

# Grand Corruption by Theft and Bribery

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## Abstract

A public official who has discretionary power over the government budget can obtain rents by stealing government revenues or receiving bribe payments in exchange for spending those revenues on public goods and services. I propose a method of simultaneously measuring these two kinds of grand corruption. I then demonstrate it using data from asset declarations of municipal mayors in the Philippines. The results suggest that an increase in government revenues increases theft, but decreases bribes by a larger extent such that total corruption falls. However, public good provision also declines since some of the additional revenues are stolen.

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# 1 Introduction

This paper is the first to simultaneously measure two kinds of grand corruption: the theft of government revenues, and bribe payments from public spending. Both types of corruption are ubiquitous, especially in the developing world.<sup>1</sup> Two of the largest corruption scandals to date illustrate how government revenues can be siphoned off directly, or otherwise allocated to public projects that are implemented by firms from which public officials obtain bribes and kickbacks. Former Malaysian Prime Minister Najib Razak is currently on trial for his suspected involvement in the theft of over \$4.5 billion from the Malaysia's state development fund 1MDB, out of which \$681 million were allegedly transferred to Mr. Razak's personal bank account. The funds were apparently embezzled out of the country and spent on luxury properties, yachts, and even used to fund the 2013 Hollywood film "The Wolf of Wall Street". In Brazil, the Petrobras scandal illustrates large scale corruption in the form of bribery, in which officials at the state-owned oil company Petroleo Brasileiro were alleged to have received bribes from construction companies in exchange for awarding contracts to the latter. The scandal is estimated to have amounted to \$9.5 billion in illicit payments, some of which were alleged to have been used in vote-buying schemes that benefited the Workers Party, including former Presidents Ignacio Lula Da Silva and Dilma Rousseff.

The costs are enormous even in normal times. The OECD (2013) estimates that about 20 to 25% of government procurement budgets, equivalent to about \$2 trillion or 2% 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 \$ 7.8 trillion from illicit financial outflows due to trade misinvoicing and leakages in the balance of payments. *The Independent* reports that about \$1 trillion a year is siphoned away

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<sup>1</sup>These, of course, are not the only types of grand corruption. From Transparency International: "Grand corruption occurs when a public official...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](https://www.transparency.org/news/feature/what_is_grand_corruption_and_how_can_we_stop_it). For recent surveys, see Fisman and Golden (2017) and Rose-Ackerman and Palifka (2016).

from developing countries through money laundering, tax evasion, and embezzlement.<sup>2</sup>

Theft and bribery also occur at the local level – in some cases, local government officials embezzle public funds that have already been allocated towards particular projects, while in other cases, they allocate the funds towards projects in exchange for bribes and kickbacks. For instance, Olken (2006) shows that in Indonesia, about 18% of government subsidized rice that were allocated to villages and districts ‘disappeared’ in that they were not received by the intended households. Olken suggests that the rice was stolen by village officials who were in charge of distributing it. Similarly, Reinikka and Svensson (2004) show that 86% of Uganda’s educational grants were not received by schools, while Neihaus and Suktankhar (2013) estimate that 79% of funds allocated to India’s National Rural Employee Guarantee Scheme did not reach the employees. Meanwhile, Batalla (2000) provides anecdotal evidence of how bribery from public spending occurs at the local level in the Philippines. Large public works projects that cover multiple jurisdictions are divided into smaller projects so that local governments could award them to their ‘favored’ contractors. In exchange, local officials apparently earn kickbacks amounting to about 20 to 40% of the project. More recent evidence of local-level bribery in developing countries include Knutsen, Kotsadam, Olsen, and Wig (2016) for Africa, Brierley (2020) for Ghana, and Figueroa (2020) for Argentina.

Developed countries are not immune to such instances of corruption. Dincer and Johnston (2018) provide a corruption perceptions index for states in the U.S. and reveal that in most states, illegal corruption in the state’s executive and legislative branches are perceived to be “slightly common” or “moderately common”. Leeson and Sobel (2008) analyze a specific type of public good provision from which local public officials can steal revenues or earn bribes - the allocation of funds for disaster relief. They show that between 1990 and 1999, each \$100 of funds provided by the Federal Emergency Management Agency (FEMA) to states for natural disaster relief increased the state’s average number of convictions of corruption-related crimes by 102%. They suggest two ways by which state public officials benefit - theft

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

and bribery. Citing Lakin (2004), they note that officials in Buchanan county in Virginia solicited bribes from firms that have been awarded contracts for reconstruction projects. As an example of theft, they mention that in 2005, a public employee in Florida attempted to embezzle \$48,000 of FEMA relief after a hurricane in 1998.

The key distinction between theft and bribery is that theft is *directly* appropriated from revenues, whereas bribes are *indirectly* earned by spending those revenues. One could then estimate the direct effect of government revenues on a public official's accumulated wealth to measure her accumulated rents from theft, and estimate the indirect effect of revenues through public spending to measure her accumulated rents from bribes. The problem, however, is that these two effects cannot be readily measured because of a critical simultaneity problem: the revenues that are stolen cannot be spent. This means that the public official's accumulated rents and the level of public spending are jointly determined. Unless one imposes additional restrictions, it is impossible to measure both the direct and the indirect effects of government revenues.

To obtain such restrictions, I construct a formal model from which I derive an important comparative static result that enables one to separate out the direct from the indirect effect. I find that there exists a threshold level of government revenues, at and below which the public official is constrained not to steal revenues and, therefore, can only keep increasing her rents by spending each additional revenue and extracting bribes therefrom. Above the threshold, I find that each additional revenue is stolen, which implies that public spending above the threshold, and the amount of bribes associated with it, remain fixed. To estimate the direct effect, one could then use data from jurisdictions that have revenues above the threshold. Pinning down the direct effect, one could then use data from jurisdictions below and above the threshold to estimate the indirect effect since bribe-taking occurs below and above the threshold, albeit at a fixed rate in the latter region.

To implement the statistical procedure, I parameterize the model, add stochastic errors, make additional assumptions, and derive the formulae for the direct effect and the indirect

effect. I then propose a two-step estimation of the parameters in the formulae. First, given data on many jurisdictions, one estimates the probability that a jurisdiction is at or below the threshold level of revenues. Second, one estimates the model's parameters using the subset of jurisdictions at or below the threshold, and the subset of jurisdictions above the threshold. These estimated parameters, along with the estimated probability from the first step, are finally combined according to the formulae for the direct and indirect effects.

