore irrelevant. I offer three arguments to rebut this claim. One is that anti-corruption efforts may be more effective when it can target the exact nature of the corrupt act. In the Philippines, for example, a public official who engages in the theft of government revenues may be charged with crimes of graft and malversation of public funds, in which case, the documentation of irregular transactions, e.g. audits, may be taken as sufficient evidence. On the other hand, bribery charges require stronger evidence since the receipt of rents alone does not establish that bribery has taken place - to prove that there was a quid pro quo arrangement, it also has to be shown that the rents were obtained *in exchange for* a specific favor.

Another reason is that the type of corruption that occurs has important implications on social welfare. While theft involves a dollar-for-dollar transfer of revenues from tax payers to the public official, bribes are paid in exchange for public goods whose marginal social benefit may be large. Thus, even when additional revenues decrease total rents, net social welfare may decrease if the foregone marginal bribe payments are sufficiently large, since the latter also implies a significant loss of marginal social benefit from the additional public goods that could have been provided had the public official taken the extra bribes instead.[27]

Lastly, the foregoing also has political implications. If bribes are associated with some positive social benefit, citizens might be willing to condone incidents of bribery. Indeed, recent papers suggest that in selecting political leaders, voters in developing countries knowingly make a tradeoff between corruption and competence. (See, e.g. Rosas and Manzetti (2015), Winters and Weitz-Shapiro (2013), Choi and Woo (2013), Zechmeister and Zizumbo-Colunga (2013). Winters and Weitz-Shapiro sum up this idea of a tradeoff using the Portuguese "rouba, mas faz" - "He robs, but he gets things done"). In contrast, the theft of government revenues presents no such tradeoff, precisely because stolen public funds cannot therefore be spent on public goods and services. Thus, voters might be less willing to tolerate the rent-seeking

[27] It is not always the case, however, that foregoing bribe payments lowers net social welfare. For a more nuanced analysis, see Desierto (2018b).

behavior of an official who steals public funds, and are thus less likely to select such official, than one who obtains rents from bribe payments alone.

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Online Appendices (For Web Publication Only)

1 Proofs

A Proof of Proposition 3.1

In equilibrium, constraint (a) binds with equality, which implies that (i) $b = \left(\frac{1}{1-\lambda}\right)\left[\overline{U} - \lambda[V(g_1) + V(T-g_1)]\right]$. Substituting (i) into the maximand and letting $g_2 = T - g_1$ (i.e. the no-theft constraint is binding), the problem can then be expressed as (ii) $\max_{g_1} V(g_1) - \left(\frac{1}{1-\lambda}\right)\left[\overline{U} - \lambda[V(g_1) + V(T-g_1)]\right]$, whose first-order condition (FOC) for optimal g_1^* is $V'(g_1^*) = \lambda V'(T - g_1^*)$, which is implicit in λ and T. Thus, since g_1^* exists - the second-order condition SOC for a maximum, $V"(g_1^*) + \lambda V"(T - g_1^*)$, is met, then there is a function, f_1, such that $g_1^* = f_1(\lambda, T)$. Since the no-theft constraint is binding, $g_2^* = T - g_1^* = T - f_1(\lambda, T)$. Meanwhile, $R^* = T - g_1^* - g_2^* + b^* = b^*$ since there is no theft. To get the expression for b^*, note that $\overline{U}$ is the agent's utility if she rejects the bribe. In this case, the agent would choose g_1^0 to maximize $\lambda[V(g_1) + V(T - g_1)]$. The FOC is $V'(g_1^0) = V'(T - g_1^0)$, which implies $g_1^0 = (T - g_1^0) = \frac{T}{2}$. Thus, $\overline{U} = \lambda[V(\frac{T}{2}) + V(\frac{T}{2})] = 2\lambda V(\frac{T}{2})$. Plugging this into (i) gives $b^* = \frac{\lambda}{1-\lambda}\left[2V(\frac{T}{2}) - V(g_1^*) - V(T - g_1^*)\right]$, which is a function, f_2, of λ, T, g_1^*.

Now, for the case when the no-theft constraint is non-binding, substitute g_2 for $T - g_1$ in problem (ii) and add the constraint $g_1 + g_2 \leq 0$. Thus, the necessary conditions for optimal g_1^*, g_2^* (and Lagrange multiplier γ^*) are the following Kuhn-Tucker conditions:

$$V'(g_1^*) + \frac{\lambda}{1-\lambda} V'(g_1^*) - 1 - \gamma^* = 0 \tag{16}$$

$$\frac{\lambda}{1-\lambda} V'(g_2^*) - 1 - \gamma^* = 0 \tag{17}$$

$$\gamma^*(g_1^* + g^* - T) = 0. \tag{18}$$

With theft, (22) implies that $\gamma^* = 0$. Equations (20) and (21) then imply that g_1^* and g_2^* are functions of λ. They are not, however, affected by T (despite equation (22)). To see this, I show below that the derivatives $\frac{dg_1^*}{\partial T}$ and $\frac{dg_1^*}{\partial T}$ are equal to zero.

Applying Cramer's rule, $\frac{dg_1^*}{dT} = -\frac{1}{\det A} \det \begin{pmatrix} V'(g_1^*)\frac{dg_1^*}{dT}\frac{1}{1-\lambda} - \frac{d\gamma^*}{dT} & 0 & -1 \\ V'(g_2^*)\frac{dg_2^*}{dT}\frac{1}{1-\lambda} - \frac{d\gamma^*}{dT} & \frac{\lambda}{1-\lambda}V''(g_2^*) & -1 \\ (g_1^* + g_2^* - T)\frac{d\gamma^*}{dT} - \gamma^* & \gamma^* & g_1^* + g_2^* - T \end{pmatrix}$. Imposing $\gamma^* = 0$ and $\frac{d\gamma^*}{dT} = 0$ gives $\frac{dg_1^*}{dT} = -\frac{1}{\det A}[(g_1^*+g_2^*-T)V'(g_1^*)\frac{dg_1^*}{dT}\frac{1}{1-\lambda}V''(g_2^*)]$ or, simplifying, $\frac{dg_1^*}{dT} = 0$. Analogously, $\frac{dg_2^*}{dT} = -\frac{1}{\det A} \det \begin{pmatrix} V''(g_1^*)\frac{1}{1-\lambda} & V'(g_1^*)\frac{dg_1^*}{dT}\frac{1}{1-\lambda} - \frac{d\gamma^*}{dT} & -1 \\ 0 & V'(g_2^*)\frac{dg_2^*}{dT}\frac{1}{1-\lambda} - \frac{d\gamma^*}{dT} & -1 \\ \gamma^* & (g_1^* + g_2^* - T)\frac{d\gamma^*}{dT} - \gamma^* & g_1^* + g_2^* - T \end{pmatrix}$. Imposing $\gamma^* = 0$ and $\frac{d\gamma^*}{dT} = 0$ gives $\frac{dg_2^*}{dT} = -\frac{1}{\det A}[(g_1^* + g_2^* - T)V'(g_2^*)\frac{dg_2^*}{dT}\frac{1}{1-\lambda}V''(g_1^*)]$ or, simplifying, $\frac{dg_2^*}{dT} = 0$.

Thus, $g_1^* = f_3(\lambda)$ and $g_2^* = f_4(\lambda)$. Now, $R^* = T - g_1^* - g_2^* + b^*$. To get the expression for b^*, note that if the agent rejects the bribe, she obtains $\overline{U} = \lambda[V(g_1^0)+V(g_2^0)]+(1-\lambda)(T-g_1^0-g_2^0)$. Plugging this into (i), adding $T - g_1^* - g_2^*$, and simplifying give $R^* = \frac{\lambda}{1-\lambda}[2V(g_1^0) - V(g_1^*) - V(g_2^*)] - 2g_1^0 + T$, which is a function of λ, T, g_1^*, g_2^*, and g_1^0. To show that $g_1^0 = f_6(\lambda)$, I show that $g_1^0 \neq g_1^*$ and $g_1^0 \neq g_2^*$, and that g_1^0 is a function only of λ (and not of T). To proceed, note that when the agent rejects the bribe, she instead chooses g_1^0, g_2^0 from solving $\max_{g_1,g_2} \lambda[V(g_1) + V(g_2)]] + (1 - \lambda)(T - g_1 - g_2)$ subject to $g_1 + g_2 - T \leq 0$. The necessary conditions are

$$\lambda V'(g_1^0) - (1 - \lambda) - \gamma^0 = 0 \tag{19}$$

$$\lambda V'(g_2^0) - (1 - \lambda) - \gamma^0 = 0 \tag{20}$$

$$\gamma^0(g_1^0 + g_2^0 - T) = 0 \tag{21}$$

Note that (23) and (24) are different from (20) and (21), and imply that $g_1^0 \neq g_1^*$ and $g_1^0 \neq g_2^*$ (and $g_1^0 = g_2^0$). However, (23) and (24) still imply that g_1^0 is a function of λ. Now, g_1^0 is unaffected by T (despite (25)). To see this, note that $\frac{dg_1^0}{dT} = -\frac{1}{\det B} \det \begin{pmatrix} \lambda V''(g_1^0)\frac{dg_1^0}{dT} & 0 & -1 \\ \lambda V''(g_2^0)\frac{dg_2^0}{dT} & \lambda V''(g_2^*) & -1 \\ 0 & 0 & g_1^0 + g_2^0 - T \end{pmatrix}$. Now with theft, $g_1^0 + g_2^0 < T$, which by equation (25) implies $\gamma^0 = 0$ and, hence, $\frac{d\gamma^0}{dT}$. Imposing $\gamma^0 = 0$ and $\frac{d\gamma^0}{dT} = 0$ gives $\frac{dg_1^0}{dT} = -\frac{1}{\det B}[(g_1^0 + g_2^0 - T)\lambda V''(g_1^0)\frac{dg_1^0}{dT}\lambda V''(g_2^0)$ or, simplifying, $\frac{dg_1^0}{dT} = 0$. Thus, $g_1^0 = f_6(\lambda)$ and $R^* = f_5(\lambda, T, g_1^*, g_2^*, f_6(\lambda))$.

B Proof of Proposition 3.2

Lemma 1 (below) establishes the existence of $\overline{T}$. One can then express $\overline{T} = \overline{g}_1 + \overline{g}_2$, where $\overline{g}_1 = \arg\max_{g_1} V(g_1) - (\frac{1}{1-\lambda})[\overline{U} - \lambda[V(g_1) + V(\overline{T} - g_1)]]$, and $\overline{g}_2 = \overline{T} - \overline{g}_1$. That is, at $\overline{T}$, the no-theft constraint is binding, which implies that it also binds for $T < \overline{T}$. Thus, when $T \leq \overline{T}$, then d=1, while $d = 0$ when $T > \overline{T}$. Thus, $\Pr(d = 1) = Pr(\overline{T} - T \geq 0)$, which is a function of T, and also of λ, since $\overline{g}_1$ and, hence, $\overline{T}$, is a function of λ.

C Lemma 1

There is a threshold (i.e. minimum) level of revenues $\overline{T} > 0$ that cannot be stolen.

The proof entails showing that even if theft is possible, not all revenues are stolen. That is, in an equilibrium in which the no-theft constraint is non-binding, some public spending are still allocated such that $g_1^*, g_2^* > 0$.

To see this, apply the implicit function theorem to the Kuhn-Tucker conditions (20), (21), (22). Then, necessary for g_1^*, g_2^*, γ^* to exist is that the inverse of

$$A = \begin{pmatrix} V''(g_1^*) & \frac{\lambda}{1-\lambda}V''(g_2^*) & -1 \\ 0 & \frac{\lambda}{1-\lambda}V''(g_2^*) & -1 \\ \gamma & \gamma & g_1^* + g_2^* - T \end{pmatrix} \tag{22}$$

exists or, equivalently, that the determinant of A is non-zero. Note that $\det A = V''(g_1^*)[\frac{\lambda}{1-\lambda}V''(g_1^*)(g_1^* + g_2^* - T) + \gamma^*]$. With theft, $g_1^* + g_2^* - T < 0$, which implies (from equation (22)) that $\gamma^* = 0$. Imposing $\gamma^* = 0$, $\det A = V''(g_1^*)[\frac{\lambda}{1-\lambda}V''(g_2^*)(g_1^* + g_2^* - T)]$, which is less than zero, unless $g_1^* = 0$ or $g_2^* = 0$ in which case $\det A = 0$. Thus, if sufficiency conditions are met such that g_1^*, g_2^*, γ^* exist, it must be that when theft occurs such that $\gamma^* = 0$, some revenues are still allocated to both principals, i.e. $g_1^*, g_2^* > 0$.

D Proof of Proposition 4.1

With total rents of the agent in jurisdiction i equal to stolen revenues and bribe payments received, one can write $\frac{R}{S}_i = (\frac{T-S}{S})_i + \frac{B}{S}_i$, where the first term is the amount of stolen revenues (per spending), while the second term is the amount of bribes (per spending). Then, $\frac{dE[(\frac{R}{S}_i)|\mathbf{x}_i]}{dT_i} = \frac{dE[\frac{T-S}{S})_i|\mathbf{x}_i]}{dT_i} + \frac{dE[\frac{B}{S}_i)|\mathbf{x}_i]}{dT_i}$. Now recall that (i) $\frac{d\frac{R}{S}}{dT} = \frac{\partial h_3()}{\partial T} + \frac{\partial h_3()}{\partial g_1}\frac{\partial g_1}{\partial T}$ if $d = 1$ and (ii) $\frac{d\frac{R}{S}}{dT} = \frac{\partial h_4()}{\partial T} + \frac{\partial h_4()}{\partial g_1}\frac{\partial g_1}{\partial T} = \frac{\partial h_4()}{\partial T}$ if $d = 0$, which imply that the change in bribes depend on g_1, while the change in stolen revenues does not. Thus, the first term in (15) captures $\frac{dE[\frac{B}{S}_i)|\mathbf{x}_i]}{dT_i}$, while the second term captures $\frac{dE[\frac{T-S}{S})_i|\mathbf{x}_i]}{dT_i}$. Since (13) can be expressed as (15), the first term in (15) and, hence, $\frac{dE[\frac{B}{S}_i)|\mathbf{x}_i]}{dT_i}$, is the indirect effect, while the second term and, hence, $\frac{dE[\frac{T-S}{S})_i|\mathbf{x}_i]}{dT_i}$, is the direct effect.