Finally, to illustrate the method, I use data from municipalities in the Philippines. The Philippines is an ideal test case, since instances of grand corruption in the allocation of public funds abound, both in the form of theft and bribery. Anecdotal evidence suggest that between 20 to 40% 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% of all corruption cases filed against high-level public officials were cases involving the malversation of public funds.<sup>3</sup>

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 manually collected, digitized, and encoded the data from all the SALNs submitted by mayors in multiple years.<sup>4</sup>

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<sup>3</sup>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).

<sup>4</sup>Asset disclosure statements have 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. (2014) 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.

As a proxy for the public official's accumulated wealth, I compute the growth of a municipal mayor's assets during one term of office, while dealing with issues of selection and likely misreporting in the SALN.

I find a positive direct effect and a negative indirect effect. That is, municipal revenues increase a mayor's accumulated rents from theft, but decrease accumulated rents from bribery. The estimated magnitude of the indirect effect is larger than that of the direct effect, such that the net change in total accumulated rents is negative. This suggests that in the case of the Philippines, an increase in government revenues lowers corruption, in that total rent accumulation slows down, but it also decreases the provision of public goods and services since some of the additional revenues are stolen.

One might contend that only the change in total rents should matter, and that the source of such rents – whether theft or bribery is irrelevant. I offer three arguments to rebut this claim. First, 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 sufficient evidence.<sup>5</sup> 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.

Second, the type of high-level 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

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<sup>5</sup>Avis, Ferraz and Finan (2018) show the effectiveness of random audits in Brazil.

could have been provided had the public official taken the extra bribes instead.

Lastly, this analysis has implications on political turnover. 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), Choi and Woo (2013), Zechmeister and Zizumbo-Colunga (2013)). Winters and Weitz-Shapiro (2013) 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 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.

## 2 Theft and Bribery in Public Good Provision

Grossman and Helpman (2001) provide a model of public good provision by a public official who extracts bribes from the private sector in exchange for spending government revenues on public goods. In this extension, I allow for the possibility that the official also steals some of the revenues.

Consider a jurisdiction with two sectors/principals whose common agent – a public official in charge of the government budget, decides how to use government revenues  $T$ . Specifically, the agent allocates public spending  $g_1$  towards principal 1 and  $g_2$  to principal 2. 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 the 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.  $R = T - g_1 - g_2 + b$ . The agent also cares 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 she attaches to social welfare.

As standard in common agency models with complete information, in equilibrium, the agent's action (spending allocation) and the principal's payment (bribes) are jointly efficient. The equilibrium allocation and bribe payment is thus a solution to the following problem:

$$\begin{aligned} & \max_{g_1, g_2, b} V(g_1) - b \\ \text{s.t. } & \lambda[V(g_1) + V(g_2)] + (1 - \lambda)(T - g_1 - g_2 + b) \geq \bar{U} \quad (a) \\ & g_1 + g_2 - T \leq 0 \quad (b), \end{aligned}$$

where  $\bar{U}$  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; hence (b) is the 'no-theft constraint'. If it is non-binding, the amount  $T - g_1 - g_2 > 0$  can be stolen.

Proposition 1 below formally establishes that there exists a threshold value of revenues  $\bar{T}$ , at or below which the no-theft constraint is binding and, therefore, theft is not possible. This implies that  $\bar{T}$  captures the demand for public spending that the agent is constrained to meet. Above this threshold, the no-theft constraint is non-binding and, thus, the agent can now steal. Because only public spending at the amount of  $\bar{T}$  has to be met, the agent is able to steal *all* additional revenues above  $\bar{T}$ .

Thus, Proposition 1 shows that when the agent is constrained not to steal and has to spend all the revenues, the equilibrium amounts of public spending,  $g_1^*$  and  $g_2^*$ , depend on the size of the revenues (as well as the weight  $\lambda$  attached to social welfare). In contrast, if the agent is unconstrained not to steal and therefore steals all additional revenues above  $\bar{T}$ , then  $g_1^*$  and  $g_2^*$  are independent of the size of the revenues and only depend on  $\lambda$ .

Total equilibrium rents  $R^*$  are therefore equal to equilibrium bribes  $b^*$  when the no-theft



constraint is binding, or when revenues are at or below  $\bar{T}$ , since theft is not possible. (In turn,  $b^*$  is determined by the amount spent on the bribing sector,  $g_1^*$ , as well as  $T$  and  $\lambda$ ). When the no-theft constraint is non-binding, or revenues are above  $\bar{T}$ , then  $R^*$  consists of both the equilibrium amount of bribes  $b^*$  and of stolen revenues  $T - g_1^* - g_2^*$ .

**Proposition 1.** *There exists an (unobservable) threshold level of revenues  $\bar{T}$ , at and below which the no-theft constraint is binding. Let  $d = 1$  indicate that this constraint is binding, i.e.  $T \leq \bar{T}$  or  $\bar{T} - T \geq 0$ , and  $d = 0$  otherwise. Then, 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:

$$(a) \ g_1^* = f_3(\lambda)$$

$$(b) \ g_2^* = f_4(\lambda)$$

$$(c) \ R^* = b^* + T - g_1^* - g_2^* = \frac{\lambda}{1-\lambda} [2V(g_1^0) - V(g_1^*) - V(g_2^*)] - 2g_1^0 + T = f_5(\lambda, T, g_1^*, g_2^*, f_6(\lambda)),$$

$$\text{where } g_1^0 = f_6(\lambda).$$

(All proofs are in the Online Appendix.)