2 Standard Errors

The standard error of the average indirect effect $S^{-1}\sum \hat{I}_i$ is obtained using the delta method. That is, $V\hat{ar}f(\hat{\theta}) \approx E(\hat{\theta}-\theta)^T f'(\hat{\theta})f'(\hat{\theta})^T(\hat{\theta}-\theta)$, where:

$$\hat{\theta}^T = [\hat{\theta}_1 \quad \hat{\theta}_2 \quad \hat{\theta}_3 \quad \hat{\theta}_4 \quad \hat{\theta}_5] \qquad = [\hat{\Phi}(\mathbf{x}_i\hat{\alpha}) \quad \hat{\phi}(\mathbf{x}_i\hat{\alpha})\hat{\alpha_T} \quad (\hat{\beta}^1_{RT}-\hat{\beta}^2_{RT}) \quad (\hat{\beta}^1_{R0}-\hat{\beta}^2_{R0}) \quad (\hat{\beta}^1_{R\lambda}-\hat{\beta}^2_{R\lambda})];$$

$$f(\hat{\theta}) = S^{-1}\sum \hat{I}_i \qquad = S^{-1}\big[(\hat{\Phi}(\mathbf{x}_i\hat{\alpha})+\hat{\phi}(\mathbf{x}_i\hat{\alpha})\alpha_T T_i))(\hat{\beta}^1_{RT}-\hat{\beta}^2_{RT}) + \hat{\phi}(\mathbf{x}_i\hat{\alpha})\hat{\alpha_T}[(\hat{\beta}^1_{R0}-\hat{\beta}^2_{R0}) + (\hat{\beta}^1_{R\lambda}-\hat{\beta}^2_{R\lambda})\lambda_i]\big];$$

$$f'(\hat{\theta})f'(\hat{\theta})^T = \begin{bmatrix} a_1^2 & a_1a_2 & a_1a_3 & a_1a_4 & a_1a_5 \\ a_2a_1 & a_2^2 & a_2a_3 & a_2a_4 & a_2a_5 \\ a_3a_1 & a_3a_2 & a_3^2 & a_3a_4 & a_3a_5 \\ a_4a_1 & a_4a_2 & a_4a_3 & a_4^2 & a_4a_5 \\ a_5a_1 & a_5a_2 & a_5a_3 & a_5a_4 & a_5^2 \end{bmatrix};$$

$$a_1 = (\hat{\beta}^1_{RT} - \hat{\beta}^2_{RT}); \quad a_2 = (\hat{\beta}^1_{R0} - \hat{\beta}^2_{R0}) + (\hat{\beta}^1_{R\lambda} - \hat{\beta}^2_{R\lambda})\overline{\lambda} + (\hat{\beta}^1_{RT} - \hat{\beta}^2_{RT})\overline{T}, \quad \overline{\lambda} = S^{-1}\sum \lambda_i, \quad \overline{T} = S^{-1}\sum T_i;$$

$$a_3 = S^{-1}\sum \hat{\Phi}(\mathbf{x}_i\hat{\alpha}) + S^{-1}\sum \hat{\phi}(\mathbf{x}_i\hat{\alpha})\hat{\alpha}_T T_i; \quad a_4 = S^{-1}\sum \hat{\phi}(\mathbf{x}_i\hat{\alpha}); \quad a_5 = S^{-1}\sum \hat{\phi}(\mathbf{x}_i\hat{\alpha})\hat{\alpha}_T \lambda_i.$$

Thus:

$$\begin{aligned} \hat{Var}(S^{-1}\sum \hat{I}_i) \approx \hat{\sigma}_1^2 a_1^2 + 2\hat{\sigma}_{12}a_1a_2 + 2\hat{\sigma}_{13}a_1a_3 + 2\hat{\sigma}_{14}a_1a_4 + 2\hat{\sigma}_{15}a_1a_5 \\ + \hat{\sigma}_2^2 a_2^2 + 2\hat{\sigma}_{23}a_2a_3 + 2\hat{\sigma}_{24}a_2a_4 + 2\hat{\sigma}_{25}a_2a_5 \\ + \hat{\sigma}_3^2 a_3^2 + 2\hat{\sigma}_{34}a_3a_4 + 2\hat{\sigma}_{35}a_3a_5 \\ + \hat{\sigma}_4^2 a_4^2 + 2\hat{\sigma}_{45}a_4a_5 \\ + \hat{\sigma}_5^2 a_5^2, \end{aligned}$$

where $\hat{\sigma}_1^2, \hat{\sigma}_2^2, ...\hat{\sigma}_5^2$ respectively denote $\hat{Var}(\hat{\theta}_1), \hat{Var}(\hat{\theta}_2), ...\hat{Var}(\hat{\theta}_5)$, while $\hat{\sigma}_{12}, \hat{\sigma}_{13}, ...\hat{\sigma}_{45}$ respectively denote $\hat{Cov}(\hat{\theta}_1\hat{\theta}_2), \hat{Cov}(\hat{\theta}_1\hat{\theta}_3), ...\hat{Cov}(\hat{\theta}_4\hat{\theta}_5)$, and the standard error of the estimated average indirect effect is simply $\sqrt{\hat{Var}(S^{-1}\sum \hat{I}_i)}$. The standard error of the estimated average total effect $S^{-1}\sum \hat{W}_i = \hat{D} + S^{-1}\sum \hat{I}_i$ is $\sqrt{\hat{Var}(S^{-1}\sum \hat{W}_i)} = \sqrt{\hat{Var}(\hat{D}) + \hat{Var}(S^{-1}\sum \hat{I}_i) + 2\hat{Cov}(\hat{D}, S^{-1}1\sum \hat{I}_i)}$.

3 The Sample

Recall that out of 1,620 municipalities for which fiscal data are available, 606 municipalities comprise the 'treatment' group, where the (binary) treatment is the possibility of accumulating wealth between 2011 and 2014 or, equivalently, of having the mayor re-elected in 2013, or of *not* experiencing a turnover. (Given that the possibility exists, one could then estimate the continuous effect of government revenues on the mayor's accumulated wealth, using the structural model I propose.) The remaining 1,014 'untreated' municipalities can then be used to construct a placebo sample. These municipalities were not 'treated' in the sense that there is no wealth accumulation possible. The assets declared in 2011 are different from those declared in 2014 since they are from different mayors. One could compute the difference in the value of these assets, but this would not capture wealth accumulation.

Thus, by estimating the structural model using the 606 municipalities, one would actually draw inference about re-elected mayors, and be able to check the validity of the results by comparing them with the results from estimating the model using the placebo sample.

The problem is that I do not have complete SALN data for all the 606 municipalities, because not all of their mayors submitted in 2011 and 2014. Thus, I only have a selected sample based on whether or not the municipality fully complied with the SALN requirements, i.e. submitted in both years. Only 231 out of the 606 municipalities complied fully - this implies an attrition rate of about 62%. The placebo sample is similarly constructed. Out of the 1,014 untreated municipalities, only 166 had both their 2011 and 2014 mayors submit the SALN and, thus, for which the difference between 2014 and 2011 assets can be computed. Attrition among the untreated municipalities is thus higher at 84%. Included in those that attrited from the main sample and the placebo sample are the 17 municipalities/cities from the National Capital Region (NCR) in Luzon - more commonly known as Metro Manila, thirteen of which did not experience a turnover in 2013. While it appears that fifteen of these municipalities had their mayor submit the SALN in both 2011 and 2014 and could thus have been included either in the main sample or the placebo sample, I have decided to exclude the entire NCR since it is a clear outlier.[28] Metro Manila is the most densely populated, urbanized, and developed region in the country. Local administration in this region is also different - the municipalities/cities are not aggregated into provinces, but are divided into districts for statistical purposes. (These districts have no elected officials, nor receive the IRA). Lastly, the SALNs of the mayors in Metro Manila are kept by the central office of the Ombudsman, and not the Office of the Deputy Ombudsman for Luzon, which introduces extra variation in the efficiency by which SALN records are stored and reproduced. As it is, there is already some variation in the location of SALN repositories - when I requested the central office for copies of the SALNs, such copies have had to be couriered from the respective deputy offices in Luzon, Visayas, and Mindanao. Thus, it is not suprising to see (in Tables A.1 and A.2) large differences in the submission rates between the Luzon, Visayas, and Mindanao areas.

A crucial issue is whether selection into the sample could be systematically related to the

[28] In Appendix 10, I verify the robustness of results by re-estimating the model using a sample that includes the NCR.

Table A.1: Patterns of SALN submission among 'treated' municipalities (i.e. no turnover in 2013)

	Luzon	Visayas	Mindanao	Total
a. Submitted at least once	130	94	8	232
submitted in 2011	130	94	8	232
submitted in 2014	130	93	8	231
b. Submitted twice	130	93	8	231
c. No submission	96	42	236	374
d. Number of municipalities (a+c)	226	136	244	606

Table A.2: Patterns of SALN submission among 'untreated' municipalities (i.e. turnover in 2013)

	Luzon	Visayas	Mindanao	Total
a. Submitted at least once	482	276	30	788
submitted in 2011	408	193	20	621
submitted in 2014	74	83	10	167
b. Submitted twice	73	83	10	166
c. No submission	58	32	136	226
d. Number of municipalities (a+c)	540	308	166	1,014

binary treatment of experiencing no turnover, which might bias the results. To try to rule this out, I demonstrate that untreated municipalities would have also selected into the sample at the same rate, had they been treated. One could then make a plausible, albeit not definitive, argument that the treatment is unrelated to selection or to full compliance with the SALN requirement.[29]

Now, the rate of full compliance among the treated is $\frac{232}{606} * \frac{231}{232} = 38\%$. (As shown in Table A.1, there are 606 municipalities that did not experience a turnover and were thus treated; among these, 232 submitted a SALN at least once - 232 in 2011 and 231 in 2014, and among these 232 municipalities, 231 submitted twice. Thus, the probability of submitting the SALN once is $\frac{232}{606}$; and the probability of submitting a second time is $\frac{231}{232}$, and their joint probability is the rate of full compliance.)

From Table A.2, there are 788 untreated municipalities whose 2011 and/or 2014 mayor submitted her SALN. To demonstrate that untreated municipalities, had they been treated,

[29]What is ultimately of interest is the continuous treatment of revenues (although necessary for this is receipt of the binary treatment of not experiencing a turnover). Thus, in Appendix 4, I show that selection either into the main or the placebo sample is unrelated to revenues by demonstrating that in both these samples, submitting the SALN twice is not significantly associated with the municipality's *ira*.

would have been selected into the (main) sample at the same rate that a treated municipality is selected, one would need to show how a mayor in these 788 municipalities would behave, that is, whether she would submit the SALN and, conditional on having submitted, whether she would submit a second time if she were re-elected. Now, there are actually two types of mayors in these municipalities - a 2011 mayor, and a 2014 mayor. (Although an untreated municipality can have two SALN submissions, i.e. one from its 2011, and another from its 2014, mayor, a particular mayor in an untreated municipality can only submit once). The rate of one/first-time submission of the 2011-mayor type is $\frac{621}{1{,}014} = 61\%$. Assuming this type of mayor would submit a second time at the same rate as a mayor in a treated municipality would, i.e. at $\frac{231}{232} = 99.6\%$, then the rate of full compliance of this type of mayor would be the joint probability $61 * 99.6\% = 60.76\%$.[30] Analogously, the rate of one/first-time submission for a 2014 mayor is $\frac{167}{1{,}014} = 16.5\%$ - with a 99.6% resubmission rate, their rate of full compliance would be $16.5 * 99.6\% = 16.43\%$. Taking the simple average gives the hypothetical rate of full compliance of untreated municipalities: $\frac{60.76+16.43}{2} = 38.6\%$, which is very close to the 38% compliance rate of the treated municipalities.

In taking the simple, rather than some weighted, average, one implicitly assumes that the 2011 and 2014 mayors in the untreated municipalities are the same in all others respects (except in their one/first-time SALN submission rate). Thus, it is as though there are only 1,014 mayors among the untreated municipalities between 2011 and 2014, although in fact there are $1,014 * 2 = 2,028$. Viewing the 2011 and 2014 mayors of a municipality as though they were only one mayor arguably makes the untreated municipalities more comparable to the treated municipalities, since the latter have only one mayor each.

As for the difference in the one/first-time submission rates between the 2011 and 2014 mayors in untreated municipalities, the relatively higher rate for the 2011 mayors is suggestive of lags or delays in the submission. That is, the 2011 mayors may simply have had more time to turn in their SALN than the 2014 mayors who have just started their first year of office. This could explain why mayors in the treated municipalities have a high rate (99%) of second-time submission - by 2014, they already have an existing SALN which they could easily

[30] In fact, Table A.2 implies that conditional on having submitted in 2014, an untreated *municipality* would have almost certainly submitted in 2011, i.e. at the rate $\frac{166}{167} = 99.4\%$. This, however, does not pertain to the mayor's behavior - the 167 mayors that submitted in 2014 could not have been the same 166 mayors that submitted in 2011.

modify or re-submit as is. The issue remains, however, as to why the 2011 submission rate is lower for the treated than the untreated municipalities, i.e. $\frac{232}{606} = 38.28\%$ vs. $\frac{621}{1{,}014} = 61\%$.

First note that this difference is largely driven by Mindanao and, to a smaller extent, by Luzon. Tables A.1 and A.2 imply that in Visayas, the 2011 submission rates in the treated and the untreated municipalities are similar at $\frac{93}{136} = 68\%$ and $\frac{193}{308} = 63\%$, respectively. The largest difference in the 2011 submission rates between treated and untreated municipalities appears to have come from Mindanao. Among the untreated, the rate is $\frac{20}{166} = 12\%$, while among the treated, it is $\frac{8}{244} = 0.03\%$, which implies a difference of $\frac{12-0.03}{0.03} = 399\%$. Meanwhile, the difference in Luzon is only 31%, that is, $\frac{408}{540} = 76\%$ among the untreated vs. $\frac{130}{226} = 58\%$ among the treated. Also, recall that the Luzon municipalities excludes the 17 from Metro Manila, most of which would have been considered treated. Including them would have raised the 2011 submission rate of treated municipalities in Luzon to about 60%, which would be closer to the rate among the untreated.[31]

Two facts about Mindanao are noteworthy. One is that it is the poorest and least developed area in the country, burdened by ongoing insurgency and armed conflict with Muslim separatist groups. The other is that local politics is far less competitive - note that $\frac{244}{244+166} = 60\%$ of municipalities in Mindanao experienced no turnover in 2013, compared to $\frac{226}{226+540} = 35\%$ and $\frac{136}{136+308} = 31\%$ in Luzon and Visayas, respectively.[32] One could envisage that both of these factors contribute to low SALN submission rates, as administrative capacity may be lower, and record-keeping less reliable, in Mindanao. Note, then, that compared to Luzon and Visayas, the rates of submission in 2011, and in 2014, and of submitting twice, are all lower (while the rate of non-submission is higher), whether among the treated or the untreated municipalities. That the difference in 2011 submission rates between Mindanao and Luzon-Visayas is more pronounced among the treated municipalities further makes plausible that administrative capacity and record-keeping may be more lax when there is weak political competition such that there is no turnover, and even more so in less developed areas (i.e. Mindanao).

[31] Thirteen of the seventeen Metro Manila mayors were reelected, and for all of them the 2011 SALN are available. This implies that the 2011 submission rate among the treated in Luzon would have been $\frac{130+13}{226+13} = 60\%$. Four were not reelected, all of whom provided 2011 SALNs. This implies that the Luzon 2011 submission rate among the untreated would have been $\frac{408+4}{540+4} = 76\%$. This gives a difference of 27%.

[32] Elections in Mindanao are also fraught with allegations of fraud and incidence of violence. See, e.g. http://newsinfo.inquirer.net/792073/violence-vote-buying-still-rampant-in-ph-polls-us-ngo.