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

$$\begin{aligned}
g_1^* &= \begin{cases} f_1(\lambda, T) & \text{if } d = 1 \\ f_3(\lambda) & \text{otherwise} \end{cases} \\
g_2^* &= \begin{cases} T - f_1(\lambda, T) & \text{if } d = 1 \\ f_4(\lambda) & \text{otherwise} \end{cases} \\
R^* &= \begin{cases} f_2(\lambda, T, g_1^*) & \text{if } d = 1 \\ f_5(\lambda, T, g_1^*, g_2^*, f_6(\lambda)) & \text{otherwise} \end{cases}
\end{aligned} \tag{1}$$

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

$$\begin{aligned}
g_1^* &= \begin{cases} f_1(\lambda, T) & \text{if } d = 1 \\ f_3(\lambda) & \text{otherwise} \end{cases} \\
S^* &= \begin{cases} T & \text{if } d = 1 \\ f_3(\lambda) + f_4(\lambda) & \text{otherwise} \end{cases} \\
R^* &= \begin{cases} f_2(\lambda, T, g_1^*) & \text{if } d = 1 \\ f_5(\lambda, T, g_1^*, f_4(\lambda), f_6(\lambda)) & \text{otherwise} \end{cases}
\end{aligned} \tag{2}$$

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

$$\begin{aligned}
\left(\frac{g_1}{S}\right)^* &= \begin{cases} \frac{f_1(\lambda, T)}{T} & \text{if } d = 1 \\ \frac{f_3(\lambda)}{f_3(\lambda) + f_4(\lambda)} & \text{otherwise} \end{cases} \\
\left(\frac{R}{S}\right)^* &= \begin{cases} \frac{f_2(\lambda, T, g_1^*)}{T} & \text{if } d = 1 \\ \frac{f_5(\lambda, T, g_1^*, f_4(\lambda), f_6(\lambda))}{f_3(\lambda) + f_4(\lambda)} & \text{otherwise} \end{cases}
\end{aligned} \tag{3}$$

This can be expressed more generally as:

$$\begin{aligned} \left(\frac{g_1}{S}\right)^* &= \begin{cases} h_1(\lambda, T) & \text{if } d = 1 \\ h_2(\lambda) & \text{otherwise} \end{cases} \\ \left(\frac{R}{S}\right)^* &= \begin{cases} h_3(\lambda, T, g_1^*) & \text{if } d = 1 \\ h_4(\lambda, T, g_1^*) & \text{otherwise} \end{cases} \end{aligned} \quad (4)$$

Lastly, note that while Proposition 1 establishes the existence of  $\bar{T}$ , the model cannot determine its value. Thus, while the amount of revenues  $T$  is observable, whether or not it exceeds  $\bar{T}$ , and therefore the indicator variable  $d$ , is unobservable. However,  $d$  depends on revenues, since a larger  $T$  makes it more likely that it exceeds  $\bar{T}$ . It also depends on  $\lambda$ , since the agent is more constrained not to steal the more she cares about social welfare. That is:

**Proposition 2.** *The value of  $d$  depends on  $\lambda$  and  $T$ .*

### 3 Measuring Theft and Bribery

To take this model to the data, 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  $d$ . The other is that  $\frac{R}{S}$  and  $d$  are measured with error. Since rents are inherently hidden, one cannot perfectly quantify  $R$ . Whether or not the no-theft constraint is binding, i.e.  $d$ , is unobservable and can thus only be captured by a proxy variable.

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  $\theta$  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

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

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  $\pi$  is a vector of parameters that are functions of  $\theta$ .
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)  $\mathbf{u}_i \sim \mathcal{N}(\mathbf{0}, \sigma^2)$ .
4.  $\pi = (\alpha, \beta^1, \beta^2)$ .
5.  $Pr(d_i = 1|\mathbf{x}_i) = \Phi(\mathbf{x}_i\alpha)$ , where  $\Phi$  is the standard normal cdf.
6.  $E(\mathbf{y}_i|\mathbf{x}_i, d_i = 1) = \mathbf{x}_i\beta^1$  and  $E(\mathbf{y}_i|\mathbf{x}_i, d_i = 0) = \mathbf{x}_i\beta^2$ .

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

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

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

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

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

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

Lastly, rearranging gives:

$$\mathbf{y}_i = \mathbf{x}_i\gamma_i + \mathbf{u}_i, \quad (9)$$

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

### 3.1 Decomposing the Marginal Effect of Revenues on Total Rents

To identify the marginal rents from theft and those from bribery, one can conduct comparative statics to determine the effect of  $T$  on  $\frac{R}{S}$ . Recall that total rents consist of stolen revenues and bribe payments. Equation (4) implies that the total derivative of  $\frac{R}{S}$  with respect to  $T$  is (i)  $\frac{d\frac{R}{S}}{dT} = \frac{\partial h_3(\cdot)}{\partial T} + \frac{\partial h_3(\cdot)}{\partial g_1} \frac{\partial g_1}{\partial T}$  if  $d = 1$  and (ii)  $\frac{d\frac{R}{S}}{dT} = \frac{\partial h_4(\cdot)}{\partial T} + \frac{\partial h_4(\cdot)}{\partial g_1} \frac{\partial g_1}{\partial T} = \frac{\partial h_4(\cdot)}{\partial T}$  if  $d = 0$ . 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.

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  $d$  is endogenous to  $\lambda$  and  $T$ . I thus derive these parameters.

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

$$\frac{R}{S_i} = \gamma_{R0_i} + \gamma_{R\lambda_i} \lambda_i + \gamma_{RT_i} T_i + u_{R_i}, \quad (10)$$

where:

$$\begin{aligned} \gamma_{R0_i} &= \Phi(\mathbf{x}_i \alpha) \beta_{R0}^1 + (1 - \Phi(\mathbf{x}_i \alpha)) \beta_{R0}^2, \\ \gamma_{R\lambda_i} &= \Phi(\mathbf{x}_i \alpha) \beta_{R\lambda}^1 + (1 - \Phi(\mathbf{x}_i \alpha)) \beta_{R\lambda}^2, \\ \gamma_{RT_i} &= \Phi(\mathbf{x}_i \alpha) \beta_{RT}^1 + (1 - \Phi(\mathbf{x}_i \alpha)) \beta_{RT}^2, \\ \beta^1 &= [\beta_{R0}^1 \quad \beta_{R\lambda}^1 \quad \beta_{RT}^1] \text{ and } \beta^2 = [\beta_{R0}^2 \quad \beta_{R\lambda}^2 \quad \beta_{RT}^2], \end{aligned}$$

or:

$$\frac{R}{S_i} = \Phi(\mathbf{x}_i\alpha)[(\beta_{R0}^1 - \beta_{R0}^2) + (\beta_{R\lambda}^1 - \beta_{R\lambda}^2)\lambda_i + (\beta_{RT}^1 - \beta_{RT}^2)T_i] + \beta_{R0}^2 + \beta_{R\lambda}^2\lambda_i + \beta_{RT}^2T_i + u_{Ri}.$$