Ultimately, however, what determines selection into the (main) sample is whether or not the mayors in treated municipalities submitted the SALN in both years. Similarly, the placebo sample consists of untreated municipalities whose 2011 mayor and 2014 mayor both submitted. Recall that the rate of inclusion into the placebo sample ($\frac{166}{1{,}014} = 16\%$) is actually much lower than the rate of selection into the main sample ($\frac{231}{606} = 38\%$). One possibility is that while lower political competition (that enables re-election in the municipality) could be associated with lower administrative and record-keeping capacities, the mayors themselves, once re-elected, might be more efficient and conscientious in submitting the SALN (on time). This might explain why, conditional on having submitted in 2011, a re-elected mayor almost certainly submits again in 2014 (i.e. at rate 99.6%), whereas a mayor that is elected for the first time in 2013 is far less likely to have submitted a SALN in 2014 (i.e. at rate 16.5%). If the latter were re-elected in the next election (2016), it could very well be that she will submit again (i.e. at rate 99.6%). This, then, provides an alternative justification for the earlier calculation that 38.6% of untreated municipalities would have been selected into the sample had they not experienced a turnover.

The foregoing analysis suggests that the selection of a municipality into the sample is exogenous to the mayor's rent-seeking behavior. That a mayor has on (retrievable) record a 2011 and a 2014 SALN might more plausibly have to do with the ability of the mayor's office to ensure that, each year, the mayor receives the SALN form, fills it in, and is sent to the appropriate (deputy) Ombudsman's office on time, as well as the ability of the latter to maintain SALN records and provide complete copies to whoever might request them. Given that the penalties for failure to submit the SALN are non-trivial, it would be rational for a mayor to submit the SALN at least once, or at random years, during her term/s of office. (Recall that the SALN is required for every year in office.) For a rent-seeking mayor to deliberately fail to submit in the *specific* years 2011 and 2014 in order to conceal accumulated rents implies that she anticipates that someone would take copies of her 2011 and 2014 SALNs and be able to infer that the difference in the value of the assets reported therein is too high to be legitimate. To my best knowledge, the Office of the Ombudsman does not routinely make this kind of calculation. In fact, newspapers and journalists periodically publish the net worth of public officials, especially during elections, but no one has been prosecuted for having reported too large a net worth. On the contrary, what usually invites further scrutiny are allegations of unreported assets or failure to submit the SALN.

Note, then, that the claim that the particular sample used in this paper is random does not ignore the possibility that rent-seeking mayors are wary of faithfully submitting the SALNs, lest they reveal ill-gotten wealth. It could very well be that they deliberately fail to submit in some years and/or omit to report some assets in the SALN.[33] Rather, the argument is that given the costs of violating SALN requirements, even a rent-seeking mayor would want to submit an accurate SALN at least once. That she would deliberately exclude the specific years 2011 and 2014 is what is untenable, which makes the particular sample random.

4 Descriptive Statistics

Appendix 5 presents summary statistics of the proxy variables in multiple tables. The first table, Table A.5, uses all 1,620 municipalities. Table A.6 uses only the 606 municipalities that were 'treated' with re-election or no turnover - the intended sample, while Table A.7 uses the 231 municipalities from this subset whose mayor submitted the SALN in 2011 and 2014 - the selected sample. Table A.8 uses the 1,014 'untreated' municipalities that had a turnover and thus had two mayors in the sample period, while Table A.9 uses the 166 municipalities from this subset whose two mayors each submitted a SALN - the placebo sample.

What is most noteworthy is the difference in asset accumulation between the treated and untreated municipalities. Table A.7 shows that between 2011 and 2014, on average, a re-elected mayor accumulated (net) assets equivalent to 0.054 of total government spending in her municipality (i.e. mean $networth = 0.054$). In contrast, mean *networth* for municipalities that had a turnover is -0.044 (- see Table A.8). This confirms that in the placebo sample, no wealth accumulation is possible. Indeed, *networth* in this sample only captures the difference in net worth between the 2011 and the 2014 mayor.

It also appears that, with the exception of the asset variables, the main sample and the placebo sample are similar - for most of the proxy variables, the mean values in Table A.7 are close to those in Table A.9. However, mean *ira* seems lower in municipalities that had no

[33] The high attrition rates in both the main and placebo samples are thus unsurprising. Also, as shown in Appendix 7, incidences of misreporting in some components of the mayor's net worth are also apparent in the sample.

turnover than those that had (- see Tables A.6 and A.8). Also, while the mean *ira* among municipalities with no turnover is 90 (million pesos - see Table A.6), the subset selected into the main sample has higher mean *ira* at 98.5 (- see Table A.7). On the other hand, while mean *ira* among municipalities that experienced a turnover is 105 (- see Table A.8), the subset selected into the placebo sample has mean *ira* equal to 120 (- see Table A.9). Since *ira* is actually the (continuous) treatment of interest in the model, one would be rightly concerned if this treatment were to determine sample selection. I thus try to demonstrate that this is unlikely.

First note that since the model is only concerned with measuring the effect of *ira* on rent accumulation, the relevant sample of interest consists only of those 606 municipalities whose mayor was re-elected in 2013 and, hence, had the opportunity to earn rents between 2011-2014. Thus, necessary for a municipality to be treated with 'rent-generating' *ira* is having been 'treated' with re-election. Table A.3 shows that the latter binary treatment appears to be exogenous in the sense that it is unrelated to all the proxy variables in the model. However, sufficiency requires that *ira* itself is exogenous to sample selection. Thus, Table A.4 tests which variables possibly determine whether or not the municipality submits the SALN in 2011 and in 2014. It appears that with the exception of *electricity*, none of the variables capturing municipality characteristics determine whether two different mayors from the same municipality would both submit their SALN. This suggests that the placebo sample of 166 municipalities is a random subset of the 1,014 municipalities that had a turnover. In contrast, some of the variables seem to affect whether or not the same re-elected mayor would submit twice. In particular, selection into the main sample appears to be negatively related with some spending variables (*construction*, *pubserv*, *health*, *econ*), negatively related to *electricity*, and positively or negatively related to some proxies for λ. Note, however, that when controlling for these variables, *ira* itself is insignificant.

Table A.3: Determinants of no turnover in 2013

VARIABLES	(1) No Turnover
Change in Net Worth per Spending	0.0605
	(0.0574)
Change in Real Assets per Spending	0.0260
	(0.261)
Change in Personal Assets per Spending	-0.0243
	(0.0821)
Change in Liabilities per Spending	-0.207
	(0.221)
Construction Spending	-0.00169
	(0.00635)
Capital and Investment Spending	0.895
	(1.236)
Public Services Spending	0.153
	(1.031)
Education Spending	-0.362
	(2.087)
Health Spending	-0.768
	(1.520)
Labor Spending	7.005
	(6.706)
Housing Spending	0.876
	(1.401)
Social Welfare Spending	0.276
	(1.323)
Economic Services Spending	0.124
	(1.094)
No Debt	0.0262
	(0.0797)
Proportion of Population Aged 15-24	1.312
	(2.711)
Proportion of School-Age Youth Enrolled in School	-0.845
	(1.386)
Proportion of Population Who Are Employed	0.290
	(0.767)

Proportion of Populationin Professional Jobs	-1.257
	(1.047)
Proportion of Households That Have Electricity	-0.00417
	(0.352)
Proportion of Households That Have At Least One Cellphone	-0.0306
	(0.491)
Proportion of Population Who are Registered Voters	0.101
	(0.429)
Internal Revenue Allotment	0.00106
	(0.00215)
Proportion of Households Who Own the Land They Occupy	-0.307
	(0.281)
Proportion of Households Who Own the House They Occupy	0.233
	(0.492)
Income Classification 1-6, with 6 as Highest Level	0.00961
	(0.0460)
Urban Municipality	-0.0499
	(0.155)
Log of the Land Area of the Municipality	-0.0410
	(0.0676)
Log of the Average Population Between 2010-2015	-0.00627
	(0.0875)
Constant	0.757
	(1.976)
Observations	278
R-squared	0.066

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.4: Determinants of submitting the SALN in both years, for municipalities that had no turnover in 2013 vs. those that had

VARIABLES	(1) Submitted in No	(2) 2011 and 2014 Turnover	(3) Submitted in With	(4) 2011 and 2014 Turnover
Construction Spending	0.000890		6.41e-05	
	(0.00520)		(0.00197)	
Capital and Investment Spending	-1.437		-0.349	
	(0.879)		(0.498)	
Public Services Spending	-1.459*		-0.182	
	(0.748)		(0.453)	
Education Spending	-0.576		0.103	
	(1.459)		(0.783)	
Health Spending	-2.541**		-0.0562	
	(0.995)		(0.578)	
Labor Spending	2.075		-3.888	
	(4.857)		(4.463)	
Housing Spending	0.600		-0.575	
	(1.149)		(0.602)	
Social Welfare Spending	-0.734		-0.272	
	(0.976)		(0.563)	
Economic Services Spending	-1.655**		-0.170	
	(0.777)		(0.459)	
No Debt	-0.0180		-0.0253	
	(0.0520)		(0.0311)	
Proportion of Population Aged 15-24	5.530***		0.972	
	(1.671)		(0.996)	
Proportion of School-Age Youth Enrolled in School	-1.943**		-0.213	
	(0.808)		(0.500)	
Proportion of Population Who Are Employed	0.303		0.208	
	(0.417)		(0.276)	
Proportion of Population in Professional Jobs	-0.0207		0.416	
	(0.668)		(0.328)	
Proportion of Households That Have Electricity	-0.493***		-0.263**	
	(0.173)		(0.106)	

Proportion of Households That Have At Least One Cellphone	1.021***		0.172	
	(0.239)		(0.152)	
Proportion of Population Who are Registered Voters	-0.269		0.150	
	(0.240)		(0.155)	
Internal Revenue Allotment	0.00239		-0.000559	
	(0.00179)		(0.000797)	
Proportion of Households Who Own the Land They Occupy	0.0144		0.151	
	(0.168)		(0.0975)	
Proportion of Households Who Own the House They Occupy	-0.127		-0.341	
	(0.307)		(0.210)	
Income Classification 1-6, with 6 as Highest Level	-0.00625		-0.0189	
	(0.0326)		(0.0181)	
Urban Municipality	-0.0131		-0.0584	
	(0.129)		(0.0554)	
Log of the Land Area of the Municipality	0.0171		-0.0131	
	(0.0425)		(0.0236)	
Log of the Average Population Between 2010-2015	-0.0796		0.0166	
	(0.0631)		(0.0345)	
Average Net Worth per Spending		0.0135		-0.0119
		(0.0470)		(0.0207)
Average Real Assets per Spending		-0.00714		-0.212**
		(0.0251)		(0.105)
Average Personal Assets per Spending		-0.0113		0.135*
		(0.0544)		(0.0745)
Average Liabilities per Spending		0.0509		0.439**
		(0.108)		(0.181)
Constant	1.719	0.994***	0.360	0.207***
	(1.212)	(0.00534)	(0.766)	(0.0166)
Observations	512	232	820	788
R-squared	0.156	0.002	0.034	0.012

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5 Summary Statistics

Table A.5: Summary Statistics for all 1,620 municipalities

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Total Spending	1,620	153.5	471.5	16.70	9,103
Change in Net Worth per Spending	397	0.0129	0.693	-9.187	9.012
Change in Real Assets per Spending	397	0.00996	0.193	-1.548	2.670
Change in Personal Assets per Spending	397	-0.000543	0.474	-8.884	2.213
Change in Liabilities per Spending	397	0.0170	0.208	-0.318	3.816
Construction Spending	1,620	18.86	104.6	0	2,998
Capital and Investment Spending	1,620	0.0826	0.0858	0	0.612
Public Services Spending	1,620	0.582	0.123	0.180	0.963
Education Spending	1,620	0.0182	0.0249	0	0.285
Health Spending	1,620	0.0770	0.0316	0	0.236
Labor Spending	1,620	0.000426	0.00333	0	0.0625
Housing Spending	1,620	0.0104	0.0279	0	0.384
Social Welfare Spending	1,620	0.0518	0.0337	0	0.356
Economic Services Spending	1,620	0.148	0.0771	0.0141	0.640
No Debt	1,620	0.393	0.489	0	1
Proportion of Population Aged 15-24	1,474	0.193	0.0129	0.0745	0.247
Proportion of School-Age Youth Enrolled in School	1,474	0.274	0.0274	0.0248	0.401
Proportion of Population Who Are Employed	1,474	0.334	0.0562	0.156	0.857
Proportion of Population in Professional Jobs	1,474	0.107	0.0489	0.00376	0.425
Proportion of Households That Have Electricity	1,474	0.762	0.193	0	0.997
Proportion of Households That Have At Least One Cellphone	1,474	0.645	0.151	0.110	1
Proportion of Population Who are Registered Voters	1,460	0.593	0.113	0.243	2.419
Internal Revenue Allotment	1,620	99.28	163.4	16.58	2,787
Proportion of Households Who Own the Land They Occupy	1,474	0.391	0.184	0.0152	0.994
Proportion of Households Who Own the House They Occupy	1,474	0.853	0.0754	0.0645	1
Income Classification 1-6, with 6 as Highest Level	1,447	3.115	1.468	1	6
Urban Municipality	1,460	0.0562	0.230	0	1
Log of the Land Area of the Municipality	1,460	9.526	0.912	6.148	12.30
Log of the Average Population Between 2010-2015	1,460	10.30	0.762	5.313	12.69
Average Net Worth per Spending	1,020	0.160	0.676	-0.0802	19.22
Average Real Assets per Spending	1,020	0.0903	0.319	0	8.840
Average Personal Assets per Spending	1,020	0.0745	0.208	0	4.480
Average Liabilities per Spending	1,020	0.0305	0.0832	0	1.912
Percentage Growth of Net Worth	229	27,535	260,784	-196.2	2.842e+06
Percentage Growth of Real Assets	210	436.4	5,681	-193.5	82,328
Percentage Growth of Personal Assets	214	190.3	1,027	-100	12,422
Percentage Growth of Liabilities	187	242.6	1,202	-168.6	13,233

Table A.6: Summary Statistics for the Intended Sample, i.e. the 606 municipalities that had no turnover

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Total Spending	606	152.6	549.8	20.94	9,103
Change in Net Worth per Spending	231	0.0540	0.641	-2.960	9.012
Change in Real Assets per Spending	231	0.000949	0.127	-1.548	0.584
Change in Personal Assets per Spending	231	0.0123	0.103	-1.009	0.728
Change in Liabilities per Spending	231	0.00462	0.0467	-0.318	0.246
Construction Spending	606	18.50	106.5	0	2,362
Capital and Investment Spending	606	0.0801	0.0798	0	0.565
Public Services Spending	606	0.592	0.122	0.248	0.963
Education Spending	606	0.0174	0.0242	0	0.184
Health Spending	606	0.0777	0.0325	0	0.206
Labor Spending	606	0.000505	0.00409	0	0.0625
Housing Spending	606	0.00953	0.0253	0	0.254
Social Welfare Spending	606	0.0499	0.0308	0	0.302
Economic Services Spending	606	0.145	0.0802	0.0141	0.640
No Debt	606	0.404	0.491	0	1
Proportion of Population Aged 15-24	552	0.193	0.0139	0.0745	0.238
Proportion of School-Age Youth Enrolled in School	552	0.276	0.0299	0.0248	0.401
Proportion of Population Who Are Employed	552	0.333	0.0597	0.200	0.857
Proportion of Population in Professional Jobs	552	0.102	0.0431	0.0167	0.327
Proportion of Households That Have Electricity	552	0.747	0.194	0	0.997
Proportion of Households That Have At Least One Cellphone	552	0.625	0.154	0.145	1
Proportion of Population Who are Registered Voters	553	0.598	0.105	0.243	1.468
Internal Revenue Allotment	606	89.67	152.7	16.58	2,787
Proportion of Households Who Own the Land They Occupy	552	0.395	0.187	0.0152	0.992
Proportion of Households Who Own the House They Occupy	552	0.856	0.0851	0.0645	0.996
Income Classification 1-6, with 6 as Highest Level	550	3.304	1.467	1	6
Urban Municipality	553	0.0325	0.178	0	1
Log of the Land Area of the Municipality	553	9.440	0.864	6.548	11.89
Log of the Average Population Between 2010-2015	553	10.23	0.758	5.313	12.34
Average Net Worth per Spending	232	0.156	0.415	-0.00302	4.583
Average Real Assets per Spending	232	0.116	0.596	0	8.840
Average Personal Assets per Spending	232	0.0801	0.204	0	2.237
Average Liabilities per Spending	232	0.0280	0.0456	0	0.364
Percentage Growth of Net Worth	229	27,535	260,784	-196.2	2.842e+06
Percentage Growth of Real Assets	210	436.4	5,681	-193.5	82,328
Percentage Growth of Personal Assets	214	190.3	1,027	-100	12,422
Percentage Growth of Liabilities	187	242.6	1,202	-168.6	13,233

Table A.7: Summary Statistics for the Selected Sample, i.e. the 231 municipalities whose mayor submitted the SALN in 2011 and 2014

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Total Spending	231	145.7	313.5	22.16	3,820
Change in Net Worth per Spending	231	0.0540	0.641	-2.960	9.012
Change in Real Assets per Spending	231	0.000949	0.127	-1.548	0.584
Change in Personal Assets per Spending	231	0.0123	0.103	-1.009	0.728
Change in Liabilities per Spending	231	0.00462	0.0467	-0.318	0.246
Construction Spending	231	17.32	44.16	0	424.6
Capital and Investment Spending	231	0.0882	0.0913	0	0.565
Public Services Spending	231	0.578	0.134	0.248	0.963
Education Spending	231	0.0190	0.0250	0	0.163
Health Spending	231	0.0726	0.0318	0	0.162
Labor Spending	231	0.000808	0.00570	0	0.0625
Housing Spending	231	0.0122	0.0318	0	0.254
Social Welfare Spending	231	0.0489	0.0369	0	0.302
Economic Services Spending	231	0.146	0.0821	0.0160	0.640
No Debt	231	0.338	0.474	0	1
Proportion of Population Aged 15-24	198	0.195	0.0148	0.0745	0.234
Proportion of School-Age Youth Enrolled in School	198	0.270	0.0305	0.0248	0.370
Proportion of Population Who Are Employed	198	0.342	0.0647	0.243	0.857
Proportion of Population in Professional Jobs	198	0.109	0.0516	0.0289	0.327
Proportion of Households That Have Electricity	198	0.754	0.201	0.207	0.985
Proportion of Households That Have At Least One Cellphone	198	0.662	0.156	0.210	1
Proportion of Population Who are Registered Voters	205	0.591	0.107	0.243	1.347
Internal Revenue Allotment	231	98.52	119.8	24.29	1,084
Proportion of Households Who Own the Land They Occupy	198	0.389	0.181	0.0962	0.941
Proportion of Households Who Own the House They Occupy	198	0.842	0.0936	0.0645	0.970
Income Classification 1-6, with 6 as Highest Level	204	3	1.525	1	6
Urban Municipality	205	0.0488	0.216	0	1
Log of the Land Area of the Municipality	205	9.553	0.890	7.296	11.89
Log of the Average Population Between 2010-2015	205	10.34	0.804	5.313	12.34
Average Net Worth per Spending	231	0.156	0.416	-0.00302	4.583
Average Real Assets per Spending	231	0.116	0.598	0	8.840
Average Personal Assets per Spending	231	0.0804	0.205	0	2.237
Average Liabilities per Spending	231	0.0281	0.0456	0	0.364
Percentage Growth of Net Worth	229	27,535	260,784	-196.2	2.842e+06
Percentage Growth of Real Assets	210	436.4	5,681	-193.5	82,328
Percentage Growth of Personal Assets	214	190.3	1,027	-100	12,422
Percentage Growth of Liabilities	187	242.6	1,202	-168.6	13,233

Table A.8: Summary Statistics for the 1,014 Municipalities that had a Turnover

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Total Spending	1,014	154.1	418.0	16.70	7,057
Change in Net Worth per Spending	166	-0.0442	0.758	-9.187	1.295
Change in Real Assets per Spending	166	0.0225	0.258	-0.329	2.670
Change in Personal Assets per Spending	166	-0.0185	0.725	-8.884	2.213
Change in Liabilities per Spending	166	0.0343	0.317	-0.284	3.816
Construction Spending	1,014	19.07	103.5	0	2,998
Capital and Investment Spending	1,014	0.0840	0.0892	0	0.612
Public Services Spending	1,014	0.577	0.122	0.180	0.903
Education Spending	1,014	0.0186	0.0254	0	0.285
Health Spending	1,014	0.0766	0.0310	0	0.236
Labor Spending	1,014	0.000379	0.00277	0	0.0373
Housing Spending	1,014	0.0109	0.0293	0	0.384
Social Welfare Spending	1,014	0.0529	0.0352	0	0.356
Economic Services Spending	1,014	0.149	0.0751	0.0187	0.637
No Debt	1,014	0.387	0.487	0	1
Proportion of Population Aged 15-24	922	0.193	0.0123	0.127	0.247
Proportion of School-Age Youth Enrolled in School	922	0.273	0.0259	0.182	0.371
Proportion of Population Who Are Employed	922	0.334	0.0540	0.156	0.630
Proportion of Population in Professional Jobs	922	0.110	0.0518	0.00376	0.425
Proportion of Households That Have Electricity	922	0.771	0.193	0.0210	0.993
Proportion of Households That Have At Least One Cellphone	922	0.656	0.148	0.110	0.947
Proportion of Population Who are Registered Voters	907	0.590	0.118	0.271	2.419
Internal Revenue Allotment	1,014	105.0	169.3	17.08	2,624
Proportion of Households Who Own the Land They Occupy	922	0.389	0.183	0.0501	0.994
Proportion of Households Who Own the House They Occupy	922	0.852	0.0689	0.560	1
Income Classification 1-6, with 6 as Highest Level	897	2.999	1.457	1	6
Urban Municipality	907	0.0706	0.256	0	1
Log of the Land Area of the Municipality	907	9.578	0.937	6.148	12.30
Log of the Average Population Between 2010-2015	907	10.35	0.760	7.146	12.69
Average Net Worth per Spending	788	0.161	0.736	-0.0802	19.22
Average Real Assets per Spending	788	0.0827	0.165	0	1.719
Average Personal Assets per Spending	788	0.0729	0.210	0	4.480
Average Liabilities per Spending	788	0.0313	0.0914	0	1.912

Table A.9: Summary Statistics for the Placebo Sample, i.e. the 166 municipalities that had a turnover and whose two mayors submitted a SALN

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Total Spending	166	158.4	249.8	22.52	1,827
Change in Net Worth per Spending	166	-0.0442	0.758	-9.187	1.295
Change in Real Assets per Spending	166	0.0225	0.258	-0.329	2.670
Change in Personal Assets per Spending	166	-0.0185	0.725	-8.884	2.213
Change in Liabilities per Spending	166	0.0343	0.317	-0.284	3.816
Construction Spending	166	16.60	34.70	0	268.1
Capital and Investment Spending	166	0.0751	0.0727	0	0.419
Public Services Spending	166	0.582	0.127	0.270	0.903
Education Spending	166	0.0181	0.0224	0	0.104
Health Spending	166	0.0704	0.0320	0	0.209
Labor Spending	166	0.000278	0.00251	0	0.0317
Housing Spending	166	0.00719	0.0230	0	0.161
Social Welfare Spending	166	0.0518	0.0352	0	0.244
Economic Services Spending	166	0.158	0.0766	0.0362	0.589
No Debt	166	0.331	0.472	0	1
Proportion of Population Aged 15-24	128	0.195	0.0119	0.163	0.236
Proportion of School-Age Youth Enrolled in School	128	0.273	0.0216	0.227	0.331
Proportion of Population Who Are Employed	128	0.343	0.0462	0.253	0.490
Proportion of Population in Professional Jobs	128	0.113	0.0549	0.0400	0.291
Proportion of Households That Have Electricity	128	0.740	0.208	0.0354	0.976
Proportion of Households That Have At Least One Cellphone	128	0.652	0.138	0.360	0.894
Proportion of Population Who are Registered Voters	138	0.606	0.182	0.336	2.419
Internal Revenue Allotment	166	120.3	142.6	22.91	852.9
Proportion of Households Who Own the Land They Occupy	128	0.395	0.204	0.0645	0.967
Proportion of Households Who Own the House They Occupy	128	0.837	0.0638	0.638	0.990
Income Classification 1-6, with 6 as Highest Level	134	2.933	1.415	1	6
Urban Municipality	138	0.0580	0.235	0	1
Log of the Land Area of the Municipality	138	9.709	0.889	7.524	11.90
Log of the Average Population Between 2010-2015	138	10.36	0.685	7.775	11.83
Average Net Worth per Spending	166	0.139	0.374	-0.000498	4.655
Average Real Assets per Spending	166	0.0756	0.133	0	1.335
Average Personal Assets per Spending	166	0.0930	0.360	0	4.480
Average Liabilities per Spending	166	0.0426	0.157	0	1.912

6 Selection Model

In the following, I formally show that the estimates are unaffected in spite of the fact that many jurisdictions/municipalities drop out of the sample because some politicians fail to submit the SALNs for the two years 2011 and 2014. In particular, I first demonstrate in subsection A that there is no selection bias if all other factors that affect government spending and rents (apart from revenues and λ) are independent of the politician's decision to submit the SALN, which I call “independence from selection”. Then, I show that there is still no selection bias under weaker assumptions if the only variables affecting the politician’s decision to submit are either λ and T, i.e. ”selection on explanatory variables”, or government spending and rents, i.e “selection on outcome variables”. In subsection B, I obtain analogous results in the case when the politician’s decision to submit the SALN also depends on whether or not the politician would accurately report the items on the SALN.

A

Jurisdiction j is selected into the sample if the politician from j submits her SALN for both years 2011 and 2014 (from which the difference in the value of her assets can be computed). Non-submission of the SALN for each year in office is a crime that is punishable by law. On the other hand, submitting the SALN makes a corrupt politician vulnerable to allegations of corruption, prosecution in court, and conviction. Thus, the politician, in deciding whether or not to submit the SALN in 2011 and 2014, weighs the utility of avoiding sanctions for failure to submit, against the (dis)utility from providing evidence/information on her assets which may be used against her.

Thus, denote the net utility of the politician j from submitting the SALN for both years 2011 and 2014 as S_j, and suppose it is determined by:

$$S_j = \mathbf{v}_j \alpha_j + w_j, \tag{23}$$

where $\mathbf{v}_j$ are the factors that affect S_j, while w_j is the error term. The politician submits the SALN for both years and, hence, is selected into the sample, if net utility S_j is positive. That is, letting s_j indicate submission for both years/selection into the sample, $s_j = 1$ if $S_j = \mathbf{v}_j \alpha_j + w_j > 0$ or $w_j > -\mathbf{v}_j \alpha$, and $s_j = 0$ otherwise.

Recall that we are interested in estimating the system

$$\mathbf{y}_j = \mathbf{x}_j \gamma_j + \mathbf{u}_j. \tag{24}$$

However, since $\mathbf{y}_j$ can only be observed if $s_j = 1$, what we are actually only able to estimate is:

$$E(\mathbf{y}_j|s_j = 1, \mathbf{x}_j) = E(\mathbf{y}_j|w_j > -\mathbf{v}_j\alpha, \mathbf{x}_j). \tag{25}$$

Consider the following assumptions:

(a) $w_j \perp \mathbf{v}_j$, $w_j \perp \mathbf{x}_j$

(b) $E(\mathbf{u}_j|\mathbf{x}_j) = E(\mathbf{u}_j) = 0$

(c) $\mathbf{u}_j \perp w_j$

(d) $\mathbf{u}_j \perp \mathbf{v}_j$

(e) $\mathbf{x}_j \perp \mathbf{v}_j$

Proposition 6.1. ***Independence from selection***

If (a), (b), (c), (d), and (e) hold, then there is no selection bias.

Proof. Under (a) and (e), equation 25 becomes $E(\mathbf{y}_j|s_j = 1, \mathbf{x}_j) = \mathbf{x}_j\gamma_j + E(u_j|w_j > -\mathbf{v}_j\alpha, \mathbf{x}_j)$ which, under (c) and (d), is equal to $\mathbf{x}_j\gamma_j + E(\mathbf{u}_j|\mathbf{x}_j)$. Under (b), this reduces to $\mathbf{x}_j\gamma_j$. ■

Proposition 6.2. ***Selection on explanatory variables***

Suppose $\mathbf{v}_j = \mathbf{x}_j$. If (a), (b), and (c) hold, then there is no selection bias.

Proof. With $\mathbf{v}_j = \mathbf{x}_j$, equation 25 can be written as $E(\mathbf{y}_j|s_j = 1, \mathbf{x}_j) = E(\mathbf{y}_j|w_j > -\mathbf{x}_j\alpha, \mathbf{x}_j)$. Under (a) and (c), this is equal to $\mathbf{x}_j\gamma_j + E(\mathbf{u}_j|\mathbf{x}_j)$ which, under (b), reduces to $\mathbf{x}_j\gamma_j$.

■

Proposition 6.3. ***Selection on outcome variables***

Suppose $\mathbf{v}_j = \mathbf{y}_j$. If (a) and (b) hold, then there is no selection bias.

Proof. With $\mathbf{v}_j = \mathbf{y}_j$, equation 25 can be written as $E(\mathbf{y}_j|s_j = 1, \mathbf{x}_j) = E(\mathbf{v}_j|w_j > -\mathbf{v}_j\alpha, \mathbf{x}_j)$. Under (a), this is equal to $E(\mathbf{v}_j|\mathbf{x}_j) = E(\mathbf{y}_j|\mathbf{x}_j) = \mathbf{x}_j\gamma_j + E(\mathbf{u}_j|\mathbf{x}_j)$ which, under (b), reduces to $\mathbf{x}_j\gamma_j$.

■

B

Now suppose that the net utility from submitting both SALNs is affected by whether or not the politician will falsify, or inaccurately report the required information on the SALN. Specifically, let $r_j = 1$ indicate accurate reporting, and 0 otherwise, and the net utility S_j is now given by:

$$S_j = \mathbf{v}_j \alpha_j + \delta r_j + w_j. \tag{26}$$

Consider the following additional assumptions:

(i) $r_j \perp \mathbf{x}_j$

(ii) $r_j \perp \mathbf{u}_j$

(iii) $r_j \perp \mathbf{v}_j$

Proposition 6.4. ***Independence from selection***

If assumptions (a), (b), (c), (d), (e), (i), and (ii) hold, then there is no selection bias.

Proof. Under (a), (e), and (i), equation 25 becomes $E(\mathbf{y}_j|s_j = 1, \mathbf{x}_j) = \mathbf{x}_j\gamma_j + E(u_j|w_j > -\mathbf{v}_j\alpha - \delta r_j, \mathbf{x}_j)$ which, under (c), (d), and (ii), is equal to $\mathbf{x}_j\gamma_j + E(\mathbf{u}_j|\mathbf{x}_j)$. Under (b), this reduces to $\mathbf{x}_j\gamma_j$.