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

$$E\left[\left(\frac{R}{S_i}\right)|\mathbf{x}_i\right] = \Phi(\mathbf{x}_i\alpha)[(\beta_{R0}^1 - \beta_{R0}^2) + (\beta_{R\lambda}^1 - \beta_{R\lambda}^2)\lambda_i + (\beta_{RT}^1 - \beta_{RT}^2)T_i] + \beta_{R0}^2 + \beta_{R\lambda}^2\lambda_i + \beta_{RT}^2T_i. \quad (11)$$

One can then obtain the derivative with respect to revenues:

$$\frac{dE\left[\left(\frac{R}{S_i}\right)|\mathbf{x}_i\right]}{dT_i} = [\Phi(\mathbf{x}_i\alpha) + \phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta_{RT}^1 - \beta_{RT}^2) + \phi(\mathbf{x}_i\alpha)\alpha_T [(\beta_{R0}^1 - \beta_{R0}^2) + (\beta_{R\lambda}^1 - \beta_{R\lambda}^2)\lambda_i] + \beta_{RT}^2, \quad (12)$$

where  $\phi(\mathbf{x}_i\alpha)\alpha_T$  is the marginal effect of  $T_i$  on  $Pr(d = 1)$ —with  $\alpha_T$  as the marginal effect of  $T_i$  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)  $\beta_{RT}^2$  and an indirect effect (b)  $[\Phi(\mathbf{x}_i\alpha) + \phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta_{RT}^1 - \beta_{RT}^2) + \phi(\mathbf{x}_i\alpha)\alpha_T [(\beta_{R0}^1 - \beta_{R0}^2) + (\beta_{R\lambda}^1 - \beta_{R\lambda}^2)\lambda_i]$  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:

$$\frac{dE\left[\left(\frac{g_1}{S_i}\right)|\mathbf{x}_i\right]}{dT_i} = [\Phi(\mathbf{x}_i\alpha) + \phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta_{gT}^1 - \beta_{gT}^2) + \phi(\mathbf{x}_i\alpha)\alpha_T [(\beta_{g0}^1 - \beta_{g0}^2) + (\beta_{g\lambda}^1 - \beta_{g\lambda}^2)\lambda_i] + \beta_{gT}^2 \quad (13)$$

Re-writing this as  $\Phi(\mathbf{x}_i\alpha) + \phi(\mathbf{x}_i\alpha)\alpha_T T_i = \frac{\frac{dE\left[\left(\frac{g_1}{S_i}\right)|\mathbf{x}_i\right]}{dT_i} - \phi(\mathbf{x}_i\alpha)\alpha_T [(\beta_{g0}^1 - \beta_{g0}^2) + (\beta_{g\lambda}^1 - \beta_{g\lambda}^2)\lambda_i] - \beta_{gT}^2}{\beta_{gT}^1 - \beta_{gT}^2}$  and

substituting into (13) obtain:

$$\frac{dE\left[\left(\frac{R}{S_i}\right)|\mathbf{x}_i\right]}{dT_i} = \left( \frac{\frac{dE\left[\left(\frac{g_1}{S_i}\right)|\mathbf{x}_i\right]}{dT_i} - \phi(\mathbf{x}_i\alpha)\alpha_T [(\beta_{g0}^1 - \beta_{g0}^2) + (\beta_{g\lambda}^1 - \beta_{g\lambda}^2)\lambda_i] - \beta_{gT}^2}{\beta_{gT}^1 - \beta_{gT}^2} \right) (\beta_{RT}^1 - \beta_{RT}^2) + \beta_{RT}^2, \quad (14)$$

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  $D = \beta_{RT}^2$ , while the **indirect effect** is  $I_i = [\Phi(\mathbf{x}_i\alpha) + \phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta_{RT}^1 - \beta_{RT}^2) + \phi(\mathbf{x}_i\alpha)\alpha_T[(\beta_{R0}^1 - \beta_{R0}^2) + (\beta_{R\lambda}^1 - \beta_{R\lambda}^2)\lambda_i]$ . The **total effect** is the sum of the direct and indirect effects, i.e.  $W_i = [\Phi(\mathbf{x}_i\alpha) + \phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta_{RT}^1 - \beta_{RT}^2) + \phi(\mathbf{x}_i\alpha)\alpha_T[(\beta_{R0}^1 - \beta_{R0}^2) + (\beta_{R\lambda}^1 - \beta_{R\lambda}^2)\lambda_i] + \beta_{RT}^2$ .

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

**Proposition 3.** *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).*

### 3.2 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  $\text{plim } \widehat{\beta_{RT}^2} = \beta_{RT}^2$  since, under assumption (6), OLS

gives a consistent estimate of  $\beta_{RT}^2$ . As for the estimate of the indirect effect, note that under assumption (6), OLS gives consistent estimates of  $\beta_{RT}^1, \beta_{RT}^2$ , while under assumption (5), the probit (MLE) regression gives consistent estimates of  $\alpha$  and, hence, of  $\Phi(\cdot)$  and  $\phi(\cdot)$ . Thus,  $\text{plim } \hat{I}_i = I_i$ , or  $\text{plim}[\hat{\Phi}(\mathbf{x}_i\hat{\alpha}) + \hat{\phi}(\mathbf{x}_i\hat{\alpha})\hat{\alpha}_T T_i](\widehat{\beta_{RT}^1} - \widehat{\beta_{RT}^2}) + \hat{\phi}(\mathbf{x}_i\hat{\alpha})\hat{\alpha}_T[(\widehat{\beta_{R0}^1} - \widehat{\beta_{R0}^2}) + (\widehat{\beta_{R\lambda}^1} - \widehat{\beta_{R\lambda}^2})\lambda_i] = [\Phi(\mathbf{x}_i\alpha) + \phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta_{RT}^1 - \beta_{RT}^2) + \phi(\mathbf{x}_i\alpha)\alpha_T[(\beta_{R0}^1 - \beta_{R0}^2) + (\beta_{R\lambda}^1 - \beta_{R\lambda}^2)\lambda_i]$ . 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  $i$ .<sup>6</sup> 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  $\text{plim}(S^{-1}\Sigma\hat{W}_i) = S^{-1}\Sigma W_i$ .

Section 4.2 reports  $\hat{D}$ , 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 the Online Appendix, 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  $S^{-1}\Sigma\hat{W}_i$ .