■

Proposition 6.5. ***Selection on explanatory variables***

Suppose $\mathbf{v}_j = \mathbf{x}_j$. If (a), (b), (c), (i) and (ii) hold, then there is no selection bias.

Proof. With $\mathbf{v}_j = \mathbf{x}_j$, equation 25 can be written as $E(\mathbf{y}_j|s_j = 1, \mathbf{x}_j) = E(\mathbf{y}_j|w_j > -\mathbf{x}_j\alpha - \delta r_j, \mathbf{x}_j)$. Under (a), (c), (i), and (ii), this is equal to $\mathbf{x}_j\gamma_j + E(\mathbf{u}_j|\mathbf{x}_j)$ which, under (b), reduces to $\mathbf{x}_j\gamma_j$.

■

Proposition 6.6. ***Selection on outcome variables***

Suppose $\mathbf{v}_j = \mathbf{y}_j$. If (a), (b), and (iii) hold, then there is no selection bias.

Proof. With $\mathbf{v}_j = \mathbf{y}_j$, equation 25 can be written as $E(\mathbf{y}_j|s_j = 1, \mathbf{x}_j) = E(\mathbf{v}_j|w_j > -\mathbf{v}_j\alpha - \delta r_j, \mathbf{x}_j)$. Under (a) and (iii), this is equal to $E(\mathbf{v}_j|\mathbf{x}_j) = E(\mathbf{y}_j|\mathbf{x}_j) = \mathbf{x}_j\gamma_j + E(\mathbf{u}_j|\mathbf{x}_j)$ which, under (b), reduces to $\mathbf{x}_j\gamma_j$.

■

7 Wealth Accumulation

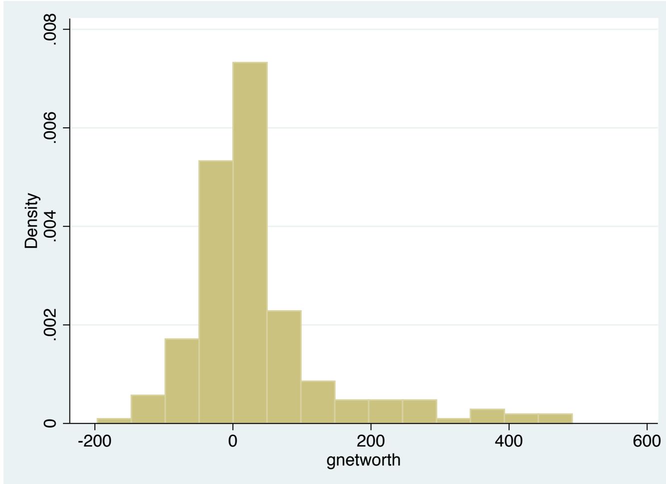
The difference in the net worth of a mayor between the years 2011 and 2014 should be close to zero, because any (legitimate) increase in salaries and allowances of the mayor would be closely matched by an increase in her expenses. Nevertheless, even accounting for the possibility that mayors are financially prudent, and that they may have other sources of legitimate income, their asset performance and spending patterns are dependent on economic conditions and, to that extent, are expected to be consistent with macroeconomic trends.

Overall, the Philippine economy grew by about 18% in the sample period - from a GDP per capita of USD 2129.5 in 2010 to 2505.8 in 2014. Between 2010 to 2014, the annual GDP growth rate reached a high of 9% and a low of about 2%.[34] Minimum wages grew by about 20%, from a monthly minimum wage of 7,995 (Philippine pesos PhP) in 2010, to 9,581.8 in 2014. The growth of GDP from Public Administration (which would include salaries in the public sector) is more modest - in 2010 it reached a high of 72,000 (million PhP), and in 2014, 82,000, implying a growth rate of about 14%. Meanwhile, spending likely outstripped the wage growth of public servants, since consumer spending grew by 26%, from 950,000 (million PhP) in 2010 to 1,200,000 in 2014. Vehicle sales alone grew by 50% - 4,000 (million PhP) in 2010 to 6,000 in 2014. By these trends, it is thus difficult to imagine that mayors would have been able to save significant amounts out of (legitimate) salaries and allowances for their net worth to have increased over the sample period.

Of course, mayors may have other legitimate sources of income - from their interest in businesses, and/or their pre-existing assets. However, unless such businesses are in the mining sector, which grew by 115%, or construction, which grew by 50%, the growth in their business incomes would have still been outpaced, or at least closely matched by, consumer spending. As for the growth of pre-existing assets, note that real estate values only grew by about a maximum of 20%. (The CPI for Housing and Utilities reached a high of 132 and a low of 110 index points.) The Philippine 10-year government bond yield had a high of 8% and a low of less than 4%, while the Central Bank benchmark interest rate had a high of 4.5% and a low of 3.5%. Philippine stock prices fared better - the Philippine Stock Exchange index (PSEi) doubled over the period, from about 3,000 basis points in 2010 to 6,000 in 2014.

[34]Data on the Philippine economy are obtained from tradingeconomics.com.

Figure A.1: Histogram of the percentage-growth of mayors' net worth between 2011-2014 (actual min. value no less than -200%; upper bound of 600% chosen for visual clarity - actual max. is 2,841,967%)



Yet even allowing for the best-case scenario (e.g. high savings and investments, involvement in mining and construction, real estate holdings), Table A.7 reveals that the implied growth rates of mayors' net worth, real assets, personal assets, and liabilities between 2011 and 2014 are extraordinarily high. The mean growth rate of net worth (*gnetworth*) is not just 100%, but 27,535%. The growth rate of real assets, personal assets, and liabilities seem to be more reasonable, although their mean values still imply that the 2011 values more-than doubled in a span of only three years. It is possible, of course, that the numbers reported in the SALN were inaccurate, but if so, it is curious that such inaccuracies, if any, appear to overstate the reported values. Note from Figures A.1 to A.4 that the distributions are right-skewed. These suggest that inaccuracies, if any, are likely not to have been committed to deliberately conceal rents. Otherwise, *grealassets* and *gpersonalassets* would be either left-skewed or more symmetric about zero. Even if overstating liabilities could help understate networth - and one does see that *gliabilities* is right-skewed, *gnetworth* still clearly has a positive skew.

Nevertheless, given the maximum values of *grealassets*, *gpersonalassets*, and *gliabilities*, the maximum value of *gnetworth* appears to be high to be consistent with the former. This is true even if the sample were restricted to mayors that provided data on all entries in the SALN (real assets, personal assets, liabilities, and net worth), in which case the distribution of the growth of these items should be more consistent with each other. Table A.10 in Appendix 8 shows the summary statistics for all mayors for which the growth in assets, personal assets, liabilities and net worth are available and can be computed. (Growth rates could not be obtained

Figure A.2: Histogram of the percentage-growth of mayors' real assets between 2011-2014 (actual min. value no less than -200%; upper bound of 400% chosen for visual clarity - actual max. is 82,328%)

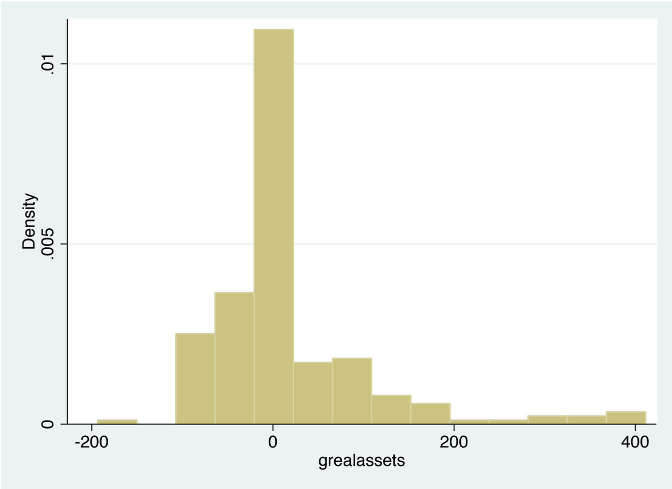


Figure A.3: Histogram of the percentage-growth of mayors' personal assets between 2011-2014 (actual min. value no less than -100%; upper bound of 600% chosen for visual clarity - actual max. is 7,696%)

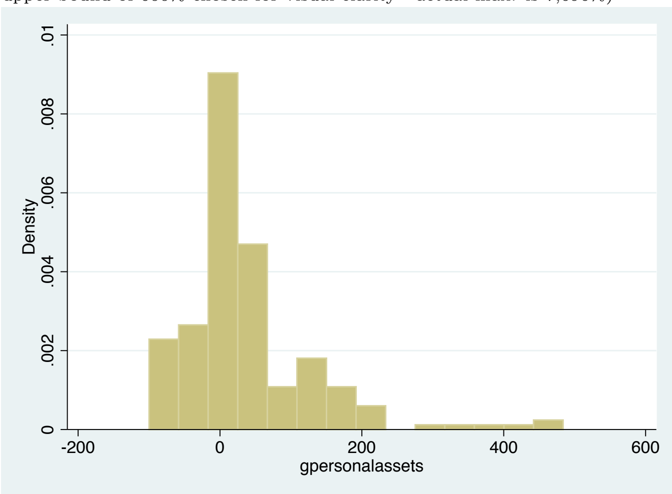
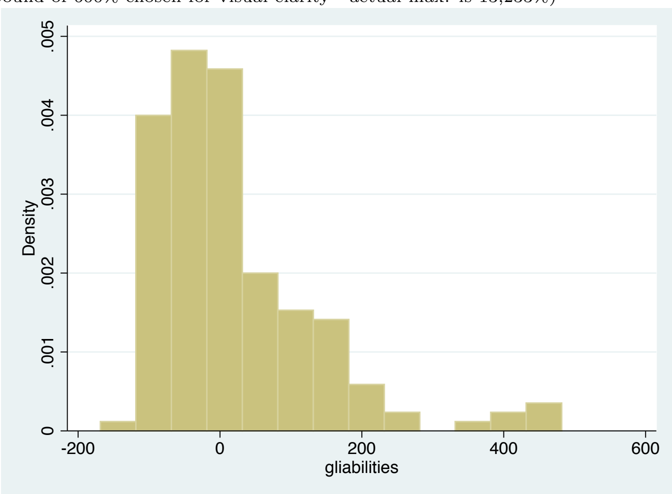


Figure A.4: Histogram of the percentage-growth of mayors' liabilities between 2011-2014 (actual min. value no less than -200%; upper bound of 600% chosen for visual clarity - actual max. is 13,233%)



when the 2011 value is zero.) While the mean *gnetworth* drops considerably to 17,176%, this still seems extraordinarily high, considering that the maximum value of *gnetworth* remains at 2,841,967% while the maximum *grealassets* is only 82,327% and maximum *personalassets* is only 7696%. One could thus try to restrict the sample based on the value of *gnetworth*. Table A.11 reports the summary statistics of the growth rates when *gnetworth* is restricted to values: less than 1,000,000%, which removes one outlier; less than 1,000%, which removes another; and less than 100%, which removes an additional 27.

Note that while *gnetworth* drops considerably as more extreme values are removed, the distribution of the other variables remain more or less stable, with the same minimum and maximum values, and the mean values hovering around the same values. This is not to be taken as evidence, however, that reported real assets, personal assets and liabilities are any more accurate than reported net worth. In fact, if we were to exclude outliers based on *grealassets*, or on *gpersonalassets*, or on *gliabilities*, the distribution of *gnetworth* remains stable - its minimum and maximum values are the same, while the mean stays around 17,000 to 20,000%. (See Tables A.12 and A.13.)

Nevertheless, there does appear to be inaccuracies in the reported values. By identity, net worth should be equal to the sum of real and personal assets, less liabilities. This implies that the difference in net worth between 2011 and 2014 should also be equal to the sum of the difference in real assets and difference in personal assets, minus the difference in liabilities. However, this equality holds for only 89 out of the 231 mayors in the sample. This is not to say that reported net worth are unreliable - it could be its components that have been inaccurately reported such that some real and personal assets and liabilities were not listed, even though the true net value (net worth) is provided. In fact, in Tables A.14 and A.15, while the mean *gnetworth* seems consistent with the mean values of *grealassets*, *gpersonalassets* and *gliabilities* when the reported net worth tallies with the calculated net worth based on reported components, it is telling that when they do not match, *gnetworth* appears to vastly outstrip the growth in real assets and real properties (net the growth in liabilities). This suggests that some components of net worth might have been omitted. Yet despite this apparent inaccuracy, recall that the distributions of *grealassets* and *gpersonalassets* themselves are right-skewed (and *gliabilities* left-skewed), which suggest that real and personal assets are more likely overstated, than understated. It thus remains doubtful that any inaccuracies in reporting might have been committed to deliberately conceal rents.[35]

To further strengthen the plausibility of this argument, Table A.16 shows that mean *gnetworth* is much larger for mayors with business interests than for those that do not. Thus, it could simply be that the growth of mayors' assets, liabilities and net worth were simply fueled by their (legitimate) business activities. However, the business activities themselves could act as cover for rent-seeking. Concealment of rents might be less necessary if a mayor has businesses that can legitimately generate additional income. Thus, a priori, it is difficult to ascertain which outliers, if any, should be discarded from the sample, as they might accurately report large rents. So as not to throw out observations that may very well contain valuable information, the succeeding regressions use all 231 data points in the sample.

8 Percentage growth of mayors' assets and liabilities

Table A.10: Summary statistics for all mayors for whose percentage growth in net worth, real assets, personal assets, and liabilities can all be computed

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Percentage Growth of Net Worth	167	17,176	219,908	-196.2	2.842e+06
Percentage Growth of Real Assets	167	520.8	6,370	-193.5	82,328
Percentage Growth of Personal Assets	167	138.0	639.2	-100	7,696
Percentage Growth of Liabilities	167	204.8	1,169	-168.6	13,233

9 OLS and Nonparametric Regressions

Tables A.17 to A.20 estimate the (reduced-form) effect of *ira* on *networth*, *realassets*, and *liabilities* by OLS, while Table A.21 implements non-parametric regressions. While the OLS estimates are statistically insignificant, the estimated coefficient of *ira* is negative for most

[35]In Appendix 6, I present a model in which the politician's decision to submit the SALN already internalizes her decision whether to (deliberately) report items in the SALN accurately or not. To the extent that this model holds, any apparent inaccuracy that is revealed in the sample should be random, rather than orchestrated.

Table A.11: Summary statistics for all mayors in A.10 for whose percentage growth of net worth is less than 1,000,000, less than 1,000, and less than 100, respectively

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
Percentage Growth of Net Worth	166	159.6	1,049	-196.2	11,713
Percentage Growth of Real Assets	166	524.3	6,389	-193.5	82,328
Percentage Growth of Personal Assets	166	139.3	640.9	-100	7,696
Percentage Growth of Liabilities	166	206.7	1,172	-168.6	13,233

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
Percentage Growth of Net Worth	165	89.53	537.2	-196.2	6,720
Percentage Growth of Real Assets	165	527.5	6,409	-193.5	82,328
Percentage Growth of Personal Assets	165	140.1	642.8	-100	7,696
Percentage Growth of Liabilities	165	208.2	1,176	-168.6	13,233

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
Percentage Growth of Net Worth	137	1.366	45.88	-196.2	98.73
Percentage Growth of Real Assets	137	618.0	7,034	-193.5	82,328
Percentage Growth of Personal Assets	137	107.5	676.5	-100	7,696
Percentage Growth of Liabilities	137	192.1	1,255	-168.6	13,233

of the specifications, which is consistent with the results from the quantile regressions. Non-parametric regressions, however, indicate a positive, although insignificant, effect of *ira* on *networth*.

Table A.12: Summary statistics for all mayors in A.10 for whose percentage growth of real assets is less than 50,000, less than 5,000, less than 500, and less than 100, respectively

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Percentage Growth of Net Worth	166	17,280	220,569	-196.2	2.842e+06
Percentage Growth of Real Assets	166	27.97	151.5	-193.5	1,502
Percentage Growth of Personal Assets	166	138.9	641.0	-100	7,696
Percentage Growth of Liabilities	166	206.3	1,172	-168.6	13,233

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Percentage Growth of Net Worth	166	17,280	220,569	-196.2	2.842e+06
Percentage Growth of Real Assets	166	27.97	151.5	-193.5	1,502
Percentage Growth of Personal Assets	166	138.9	641.0	-100	7,696
Percentage Growth of Liabilities	166	206.3	1,172	-168.6	13,233

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Percentage Growth of Net Worth	164	17,450	221,913	-196.2	2.842e+06
Percentage Growth of Real Assets	164	15.19	85.75	-193.5	411.3
Percentage Growth of Personal Assets	164	129.1	638.4	-100	7,696
Percentage Growth of Liabilities	164	206.3	1,179	-168.6	13,233

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Percentage Growth of Net Worth	146	19,587	235,195	-196.2	2.842e+06
Percentage Growth of Real Assets	146	-8.266	43.43	-193.5	89.94
Percentage Growth of Personal Assets	146	130.0	673.1	-100	7,696
Percentage Growth of Liabilities	146	197.6	1,241	-168.6	13,233

Table A.13: Summary statistics for all mayors in A.13 for whose percentage growth of personal assets is less than 5,000, and less than 100, respectively

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Percentage Growth of Net Worth	166	17,280	220,569	-196.2	2.842e+06
Percentage Growth of Real Assets	166	524.3	6,389	-193.5	82,328
Percentage Growth of Personal Assets	166	92.50	250.4	-100	1,676
Percentage Growth of Liabilities	166	206.7	1,172	-168.6	13,233

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Percentage Growth of Net Worth	126	22,679	253,174	-100	2.842e+06
Percentage Growth of Real Assets	126	670.1	7,333	-100	82,328
Percentage Growth of Personal Assets	126	2.296	43.58	-100	99.96
Percentage Growth of Liabilities	126	211.1	1,319	-100	13,233

Table A.14: Summary statistics for all mayors in A.10 whose reported net worth tallies with calculated net worth

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Percentage Growth of Net Worth	72	126.9	795.2	-100	6,720
Percentage Growth of Real Assets	72	21.20	98.31	-100	650
Percentage Growth of Personal Assets	72	206.8	934.7	-100	7,696
Percentage Growth of Liabilities	72	280.9	1,587	-100	13,233

Table A.15: Summary statistics for all mayors in A.10 whose reported net worth does not tally with calculated net worth

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Percentage Growth of Net Worth	95	30,098	291,563	-196.2	2.842e+06
Percentage Growth of Real Assets	95	899.4	8,445	-193.5	82,328
Percentage Growth of Personal Assets	95	85.93	234.9	-100	1,583
Percentage Growth of Liabilities	95	147.2	710.0	-168.6	6,236

Table A.16: Summary statistics for all mayors in A.10 with business interests, and without business interests, respectively

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Percentage Growth of Net Worth	100	28,599	284,181	-100	2.842e+06
Percentage Growth of Real Assets	100	26.99	169.5	-100	1,502
Percentage Growth of Personal Assets	100	102.2	286.5	-100	1,676
Percentage Growth of Liabilities	100	266.8	1,373	-100	13,233

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Percentage Growth of Net Worth	67	128.2	824.0	-196.2	6,720
Percentage Growth of Real Assets	67	1,258	10,055	-193.5	82,328
Percentage Growth of Personal Assets	67	191.6	948.4	-99.05	7,696
Percentage Growth of Liabilities	67	112.4	771.5	-168.6	6,236

Table A.17: Reduced-form effect of municipal revenues on mayor's accumulated net worth, real assets, and liabilities, by OLS regression

	(1)	(2)	(3)	(4)	(5)	(6)
	Change in NET WORTH per Spending		Change in REAL ASSETS per Spending		Change in LIABILITIES per Spending	
Proportion of Population Aged 15-24		1.239		-0.138		0.0382
		(3.354)		(0.642)		(0.213)
Internal Revenue Allotment	-4.43e-05	-3.12e-05	-1.86e-05	2.72e-06	-6.63e-06	-1.54e-05
	(0.000353)	(0.000402)	(7.01e-05)	(7.69e-05)	(2.57e-05)	(2.55e-05)
Constant	0.0584	-0.192	0.00278	0.0234	0.00527	-0.000235
	(0.0547)	(0.649)	(0.0109)	(0.124)	(0.00399)	(0.0412)
Observations	231	198	231	198	231	198
R-squared	0.000	0.001	0.000	0.000	0.000	0.002

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.18: Reduced-form effect of municipal revenues on mayor's accumulated net worth, real assets, and liabilities, by OLS regression, with controls

VARIABLES	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Proportion of Population Aged 15-24	-0.227	-0.907	0.0251
	(4.126)	(0.776)	(0.261)
Internal Revenue Allotment	-0.000547	-0.000924	-0.000136
	(0.00331)	(0.000622)	(0.000210)
Log of the Land Area of the Municipality	-0.0343	0.00489	-0.000637
	(0.0802)	(0.0151)	(0.00508)
Log of the Ave. Population (2010-2015)	0.140	0.0568***	0.00657
	(0.110)	(0.0207)	(0.00699)
Constant	-0.993	-0.400	-0.0513
	(1.319)	(0.248)	(0.0836)
Observations	176	176	176
R-squared	0.022	0.050	0.008

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.19: Reduced-form effect of municipal revenues on mayor's accumulated net worth, by OLS regression, with different proxies for λ

	(1)	(2)	(3)	(4)	(5)
		Change in NET WORTH per Spending			
Proportion of School-Age Youth Enrolled in School	-0.929				
	(1.593)				
Internal Revenue Allotment	2.25e-06	-4.31e-06	-0.000743*	-0.000114	0.00206
	(0.000394)	(0.000394)	(0.000424)	(0.000404)	(0.00170)
Proportion of Population Who Are Employed		-0.635			
		(0.750)			
Proportion of Population in Professional Jobs			3.970***		
			(1.014)		
Proportion of Households That Have a Cellphone				0.386	
				(0.320)	
Proportion of Population Who are Registered Voters					0.558
					(0.485)
Constant	0.298	0.265	-0.310***	-0.197	-0.404
	(0.435)	(0.264)	(0.109)	(0.212)	(0.348)
Observations	198	198	198	198	205
R-squared	0.002	0.004	0.073	0.007	0.010

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.20: 'Placebo' reduced-form effect of municipal revenues on the differences in net worth, real assets, and liabilities of the 2011 and 2014 mayors, by OLS regression

VARIABLES	(1) Difference in NET WORTH per Spending	(2) Difference in REAL ASSETS per Spending	(3) Difference in LIABILITIES per Spending
Proportion of Population Aged 15-24	0.594	-0.421	-1.013
	(6.411)	(2.056)	(2.703)
Internal Revenue Allotment	0.000234	-8.49e-05	-0.000154
	(0.000524)	(0.000168)	(0.000221)
Constant	-0.214	0.114	0.264
	(1.244)	(0.399)	(0.525)
Observations	128	128	128
R-squared	0.002	0.003	0.006

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.21: Reduced-form effect of municipal revenues on mayor's accumulated net worth, real assets, and liabilities, by nonparametric regression

	(1) Mean	(2) Effect on Change in Net Worth per Spending	(3) Mean	(4) Effect on Change in Real Assets per Spending	(5) Mean	(6) Effect on Change in Liabilities per Spending
Proportion of Population Aged 15-24		1.295		-0.141		0.0487
		(2.049)		(0.383)		(0.238)
Internal Revenue Allotment		0.000349		3.74e-06		-2.35e-05
		(0.000325)		(6.92e-05)		(3.11e-05)
Change in NET WORTH per Spending	0.0355					
	(0.0438)					
Change in REAL ASSETS per Spending			-0.00405			
			(0.0112)			
Change in LIABILITIES per Spending					0.00533*	
					(0.00294)	
Observations	197	197	197	197	197	197
R-squared	0.010	0.010	0.005	0.005	0.015	0.015

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

10 Robustness Checks

A Other proxies for spending $\frac{g_1}{S}$

Recall that the model implies that the direct effect D is unaffected by spending. This means that using different proxies for $\frac{g_1}{S}$ should give the exact same estimate $\hat{D}$. Furthermore, equations (2) and (3) show that $\frac{g_1}{S}$ already incorporates g_2 - precisely by dividing by total spending S, one knows that $\frac{g_1}{S}$ captures all other spending g_2. That is, the components of total spending are jointly determined. In what follows, I show that the indirect effect I is the same, regardless of which component is used to proxy for $\frac{g_1}{S}$. Thus, one does not need to know ex-ante which type of public spending generates bribes - the same indirect effect I is obtained.

With some abuse of notation, let $\frac{g_1}{S}$ also refer to the spending proxy used in the main results, i.e. *construction*, and let $\frac{g_2}{S} + \frac{g_3}{S} + ...\frac{g_K}{S} = \frac{S-g_1}{S}$ denote all other types of spending, e.g. $health, pubserv, educ$, etc. Then if $\frac{g_1}{S}$ and $\frac{S-g_1}{S}$ are jointly determined, then the error term for $\frac{g_1}{S}_i$ in equation (9) would be $\mathbf{u}_{g_i} = \mathbf{x}_i\delta_g + \mathbf{v}_{g_i}$, where δ_g would capture the correlation between $\mathbf{x}_i$ and $\frac{S-g_1}{S}_i$, (with $E(v_{g_i})|\mathbf{x}_i = 0$).

Thus, as one uses different spending components $\frac{g_k}{S}$, $k = 1, 2, ...K$, the value of δ_g would also have different values. However, the effect of T on $\frac{R}{S}$ through $\frac{g_1}{S}$ would still be the same as the effect through any another proxy $\frac{g_k}{S}$. To show this formally, let $\mathbf{u}_i$ be a composite error term $\mathbf{u}_i = \mathbf{x}_i\delta + \mathbf{v}_i$, with $E(\mathbf{v}_i|\mathbf{x}_i) = 0$, $\delta = [\delta_R \quad \delta_g]$, $\delta_R = [\delta_{R0} \quad \delta_{R\lambda} \quad \delta_{RT}]^T$, and $\delta_g = [\delta_{g0} \quad \delta_{g\lambda} \quad \delta_{gT}]^T$. To focus only on the correlation between $\mathbf{x}_i$ and $\frac{S-g_1}{S}_i$, let $[\delta_{R0} \quad \delta_{R\lambda} \quad \delta_{RT}]^T = [0 \quad 0 \quad 0]^T$.

Equation (8) can thus be re-written as

$$\mathbf{y}_i = \Phi(\mathbf{x}_i\alpha)\mathbf{x}_i\beta^{\mathbf{1}} + (1 - \Phi(\mathbf{x}_i\alpha))\mathbf{x}_i\beta^{\mathbf{2}} + \mathbf{x}_i\delta + \mathbf{v}_i, \tag{27}$$

or:

$$\mathbf{y}_i = \mathbf{x}_i\gamma^E + \mathbf{v}_i, \tag{28}$$

where $\gamma^E \equiv \Phi(\mathbf{x}_i\alpha)(\beta^{\mathbf{1}} + \delta) + (1 - \Phi(\mathbf{x}_i\alpha))(\beta^{\mathbf{2}} + \delta)$.

One can then express $\frac{R}{S}_i$ as:

$$\frac{R}{S}_i = \gamma^E_{R0_i} + \gamma^E_{R\lambda_i}\lambda_i + \gamma^E_{RT_i}T_i + v_{R_i}, \tag{29}$$

where:

$\gamma^E_{R0_i} = \Phi(\mathbf{x}_i\alpha)(\beta^1_{R0} + \delta_{R0}) + (1 - \Phi(\mathbf{x}_i\alpha))(\beta^2_{R0} + \delta_{R0})$,

$\gamma^E_{R\lambda_i} = \Phi(\mathbf{x}_i\alpha)(\beta^1_{R\lambda} + \delta_{R\lambda}) + (1 - \Phi(\mathbf{x}_i\alpha))(\beta^2_{R\lambda} + \delta_{R\lambda})$,

$\gamma^E_{RT_i} = \Phi(\mathbf{x}_i\alpha)(\beta^1_{RT} + \delta_{RT}) + (1 - \Phi(\mathbf{x}_i\alpha))(\beta^2_{RT} + \delta_{RT})$,

$\beta^{\mathbf{1}}{}_R = [\beta^1_{R0} \quad \beta^1_{R\lambda} \quad \beta^1_{RT}]^T$ and $\beta^{\mathbf{2}}{}_R = [\beta^2_{R0} \quad \beta^2_{R\lambda} \quad \beta^2_{RT}]^T$.

However, with $[\delta_{R0} \quad \delta_{R\lambda} \quad \delta_{RT}]^T = [0 \quad 0 \quad 0]^T$, this reduces to

$$\frac{R}{S}_i = \Phi(\mathbf{x}_i\alpha)[(\beta^1_{R0} - \beta^2_{R0}) + (\beta^1_{R\lambda} - \beta^2_{R\lambda})\lambda_i + (\beta^1_{RT} - \beta^2_{RT})T_i] + \beta^2_{R0} + \beta^2_{R\lambda}\lambda_i + \beta^2_{RT}T_i + v_{R_i}. \tag{30}$$

Finally, since $E(\mathbf{v}_i|\mathbf{x}_i) = 0$, the expected value of $\frac{R}{S}_i$ given $\mathbf{x}_i$ is the same as before (see equation (12)):

$$E[(\frac{R}{S}_i)|\mathbf{x}_i] = \Phi(\mathbf{x}_i\alpha)[(\beta^1_{R0}-\beta^2_{R0})+(\beta^1_{R\lambda}-\beta^2_{R\lambda})\lambda_i+(\beta^1_{RT}-\beta^2_{RT})T_i]+\beta^2_{R0}+\beta^2_{R\lambda}\lambda_i+\beta^2_{RT}T_i, \quad (31)$$

as well as its derivative with respect to revenues (see equation (13)):

$$\frac{dE[(\frac{R}{S}_i)|\mathbf{x}_i]}{dT_i} = [\Phi(\mathbf{x}_i\alpha)+\phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta^1_{RT}-\beta^2_{RT})+\phi(\mathbf{x}_i\alpha)\alpha_T[(\beta^1_{R0}-\beta^2_{R0})+(\beta^1_{R\lambda}-\beta^2_{R\lambda})\lambda_i]+\beta^2_{RT}, \quad (32)$$

Thus, the same direct, indirect, and total effects are obtained, which implies that the particular choice of spending proxy, as long as it is divided by total spending S, is inconsequential. Indeed, Tables A.22 to A.27 show that using different components of spending gives the exact same results.