## 4 Illustration

To demonstrate the estimation of the direct, indirect, and total effects of government revenues on a public official's rents (per spending), I use data from the Philippines.

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. The empirical analysis in this paper is conducted at

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<sup>6</sup>After performing the two-step procedure, one then computes  $\hat{I}_i, \hat{W}_i$  by choosing some value of  $\lambda_i, T_i$ . Thus, in getting  $\text{plim } \hat{I}_i$ , I have 'fixed' the value of  $\lambda_i$  and  $T_i$  which are thus treated as constants.



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, 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.<sup>7</sup>

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 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% 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.

To estimate the parameters of interest, one needs data on  $\frac{R}{S}$ ,  $\frac{g_1}{S}$ ,  $T$ ,  $\lambda$ , and a proxy for  $d$ .

I describe these next.

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<sup>7</sup>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 the Online Appendix for a more detailed discussion of the data, and additional results using a sample that includes the NCR.)

## 4.1 Data

**BLGF.** From the Bureau of Local Government Finance (BLGF), I obtained statements 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 measure of total spending  $S$ , I use total expenditures, and for  $T$ , I use the Internal Revenue Allotment. The latter is reasonably exogenous as it is automatically allocated out of national revenues according to a fixed, legally-mandated, formula.<sup>8</sup> 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 measures of  $\frac{g_i}{S}$ .<sup>9</sup>

To construct a proxy for whether or not the no-theft constraint is binding, I exploit a particular institutional feature in the Philippines by creating a proxy called *No Debt*, which assigns  $d = 1$  to municipalities that have no debt—their cost of debt is zero, and  $d = 0$  otherwise.

In the Philippines, the municipality can “contract loans, credits, and other forms of indebtedness” in order to finance additional spending on public goods and services, but there

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<sup>8</sup>Brollo et al. (2013) similarly use federal transfers to the municipality as a measure of the latter’s revenues in Brazil.

<sup>9</sup>The Online Appendix formally shows that the particular type of expenditure is immaterial – using any of these measures yields the exact same results, since the expenditures are jointly determined.

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.<sup>10</sup> 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  $No\ Debt = 0$ .

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  $No\ Debt = 1$ , the no-theft constraint is binding.<sup>11</sup>

In the Online Appendix, I also consider two other proxies for  $d$ —*city* and *urban*, 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 in these municipalities are subject to more scrutiny. As reported in the Online Appendix, the results when using these proxies are actually stronger. Using  $NoDebt$  gives more conservative estimates.

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<sup>10</sup>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.”

<sup>11</sup>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.

**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  $\lambda$ . Recall that  $\lambda$  measures the extent to which the politician values social welfare over rents. In effect,  $\lambda$  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.

In the Online Appendix, I use other data from the Census to construct the following alternative proxies for  $\lambda$ : 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 proxy for  $\lambda$  to the extent that they capture the vigilance and capability of the municipality to monitor the performance of the politician.

Data from the 2010 Census and the Philippine Standard Geographic Code (PSGC) are also used 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 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 networkth.

I obtain 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. 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. (2014) make a similar argument in justifying the use of the asset disclosure affidavits in India. Szakonyi (2018) shows that after the imposition of financial disclosure requirements in Russia, incumbent municipal officials were less likely to run again. This suggests that it is not easy for public officials to falsify documents and that disclosure requirements can actually reveal rents accumulated from public office.

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.<sup>12</sup> 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 obtained fiscal data from 1,620 municipalities, or 99% of all municipalities in the Philippines. The analysis covers the period between 2011 and 2014, and there was an election in 2013.<sup>13</sup> 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

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<sup>12</sup>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>.)

<sup>13</sup>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.

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.<sup>14</sup> 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.

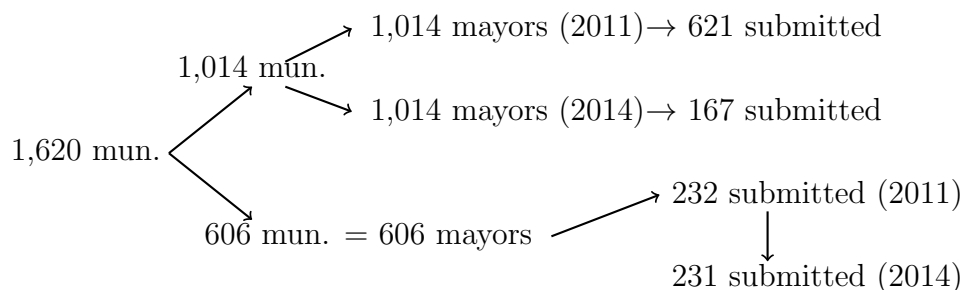
The Online Appendix provides greater detail and further statistical analyses to show that the sample, though small, is likely to be a random one. It also presents a selection model that shows that even if the sample were non-random—specifically, even if the mayor’s probability of submitting the SALN and/or her probability of accurately reporting items in

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<sup>14</sup>As shown in the Online Appendix, 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.

the SALN were to vary systematically with the mayor's rents, this would still not bias the results under certain conditions. Summary statistics are also in the Online Appendix.

Figure 1: SALN submission by mayors in 2011 and 2014



## 4.2 Results

Table ?? demonstrates that the measures 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 to have been legitimately accumulated over the sample period. On average, mayors' net worth grew by about 27,000% between 2011 and 2014. Even for a restricted sample that includes about 70% of the sample, the growth rate of mayors' assets over the period still amounts to 160%. Such growth vastly outstrips most macroeconomic indicators, from GDP per capita and wages to consumer spending, vehicle sales, and real estate values.<sup>15</sup>

The direct, indirect, and total effects of revenues  $T$  on rents per spending  $\frac{R}{S}$  are estimated according to the procedure presented in Section 3. Table ?? presents the results using the IRA as a measure of revenues  $T$ , construction spending per total spending to measure  $\frac{g_1}{S}$ , the proportion of the population aged 15-24 as proxy for  $\lambda$ , *No Debt* as proxy for  $d$ , and the change in net worth, in real assets, and in liabilities (per spending) as different measures of  $\frac{R}{S}$ .

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<sup>15</sup>See Online Appendix for details.



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)	<b>27,535%</b>
Mayors' net worth (restricted sample—166 municipalities)	<b>160%</b>

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%, which is still higher than the percentage growth of any of the economic indicators.

First note that the estimated direct effect is positive while the indirect effect is negative and larger in absolute value. Thus, the estimated total effect of the IRA on the change in net worth (per spending) is negative. The table shows that a 1-unit increase in the IRA induces a drop of 0.0000621 in the change in the mayor's net worth (per spending). This implies a  $\frac{0.0000621}{0.054} = 0.1\%$  decrease in the mean change in net worth (per spending) following a 1% increase in mean IRA. This means that for a municipality with mean total spending  $S$ , an additional ₱1 million in revenues is expected to decrease the mayor's rents by  $145.72m \times 0.0000621 = \text{₱}9,049.21$ . The estimated direct and indirect effects reveal that  $145.72m \times 0.0001281 = \text{₱}18,666.73$  of the ₱1million are expected to be stolen, while bribe payments are expected to decrease by  $145.72m \times 0.0001902 = \text{₱}27,715.94$ . Thus, on net, the expected (total) marginal rents generated by an additional ₱1million of revenues is  $18,666.73 - 27,715.94 = \text{₱}-9,049.21$  (see Figure 2).

Note that the total effect alone cannot reveal the extent of corruption in the allocation of government revenues – on the contrary, the estimated total effect shows a decrease in the change in net worth (per spending). Rather, it is the decomposition of the total effect into the direct and indirect effects which provides a clearer picture.

A decrease in the change in net worth following an increase in revenues already suggests

Table 2: 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)
(80% CI)	(0.074, 1.63)	(-0.399, 1.286)	(-0.648, -0.079)
Indirect Effect	-1.902	-0.4	0.232
(95% CI)	(-6.798, 3.00)	(-1.475, 0.675)	(-0.211, 0.676)
(80% CI)	(-0.198, -2.78)	(-1.087, 0.045)	(0.089, 0.601)
Total Effect	-0.621	-0.094	-0.088
(95% CI)	(-5.738, 4.496)	(-1.101, 0.914)	(-0.575, 0.398)
(80% CI)	(-0.124, -0.115)	(-1.485, 1.331)	(-0.558, 0.552)
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. The indirect and total effects vary across observations, and are here evaluated at the means. 95% and 80% 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 ₱1 million on theft, public spending, and bribe payments, simulated for a municipality with mean *ira*

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

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

that the change in net worth captures something other than a change in legitimate wealth. Changes in the IRA generate 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 ?? 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 generates rents, in a manner proposed by the 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.

Examining the estimates of particular parameters that go into the calculation of the direct and indirect effects provides further corroborating evidence. Recall from the formal derivations in Section 3 that the direct effect is equal to  $\beta_{RT}^2$ —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  $\widehat{\beta_{RT}^2}$ —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  $\beta_{RT}^1$ —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  $\widehat{\beta}_{RT}^1$ —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  $\widehat{\beta}_{RT}^2$  to be taken as evidence of rents from theft are that  $\widehat{\beta}_{RT}^2 \geq 0$  and  $\widehat{\beta}_{RT}^1 \leq 0$ . 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.

Tables ?? to ?? confirm this pattern. When the change in net worth is used as a measure of rents (Table ??),  $\widehat{\beta}_{RT}^1$  is equal to  $-6.67e(-05)$ , while  $\widehat{\beta}_{RT}^2$  is equal to  $0.000128$  (the same as the direct effect in Table ??). Table ?? 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 ??):  $\widehat{\beta}_{RT}^1 = 8.68e(-06)$ , and  $\widehat{\beta}_{RT}^2 = -3.20e(-05)$ .

As for the indirect effect, the formal derivation in section 3 shows that it is a function of the parameters 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 the mayors 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  $\lambda$  (the weight that the mayor 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 mayor would want to steal. Thus, larger (smaller) revenues and a lower (higher) social-welfare weight would increase (decrease) the probability that the mayor is able to steal (i.e. that the no-theft constraint

Table 3: 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

	<i>No Debt = 1</i>		<i>No Debt = 0</i>	
	(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 (75.46)	2.043 (6.753)	-207.6 (341.1)	-0.900 (2.186)
Internal Revenue Allotment	0.166*** (0.0161)	-6.67e-05 (0.00144)	0.270*** (0.0284)	0.000128 (0.000182)
Constant	-11.36 (14.63)	-0.229 (1.310)	34.75 (65.80)	0.146 (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 4: 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

	<i>No Debt = 1</i>		<i>No Debt = 0</i>	
	(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 (75.46)	-0.0197 (0.442)	-207.6 (341.1)	-0.350 (1.221)
Internal Revenue Allotment	0.166*** (0.0161)	-6.13e-05 (9.42e-05)	0.270*** (0.0284)	3.07e-05 (0.000102)
Constant	-11.36 (14.63)	0.0142 (0.0857)	34.75 (65.80)	0.0566 (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 5: 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

	<i>No Debt</i> = 1		<i>No Debt</i> = 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 (75.46)	0.00978 (0.222)	-207.6 (341.1)	0.129 (0.368)
Internal Revenue Allotment	0.166*** (0.0161)	8.68e-06 (4.74e-05)	0.270*** (0.0284)	-3.20e-05 (3.06e-05)
Constant	-11.36 (14.63)	-0.00567 (0.0431)	34.75 (65.80)	-0.0113 (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. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

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 ??) estimating the probability that the no-theft constraint is binding (i.e.  $Pr(\textit{No Debt} = 1)$ ), 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 ?? to ??. Finally, since bribes are earned by spending, the equilibrium effect of the IRA 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 ??), with the estimated parameters determining the probability of being in one

Table 6: Estimating the probability (by probit regression) that the no-theft constraint binds, as proxied by *No Debt*

	<i>No Debt</i>
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

jurisdiction-type or the other acting as weights.

From the formula for the indirect effect, one can deduce that the estimated indirect effects in Table ?? are negative because  $\widehat{\beta}_{R\lambda}^2$ —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 ??) 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 ( $\widehat{\beta}_{RT}^2 > 0$ ), the equilibrium amount of stolen revenues is sufficiently low. Note that the same pattern holds when using the change in real assets as proxy for rents—Table ?? shows that  $\widehat{\beta}_{R\lambda}^2$  is negative. One can also get a consistent result with the change in liabilities, in which case  $\widehat{\beta}_{R\lambda}^2$  is now positive (see Table ??).