Table A.22: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through health spending

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	.0001281	.0000307	-.000032
(s.e.)	(.000146)	(.00007)	(.0000244)
Indirect Effect	-.0001902	-.00004	.0000232
(s.e.)	(.0002498)	(.0000548)	(.0000226)
Total Effect	-.0000621	-.0000095	-.0000088
(s.e.)	(.0002611)	(.0000514)	(.0000248)
Observations	198	198	198

Table A.23: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through labor spending

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	.0001281	.0000307	-.000032
(s.e.)	(.000146)	(.00007)	(.0000244)
Indirect Effect	-.0001902	-.00004	.0000232
(s.e.)	(.0002498)	(.0000548)	(.0000226)
Total Effect	-.0000621	-.0000095	-.0000088
(s.e.)	(.0002611)	(.0000514)	(.0000248)
Observations	198	198	198

Table A.24: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through public-services spending

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	.0001281	.0000307	-.000032
(s.e.)	(.000146)	(.00007)	(.0000244)
Indirect Effect	-.0001902	-.00004	.0000232
(s.e.)	(.0002498)	(.0000548)	(.0000226)
Total Effect	-.0000621	-.0000095	-.0000088
(s.e.)	(.0002611)	(.0000514)	(.0000248)
Observations	198	198	198

Table A.25: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through education spending

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	.0001281	.0000307	-.000032
(s.e.)	(.000146)	(.00007)	(.0000244)
Indirect Effect	-.0001902	-.00004	.0000232
(s.e.)	(.0002498)	(.0000548)	(.0000226)
Total Effect	-.0000621	-.0000095	-.0000088
(s.e.)	(.0002611)	(.0000514)	(.0000248)
Observations	198	198	198

Table A.26: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through social welfare spending

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	.0001281	.0000307	-.000032
(s.e.)	(.000146)	(.00007)	(.0000244)
Indirect Effect	-.0001902	-.00004	.0000232
(s.e.)	(.0002498)	(.0000548)	(.0000226)
Total Effect	-.0000621	-.0000095	-.0000088
(s.e.)	(.0002611)	(.0000514)	(.0000248)
Observations	198	198	198

Table A.27: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through economic services spending

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	.0001281	.0000307	-.000032
(s.e.)	(.000146)	(.00007)	(.0000244)
Indirect Effect	-.0001902	-.00004	.0000232
(s.e.)	(.0002498)	(.0000548)	(.0000226)
Total Effect	-.0000621	-.0000095	-.0000088
(s.e.)	(.0002611)	(.0000514)	(.0000248)
Observations	198	198	198

B Inclusion of NCR mayors

Table A.28 estimates the reduced-form model, while Table A.29 estimates the structural model, using a sample that includes municipalities from NCR/Metro Manila.

Table A.28: Total effect of IRA on mayor's accumulated net worth, real assets, and liabilities, by quantile regression - sample includes NCR

	(1)	(2)	(3)	(4)	(5)	(6)
	Change in NETWORTH per Spending		Change in REAL ASSETS per Spending		Change in LIABILITIES per Spending	
Proportion of Population Aged 15-24		-0.103		-0.00524		-0.00360
		(0.140)		(0.0375)		(0.0448)
Internal Revenue Allotment	-7.06e-06*	-4.40e-06	0	3.03e-08	0	-7.99e-08
	(3.69e-06)	(1.51e-05)	(5.63e-07)	(4.39e-06)	(3.54e-06)	(4.31e-06)
Constant	0.00778***	0.0271	0	0.00110	0	0.000744
	(0.00192)	(0.0273)	(0.000587)	(0.00725)	(0.000892)	(0.00869)
Observations	241	208	231	198	231	198
sum_adev	12.38	10.36	4.424	3.753	2.644	2.153
sum_rdev	12.39	10.37	4.424	3.754	2.644	2.153

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

C Removal of Outliers

Figures A.5 to A.7 reveal that except for few values that are very far from zero, the distributions of *networth*, *realassets* and *liabilities* are symmetric about zero. I drop these extreme values and re-estimate the structural model. Table A.30 reports results for the case when *networth*

Table A.29: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through construction spending; sample includes NCR

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	.0001048	.0000307	-.000032
(s.e.)	(.0001077)	(.0000725)	(.0000225)
Indirect Effect	-.0000645	-.0000315	.000014
(s.e.)	(.0001181)	(.0000459)	(.0000207)
Total Effect	.0000404	.0000008	-.000018
(s.e.)	(.0001265)	(.0000572)	(.0000235)
Observations	208	208	208

is restricted to values between -3 and 3, Table A.31 for when *realassets* is between -0.5 and 0.5, Table A.32 for when *liabilities* is between -0.2 and 0.2, and Table A.33 for when *networth* is further restricted to values between -0.2 and 0.2.

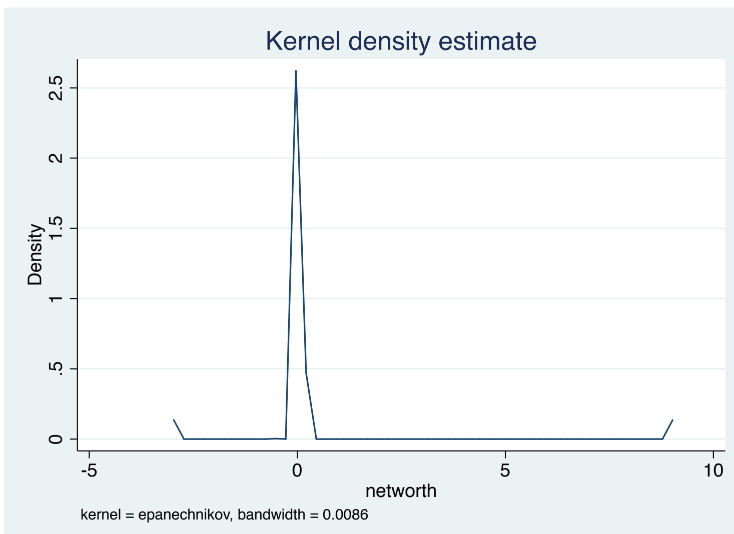


Figure A.5: $networth \in (-3, 3)$ approx. symmetric around zero

D Allocated IRA

The IRA amounts in the sample are those reported to have been *received* by the municipalities. I obtained data from the Department of Budget and Management on the IRA amount that the national government reports to have *allocated* to each municipality over the sample period. (Such allocations are computed using the IRA-formula specified by law.) There are discrepancies - for 92 (out of 231) municipalities, the reported IRA is not exactly equal to the allocated IRA. (See summary statistics below.)

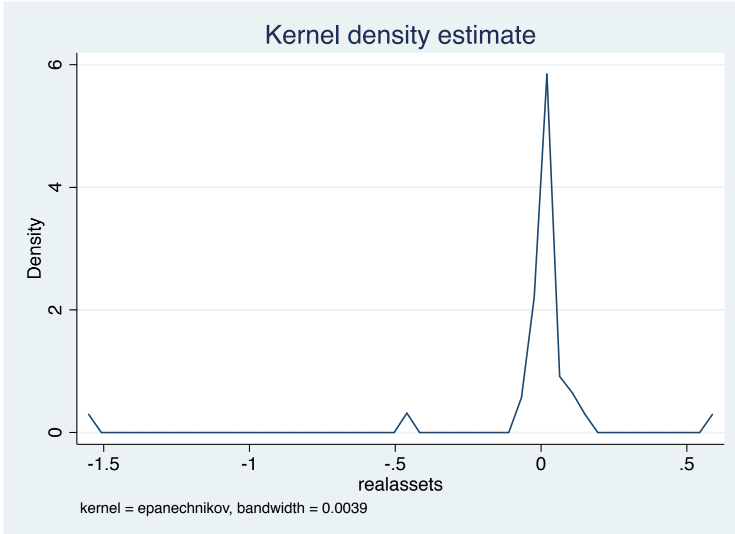


Figure A.6: $realassets \in (-0.5, 0.5)$ approx. symmetric around zero

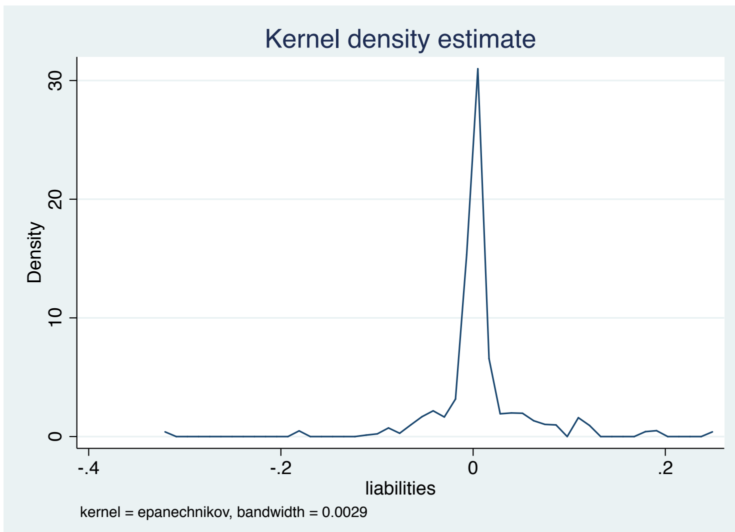


Figure A.7: $liabilities \in (-0.2, 0.2)$ approx. symmetric around zero

Received IRA vs. Allocated IRA

Variable	Obs	Mean	Std. Dev.	Min	Max
Received IRA	231	98.52139	119.839	24.29	1083.83
Allocated IRA	231	98.35736	118.5756	24.29	1062.27

However, Tables A.34 to A.39 show that using the allocated IRA in lieu of the received IRA generates estimates that are practically identical to estimates using received IRA.

Table A.30: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through construction spending; sample includes only municipalities whose mayor's change in net worth per spending is between -3 and 3

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	.0001281	.0000307	-.000032
(s.e.)	(.0001418)	(.0000699)	(.0000229)
Indirect Effect	-.0001032	-.0000387	.0000213
(s.e.)	(.0000864)	(.0000541)	(.0000223)
Total Effect	.0000249	-.0000081	-.0000107
(s.e.)	(.0000962)	(.0000558)	(.0000230)
Observations	197	197	197

Table A.31: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through construction spending; sample includes only municipalities whose mayor's change in real assets per spending is between -0.5 and 0.5

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	.0000233	-.0000242	-.0000341
(s.e.)	(.0000548)	(.0000292)	(.0000219)
Indirect Effect	-.0001396	-.0000126	.0000245
(s.e.)	(.000258)	(.0000368)	(.0000219)
Total Effect	-.0001163	-.0000368	-.0000096
(s.e.)	(.0002594)	(.0000390)	(.0000232)
Observations	197	197	197

Table A.32: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through construction spending; sample includes only municipalities whose mayor's change in liabilities per spending is between -0.2 and 0.2

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	.0001201	.0000312	-.0000215
(s.e.)	(.0001431)	(.0000707)	(.0000175)
Indirect Effect	-.0001895	-.0000406	.0000185
(s.e.)	(.0002137)	(.0000575)	(.0000199)
Total Effect	-.0000694	-.0000094	-.000003
(s.e.)	(.000217)	(.000054)	(.00002)
Observations	197	197	197

Table A.33: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through construction spending; sample includes only municipalities whose mayor's change in net worth per spending is between -0.2 and 0.2

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	-.0000172	-.0000255	-.0000255
(s.e.)	(.000028)	(.0000268)	(.0000171)
Indirect Effect	-.0000207	.0000005	.0000154
(s.e.)	(.0000265)	(.00003)	(.0000206)
Total Effect	-.0000379	-.000025	-.0000101
(s.e.)	(.0000291)	(.0000316)	(.0000215)
Observations	185	185	185

Table A.34: Reduced-form effect of municipal revenues on mayor's accumulated net worth, real assets, and liabilities, by quantile regression; revenues proxied by allocated Internal Revenue Allotment

	(1)	(2)	(3)	(4)	(5)	(6)
	Change in NET WORTH per Spending		Change in REAL ASSETS per Spending		Change in LIABILITIES per Spending	
Proportion of Population Aged 15-24		-0.0220		-0.00524		-0.00365
		(0.139)		(0.0374)		(0.0424)
Internal Revenue Allotment (Allocated)	-2.34e-05*	-2.32e-05***	0	3.09e-08	0	-8.11e-08
	(1.34e-05)	(8.88e-06)	(5.77e-07)	(4.34e-06)	(3.54e-06)	(1.44e-06)
Constant	0.00912***	0.0137	0	0.00110	0	0.000755
	(0.00262)	(0.0272)	(0.000590)	(0.00724)	(0.000891)	(0.00837)
Observations	231	198	231	198	231	198
Sum of abs. deviations	12.32	10.31	4.424	3.753	2.644	2.153
Sum of raw deviations	12.35	10.33	4.424	3.754	2.644	2.153

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.35: Estimating the probability (by probit regression) that the no-theft constraint binds, as proxied by *No Debt*; revenues proxied by allocated Internal Revenue Allotment

VARIABLES	No Debt
Proportion of Population Aged 15-24	4.663
	(6.013)
Internal Revenue Allotment (Allocated)	-0.00190**
	(0.000963)
Constant	-1.133
	(1.163)
Observations	198

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

When the municipalities whose received IRA is not equal to allocated IRA are dropped from the sample, the reduced-form estimates remain robust - the estimated coefficient of ira is still around $-2.00e(-05)$. (See Table A.40.) However, results from estimating the structural model are different - while the direct effect is still positive, and the indirect effect still negative, the total effect is now positive (See Table A.41.)