The same overall result—positive direct effect and negative indirect and total effects, is consistently obtained even when using alternative proxies for  $\lambda$ . Table ?? in the Online Appendix shows that with one exception, all the estimated direct, indirect, and total effects are remarkably close in values.

The Online Appendix also subsets the sample by major geographical areas. Table ?? there in shows that the result is likely driven by Luzon, rather than the combined Visayas and Mindanao regions (VisMin). Not only is the estimated direct effect in VisMin negative, but Table ?? shows that  $|\widehat{\beta}_{RT}^2| < |\widehat{\beta}_{RT}^1|$ . In contrast, Table ?? reveals that, in Luzon,  $\widehat{\beta}_{RT}^2 > 0$

while  $\widehat{\beta}_{RT}^1 < 0$ . Also, 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 ??), it appears to increase it in VisMin (see Table ??), which further casts doubt on the possibility that the  $\widehat{\beta}_{RT}^2$  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 comes from estimating the direct, indirect, and total effects in the placebo sample.<sup>16</sup> Table ?? in the Appendix shows that the signs of the estimates are inconsistent across the different proxies for rents. While from Table ??, 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 ??),  $\widehat{\beta}_{RT}^1 > 0$ , but when using the change in real assets (Table ??),  $\widehat{\beta}_{RT}^1 < 0$ . In the latter,  $\widehat{\beta}_{RT}^2$  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 ??),  $\widehat{\beta}_{RT}^1, \widehat{\beta}_{RT}^2 > 0$ , which is consistent with the results from Table ?? inasmuch as liabilities decrease, while real assets increase, net worth, but is then inconsistent with a rent-seeking interpretation.

I perform other robustness checks. These include using other types of spending to measure  $\frac{g_1}{S}$ , the removal of outliers, the inclusion of municipalities in NCR/Metro Manila, and using other proxies for  $d$ .

Overall, the results suggest that an increase in government revenues lowers corruption – it increases the theft of revenues but decreases bribes to a larger extent such that total rent accumulation falls. However, this also implies that public good provision declines, since the

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<sup>16</sup>Recall that for placebo municipalities, 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.



stolen revenues forego public spending.

While the results are particular to the Philippines, and depends on the quality of data, the empirical exercise is potentially replicable using other data and proxies, including alternative measures of whether or not the no-theft constraint is binding, which may be country-specific. The method provides a general approach to measuring theft and bribery and, as such, can overcome concerns of external validity.

## 5 Conclusions

This paper proposes a method of measuring the two kinds of grand corruption in the allocation of government revenues – theft and bribery. 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 and services 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). However, since what is stolen is therefore not spent, the direct and indirect effects are jointly determined. Without providing an explicit model from which identification restrictions can be derived, it is impossible to disentangle the effect of an increase in revenues on the expected change in theft from its effect on the expected change in bribe-rents, and vice versa.

Conventional approaches to estimating the total effect of revenues on 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. However, decomposing the total effect into a direct and indirect effect can reveal the true extent of corruption. This is because the marginal effects of revenues on theft and on bribes can be different, not only in magnitude, but in the direction of the effects. As I illustrate using municipal-level data from the Philippines, decomposing the total effect of revenues into a direct effect and an indirect effect can reveal an increase in stolen revenues and

a decrease in bribe payments, which could explain why total rents appear to be unchanged or even decrease.

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# Online Appendices (For Web Publication Only)

## 1 Theft and Bribery in the Philippines

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. 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. The World Bank Governance Indicators show a similar pattern. According to the Control of Corruption Indicator (CCI), the country was at the 25 percentile rank in 2008 – 25% of countries fared better than the Philippines. Its rank decreased to 44 in 2013, before going up to 34 in 2016.<sup>17</sup>

Grand corruption in the allocation of public funds is particularly pernicious. Batalla (2000) finds, based on interviews and news reports, that 20-60 percent of public works contracts are lost to corruption. He notes that many road projects are divided into smaller projects, each worth less than ₱10 million (Philippine Peso, approx. \$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 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% of the project cost as kick-

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<sup>17</sup>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#>

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

Corruption does not only occur at the local level. While Batalla indicates that almost 3,000 cases were filed against LGU officials between 1990-1995 involving about ₱2.3 billion (\$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 ₱7.8 billion (\$150 million).

Such trends have continued to the present. 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 \$350 million flood control project with Belgian firm Baagerwerken Decloedt En Zoon (BDZ), and the \$400 million NAIA 3 airport terminal contract with PIATCO and German firm Fraport.<sup>18</sup> Philippine news network Rappler reports that between 1979–2016, a total of 33,772 corruption cases were filed before the Sandiganbayan.<sup>19</sup> The total amount of public funds involved in the 15 largest cases that are still pending as of November 2016 is approximately \$750 million.

In many instances, it is difficult to isolate particular forms of corruption involved, 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

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<sup>18</sup>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>.

<sup>19</sup><https://www.rappler.com/newsbreak/159148-biggest-corruption-cases-sandiganbayan-graft-plunder-malversation>

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 ₱50 million (\$1 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 (30 percent) are cases of malversation, while 7,968 (24%) involve graft.<sup>20</sup>

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.<sup>21</sup> 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.

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<sup>20</sup>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).

<sup>21</sup>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).

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 social benefit from public goods and services.

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 are some of the most controversial corruption cases in the Philippines in recent times.<sup>22</sup> 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 \$ 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

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<sup>22</sup>Detailed accounts of such controversies can be readily found in many Philippine news reports.



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 ₱728 million (\$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. 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) 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 the 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 40–50% kickback to the legislator, and a commission of 10–15% 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 ₱10 billion (\$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 ₱900 million (\$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 can 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 ₱1.5 billion (\$30 million) in royalties. These 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 be attached to them.

The allocation of the Malampaya royalties thus appears to provide both instances of theft and bribery.