Table A.36: Effect of municipal revenues on public spending on construction and on the mayor's accumulated net worth (by system OLS regression), in municipalities in which the no-theft constraint binds ($No\ Debt = 1$), and in municipalities in which it does not bind ($No\ Debt = 0$); revenues proxied by allocated Internal Revenue Allotment

	$No\ Debt = 1$		$No\ Debt = 0$	
	(1)	(2)	(3)	(4)
	Construction spending	Change in NET WORTH per spending	Construction spending	Change in NET WORTH per spending
Proportion of Population Aged 15-24	34.35	2.042	-211.5	-0.912
	(76.08)	(6.754)	(339.3)	(2.186)
Internal Revenue Allotment (Allocated)	0.166***	-6.50e-05	0.276***	0.000134
	(0.0163)	(0.00145)	(0.0286)	(0.000184)
Constant	-11.36	-0.229	35.01	0.148
	(14.75)	(1.310)	(65.45)	(0.422)
Observations	68	68	130	130
R-squared	0.618	0.001	0.425	0.005

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.37: Effect of municipal revenues on public spending on construction and on the mayor's accumulated real assets (by system OLS regression), in municipalities in which the no-theft constraint binds ($No\ Debt = 1$), and in municipalities in which it does not bind ($No\ Debt = 0$); revenues proxied by allocated Internal Revenue Allotment

	$No\ Debt = 1$		$No\ Debt = 0$	
	(1)	(2)	(3)	(4)
	Construction spending	Change in NET WORTH per spending	Construction spending	Change in NET WORTH per spending
Proportion of Population Aged 15-24	34.35	-0.0113	-211.5	-0.358
	(76.08)	(0.441)	(339.3)	(1.221)
Internal Revenue Allotment (Allocated)	0.166***	-7.05e-05	0.276***	3.42e-05
	(0.0163)	(9.47e-05)	(0.0286)	(0.000103)
Constant	-11.36	0.0133	35.01	0.0579
	(14.75)	(0.0856)	(65.45)	(0.235)
Observations	68	68	130	130
R-squared	0.618	0.009	0.425	0.001

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

E Other proxies for d

Lastly, I use two other proxies for d (i.e. the indicator for when the no-theft constraint is binding), namely, *city*, an indicator for city-municipalities, and *urban*, an indicator for urban

Table A.38: Effect of municipal revenues on public spending on construction and on the mayor's accumulated liabilities (by system OLS regression), in municipalities in which the no-theft constraint binds ($No\ Debt = 1$), and in municipalities in which it does not bind ($No\ Debt = 0$); revenues proxied by allocated Internal Revenue Allotment

	No Debt = 1		*No Debt* = 0	
	(1)	(2)	(3)	(4)
	Construction spending	Change in NET WORTH per spending	Construction spending	Change in NET WORTH per spending
Proportion of Population Aged 15-24	34.35	0.00741	-211.5	0.130
	(76.08)	(0.222)	(339.3)	(0.368)
Internal Revenue Allotment (Allocated)	0.166***	1.13e-05	0.276***	-3.29e-05
	(0.0163)	(4.77e-05)	(0.0286)	(3.10e-05)
Constant	-11.36	-0.00541	35.01	-0.0114
	(14.75)	(0.0431)	(65.45)	(0.0710)
Observations	68	68	130	130
R-squared	0.618	0.001	0.425	0.009

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.39: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through construction spending; revenues proxied by allocated Internal Revenue Allotment

	(1)	(2)	(3)
	Change in NET WORTH per Spending	Change in REAL ASSETS per Spending	Change in LIABILITIES per Spending
Direct Effect	.0001281	.0000307	-.000032
(s.e.)	(.0001457)	(.00007)	(.0000244)
Indirect Effect	-.0001902	-.00004	.0000232
(s.e.)	(.0002498)	(.0000548)	(.0000226)
Total Effect	-.0000621	-.0000094	-.0000088
(s.e.)	(.0002611)	(.0000514)	(.0000248)
Observations	198	198	198

municipalities. As Tables A.42 and A.43 show, the estimated total effect (via the structural approach) is now positive, albeit the direct effect is still positive and the indirect effect still negative.

11 Additional Tables

Table A.40: Reduced-form effect of municipal revenues on mayor's accumulated net worth, real assets, and liabilities, by quantile regression; sample includes only municipalities with received equal to allocated Internal Revenue Allotment

	(1)	(2)	(3)	(4)	(5)	(6)
	Change in NETWORTH per Spending		Change in REAL ASSETS per Spending		Change in LIABILITIES per Spending	
Proportion of Population Aged 15-24		0.0713		-0.0365		-0.000746
		(0.248)		(0.128)		(0.0727)
Internal Revenue Allotment (Allocated)	-2.52e-05*	2.55e-05	0	6.89e-06	1.48e-06	1.47e-06
	(1.34e-05)	(2.59e-05)	(3.64e-06)	(1.39e-05)	(5.50e-06)	(6.96e-06)
Constant	0.0109***	-0.00572	0	0.00713	-4.98e-05	8.85e-05
	(0.00323)	(0.0489)	(0.00173)	(0.0250)	(0.00131)	(0.0140)
Observations	138	112	138	112	138	112
Sum of abs. deviations	5.712	4.056	2.942	2.446	1.640	1.356
Sum of raw deviations	5.715	4.063	2.942	2.449	1.640	1.357

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.41: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through construction spending; sample includes only municipalities with received equal to allocated Internal Revenue Allotment

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	.0004287	.0001173	-.0000578
(s.e.)	(.000296)	(.0001515)	(.0000443)
Indirect Effect	-.0002974	-.0001454	(.000116)
(s.e.)	(.0002215)	(.0001282)	(.0000531)
Total Effect	.0001312	-.000028	.0000582
(s.e.)	(.0002263)	(.0001277)	(.0000547)
Observations	113	113	113

Table A.42: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through construction spending; no-theft constraint proxied by *city*

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	.0006875	.0001247	-.0000305
(s.e.)	(.0007139)	(.0001851)	(.0000641)
Indirect Effect	-.0000535	-.0000139	-.0000087
(s.e.)	(.0001201)	(.0000351)	(.0000127)
Total Effect	.000634	.0001108	-.0000392
(s.e.)	(.000652)	(.0001741)	(.0000624)
Observations	198	198	198

Table A.43: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth, real assets, and liabilities through construction spending; no-theft constraint proxied by *urban*

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Direct Effect	.0021439	.0003165	-.0000005
(s.e.)	(0.000657)	(.0003521)	(.0001085)
Indirect Effect	-.0002029	-.0000336	-.0000068
(s.e.)	(.0000784)	(.0000177)	(.0000085)
Total Effect	.001941	.0002829	-.0000073
(s.e.)	(.0006031)	(.0003373)	(.0001033)
Observations	198	198	198

Table A.44: Reduced-form effect of municipal revenues on mayor's accumulated net worth, real assets, and liabilities, by quantile regression, with control variables

	(1) Change in NET WORTH per Spending	(2) Change in REAL ASSETS per Spending	(3) Change in LIABILITIES per Spending
Proportion of Population Aged 15-24	-0.258	-0.0602**	-0.0858
	(0.213)	(0.0296)	(0.0703)
Internal Revenue Allotment	-0.000139	1.75e-06	-5.05e-05
	(0.000159)	(4.99e-05)	(4.56e-05)
Log of the Land Area of the Municipality	0.00457	0.000549	0.00137
	(0.00315)	(0.00119)	(0.00104)
Log of the Ave. Population (2010-2015)	0.00611	1.70e-05	0.00201
	(0.00671)	(0.000946)	(0.00183)
Constant	-0.0414	0.00689	-0.0132
	(0.0837)	(0.0137)	(0.0243)
Observations	176	176	176
Sum of abs. deviations	9.915	3.558	2.050
Sum or raw deviations	9.941	3.562	2.057

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.45: Reduced-form effect of municipal revenues on mayor's accumulated net worth, by quantile regression, using different proxies for λ

	(1)	(2)	(3)	(4)	(5)
	Change in NET WORTH per Spending				
Proportion of School-Age Youth Enrolled in School	0.0158				
	(0.0651)				
Internal Revenue Allotment	-2.22e-05***	-2.14e-05*	-2.49e-05**	-2.40e-05***	2.58e-05
	(8.29e-06)	(1.22e-05)	(1.03e-05)	(8.39e-06)	(4.41e-05)
Proportion of Population Who Are Employed		-0.0145*			
		(0.00804)			
Proportion of Population in Professional Jobs			0.00687		
			(0.0413)		
Proportion of Households That Have a Cellphone				0.00125	
				(0.0128)	
Proportion of Population Who are Registered Voters					0.0397**
					(0.0182)
Constant	0.00473	0.0139***	0.00863*	0.00844	-0.0171
	(0.0179)	(0.00471)	(0.00447)	(0.00902)	(0.0120)
Observations	198	198	198	198	205
sum_adev	10.31	10.31	10.31	10.31	11.94
sum_rdev	10.33	10.33	10.33	10.33	11.94

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.46: 'Placebo effect' of municipal revenues on the differences in net worth, real assets, and liabilities of the 2011 and the 2014 mayors, by quantile regression

	(1) Difference in NET WORTH per Spending	(2) Difference in REAL ASSETS per Spending	(3) Difference in LIABILITIES per Spending
Proportion of Population Aged 15-24	-0.197	0.224	0.0937
	(0.458)	(0.395)	(0.133)
Internal Revenue Allotment	2.33e-05	1.21e-05	3.16e-06
	(2.59e-05)	(1.65e-05)	(4.11e-06)
Constant	0.0342	-0.0474	-0.0180
	(0.0898)	(0.0799)	(0.0261)
Observations	128	128	128
Sum of abs. deviations	12.13	5.909	4.928
Sum of raw deviations	12.15	5.929	4.933

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.47: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth through construction spending, using different proxies for λ

	Change in NET WORTH per Spending, using as λ the following proxies:				
	Proportion of School-Age Youth Enrolled in School	Proportion Who Are Employed	Proportion of Population in Professional Jobs	Proportion of Households That Have a Cellphone	Proportion of Population who are Registered Voters
Direct Effect	.0001057	.0001294	.0000596	.0001026	.0007989
(s.e.)	(.0001328)	(.000135)	(.0000975)	(.0001307)	(.0005053)
Indirect Effect	-.0001342	-.0001702	-.0008474	-.0002589	.0010737
(s.e.)	(.0002666)	(.0002569)	(.0007179)	(.0003786)	(.0018987)
Total Effect	-.0000285	-.0000408	-.0007879	-.0001563	.0018726
(s.e.)	(.0002742)	(.0002606)	(.0007209)	(.0003854)	(.0019048)
Observations	198	198	198	198	205

Table A.48: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth through construction spending, subsetting the sample of municipalities by major geographical areas Luzon, Visayas-Mindanao

	Change in NET WORTH per Spending, using municipalities in:		
	Entire country	Luzon	Visayas and Mindanao
Direct Effect	.0001281	.0004345	-.0000065
(s.e.)	(.0001457)	(.0004249)	(.0000508)
Indirect Effect	-.0001902	-.0003678	-.0000315
(s.e.)	(.0002498)	(.0008233)	(.00005)
Total Effect	-.0000621	.0000667	-.0000381
(s.e.)	(.0002611)	(.0008281)	(.0000612)
Observations	198	129	69

Table A.49: Effect of municipal revenues on public spending on construction and on the mayor's accumulated net worth (by system OLS regression), in municipalities in which the no-theft constraint binds (*No Debt* = 1), and in municipalities in which it does not bind (*No Debt* = 0); sample includes only municipalities in Visayas and Mindanao

	No Debt = 1		*No Debt* = 0	
	(1)	(2)	(3)	(4)
	Construction spending	Change in NET WORTH per spending	Construction spending	Change in NET WORTH per spending
Proportion of Population Aged 15-24	91.06	-1.299	-179.5	0.630
	(72.80)	(0.953)	(169.2)	(0.784)
Internal Revenue Allotment	0.0857***	-4.93e-05	0.160***	-6.53e-06
	(0.0213)	(0.000279)	(0.0113)	(5.22e-05)
Constant	-20.82	0.294	33.18	-0.118
	(14.44)	(0.189)	(33.74)	(0.156)
Observations	17	17	52	52
R-squared	0.570	0.115	0.797	0.012

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.50: Effect of municipal revenues on public spending on construction and on the mayor's accumulated net worth (by system OLS regression), in municipalities in which the no-theft constraint binds (*No Debt* = 1), and in municipalities in which it does not bind (*No Debt* = 0); sample includes only municipalities in Luzon

	No Debt = 1		*No Debt* = 0	
	(1)	(2)	(3)	(4)
	Construction spending	Change in NET WORTH per spending	Construction spending	Change in NET WORTH per spending
Proportion of Population Aged 15-24	65.92	3.533	218.6	-5.185
	(89.78)	(8.278)	(559.6)	(4.493)
Internal Revenue Allotment	0.167***	-0.000135	0.524***	0.000435
	(0.0183)	(0.00169)	(0.0518)	(0.000416)
Constant	-16.16	-0.460	-65.15	0.915
	(17.19)	(1.585)	(105.5)	(0.847)
Observations	51	51	78	78
R-squared	0.639	0.004	0.592	0.024

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.51: Direct, Indirect, and Total Effects of municipal revenues on the differences in net worth, real assets, and liabilities of the 2011 and the 2014 mayors through construction spending; using placebo sample

	(1) Difference in NET WORTH per Spending	(2) Difference in REAL ASSETS per Spending	(3) Difference in LIABILITIES per Spending
Direct Effect	.0003089	-.0000534	-.0000922
(s.e.)	(.0003481)	(.0000585)	(.0000587)
Indirect Effect	-.0001304	-.000062	-.0001252
(s.e.)	(.0002187)	(.0001421)	(.0001923)
Total Effect	.0001785	-.0001154	-.0002175
(s.e.)	(.0001761)	(.0001433)	(.0001938)
Observations	128	128	128

Table A.52: Estimating the probability (by probit regression) that the no-theft constraint binds, as proxied by *No Debt*; using placebo sample

	No Debt
Proportion of Population Aged 15-24	-3.950
	(10.21)
Internal Revenue Allotment	-0.00235**
	(0.00114)
Constant	0.527
	(1.983)
Observations	128

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.53: Effect of municipal revenues on public spending on construction and on the difference in net worth of the 2011 and 2014 mayors (by system OLS regression), in municipalities in which the no-theft constraint binds ($No\ Debt = 1$), and in municipalities in which it does not bind ($No\ Debt = 0$); using placebo sample

	$No\ Debt = 1$		$No\ Debt = 0$	
	(1)	(2)	(3)	(4)
	Construction spending	Difference in NET WORTH per spending	Construction spending	Difference in NET WORTH per spending
Proportion of Population Aged 15-24	-13.69	1.336	8.675	0.463
	(249.0)	(2.961)	(249.0)	(8.447)
Internal Revenue Allotment	0.197***	7.05e-05	0.191***	0.000309
	(0.0281)	(0.000334)	(0.0196)	(0.000666)
Constant	-4.772	-0.289	-6.022	-0.223
	(48.49)	(0.577)	(48.37)	(1.641)
Observations	39	39	89	89
R-squared	0.558	0.006	0.523	0.003

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.54: Effect of municipal revenues on public spending on construction and on the difference in real assets of the 2011 and 2014 mayors (by system OLS regression), in municipalities in which the no-theft constraint binds ($No\ Debt = 1$), and in municipalities in which it does not bind ($No\ Debt = 0$); using placebo sample

	$No\ Debt = 1$		$No\ Debt = 0$	
	(1)	(2)	(3)	(4)
	Construction spending	Difference in REAL ASSETS per spending	Construction spending	Difference in REAL ASSETS per spending
Proportion of Population Aged 15-24	-13.69	-0.600	8.675	-0.376
	(249.0)	(7.395)	(249.0)	(1.205)
Internal Revenue Allotment	0.197***	-0.000199	0.191***	-5.34e-05
	(0.0281)	(0.000835)	(0.0196)	(9.50e-05)
Constant	-4.772	0.178	-6.022	0.0923
	(48.49)	(1.440)	(48.37)	(0.234)
Observations	39	39	89	89
R-squared	0.558	0.002	0.523	0.005

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.55: Effect of municipal revenues on public spending on construction and on the difference in liabilities of the 2011 and 2014 mayors (by system OLS regression), in municipalities in which the no-theft constraint binds ($No\ Debt = 1$), and in municipalities in which it does not bind ($No\ Debt = 0$); using placebo sample

	$No\ Debt = 1$		$No\ Debt = 0$	
	(1)	(2)	(3)	(4)
	Construction spending	Difference in LIABILITIES per spending	Construction spending	Difference in LIABILITIES per spending
Proportion of Population Aged 15-24	-13.69	-2.196	8.675	-0.716
	(249.0)	(10.24)	(249.0)	(1.154)
Internal Revenue Allotment	0.197***	-0.000388	0.191***	-9.22e-05
	(0.0281)	(0.00116)	(0.0196)	(9.10e-05)
Constant	-4.772	0.553	-6.022	0.180
	(48.49)	(1.993)	(48.37)	(0.224)
Observations	39	39	89	89
R-squared	0.558	0.004	0.523	0.018

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1