## 2 Proofs

### A Proof of Proposition 1

I first show the existence of  $\bar{T}$  by applying the implicit function theorem to the following Kuhn-Tucker conditions for optimal  $g_1^*, g_2^*$  (and Lagrange multiplier  $\gamma^*$ ):

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

Consider interior solutions. Necessary for  $g_1^*, g_2^*, \gamma^*$  to exist is that the inverse of

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

exists or, equivalently, that the determinant of  $A$  is non-zero. Note that  $\det A = V''(g_1^*)[\frac{\lambda}{1-\lambda} V''(g_2^*)(g_1^* + g_2^* - T) + \gamma^*]$ . With theft,  $g_1^* + g_2^* - T < 0$ , which implies (for complementary slackness to hold) 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  $g_1^*, g_2^*, \gamma^*$  exist, it must be that even when theft occurs such that  $\gamma^* = 0$ , some revenues are still allocated to both principals, i.e.  $g_1^*, g_2^* > 0$ . Consider the minimum possible values  $\bar{g}_1, \bar{g}_2 > 0$  that such allocations can take, and let their sum be denoted as threshold  $\bar{T}$ . Then, if revenues are at or below this threshold, i.e.  $T \leq \bar{T}$ , the agent is constrained to provide  $\bar{g}_1, \bar{g}_2$ , which means that she is constrained not to steal the amount

$\bar{T} = \bar{g}_1 + \bar{g}_2$ . Thus, the no-theft constraint is binding when  $T \leq \bar{T}$ .

I next show results (1) and (2). First consider the case when the no-theft constraint is binding, i.e.  $d = 1$ . In equilibrium, constraint (a) binds with equality, which implies that (i)  $b = \left(\frac{1}{1-\lambda}\right) [\bar{U} - \lambda[V(g_1) + V(T - g_1)]]$ . Substituting (i) into the maximand and letting  $g_2 = T - g_1$  (since the no-theft constraint is binding), the problem can then be expressed as (ii)  $\max_{g_1} V(g_1) - \left(\frac{1}{1-\lambda}\right) [\bar{U} - \lambda[V(g_1) + V(T - g_1)]]$ , whose first-order condition (FOC) for optimal  $g_1^*$  is  $V'(g_1^*) = \lambda V'(T - g_1^*)$ , which is implicit in  $\lambda$  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  $\bar{U}$  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,  $\bar{U} = \lambda[V(\frac{T}{2}) + V(\frac{T}{2})] = 2\lambda V(\frac{T}{2})$ . Plugging this into (i) gives  $b^* = \frac{\lambda}{1-\lambda} [2V(\frac{T}{2}) - V(g_1^*) - V(T - g_1^*)]$ , which is a function,  $f_2$ , of  $\lambda, T, g_1^*$ .

Now, for the case when the no-theft constraint is non-binding ( $d = 0$ ), 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  $g_1^*, g_2^*, \gamma^*$  are given by the above Kuhn-Tucker conditions. With theft, complementary slackness requires that  $\gamma^* = 0$ , which implies that  $g_1^*$  and  $g_2^*$  are functions of  $\lambda$ . They are not, however, affected by  $T$ . To see this, I show below that the derivatives  $\frac{dg_1^*}{dT}$  and  $\frac{dg_2^*}{dT}$  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  $\bar{U} = \lambda[V(g_1^0) + V(g_2^0)] + (1-\lambda)(T - g_1^0 - g_2^0)$ . 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  $\lambda, T, g_1^*, g_2^*$ , 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  $\lambda$  (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

$$\begin{aligned} \lambda V'(g_1^0) - (1-\lambda) - \gamma^0 &= 0 \\ \lambda V'(g_2^0) - (1-\lambda) - \gamma^0 &= 0 \\ \gamma^0(g_1^0 + g_2^0 - T) &= 0. \end{aligned}$$

Note that these conditions are different from the previous Kuhn-Tucker conditions, implying that  $g_1^0 \neq g_1^*$  and  $g_1^0 \neq g_2^*$  (and  $g_1^0 = g_2^0$ ). They still imply that  $g_1^0$  is a function of  $\lambda$ .

However,  $g_1^0$  is unaffected by  $T$ . 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 implies  $\gamma^0 = 0$  and, hence,  $\frac{d\gamma^0}{dT} = 0$ . Imposing  $\gamma^0 = 0$  and  $\frac{d\gamma^0}{dT} = 0$  gives  $\frac{dg_1^0}{dT} = -\frac{1}{\det B} [(g_1^0 + g_2^0 - T) \lambda V'''(g_1^0) \frac{dg_1^0}{dT} \lambda V''(g_2^*)]$  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 2

From the proof of Proposition 1, one can express the threshold level of revenues as  $\bar{T} = \bar{g}_1 + \bar{g}_2$ , where  $\bar{g}_1 = \arg \max_{g_1} V(g_1) - (\frac{1}{1-\lambda}) [\bar{U} - \lambda[V(g_1) + V(\bar{T} - g_1)]]$ , and  $\bar{g}_2 = \bar{T} - \bar{g}_1$ . Since  $d = 1$  if  $T \leq \bar{T}$  and  $d = 0$  otherwise, the value of  $d$  depends on  $T$  and also on  $\lambda$ , since  $\bar{g}_1$  and, hence,  $\bar{T}$ , is a function of  $\lambda$ .

## C Proof of Proposition 3

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  $\frac{dR}{dT} = \frac{\partial h_3(\cdot)}{\partial T} + \frac{\partial h_3(\cdot)}{\partial g_1} \frac{\partial g_1}{\partial T}$  if  $d = 1$  and  $\frac{dR}{dT} = \frac{\partial h_4(\cdot)}{\partial T} + \frac{\partial h_4(\cdot)}{\partial g_1} \frac{\partial g_1}{\partial T} = \frac{\partial h_4(\cdot)}{\partial T}$  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.

### 3 Standard Errors

The standard error of the average indirect effect  $S^{-1} \sum \hat{I}_i$  is obtained using the delta method.

That is,  $\widehat{Var}f(\hat{\theta}) \approx E(\hat{\theta} - \theta)^T f'(\hat{\theta})f'(\hat{\theta})^T(\hat{\theta} - \theta)$ , where:

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

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

$$f'(\hat{\theta})f'(\hat{\theta})^T = \begin{bmatrix} a_1^2 & a_1 a_2 & a_1 a_3 & a_1 a_4 & a_1 a_5 \\ a_2 a_1 & a_2^2 & a_2 a_3 & a_2 a_4 & a_2 a_5 \\ a_3 a_1 & a_3 a_2 & a_3^2 & a_3 a_4 & a_3 a_5 \\ a_4 a_1 & a_4 a_2 & a_4 a_3 & a_4^2 & a_4 a_5 \\ a_5 a_1 & a_5 a_2 & a_5 a_3 & a_5 a_4 & a_5^2 \end{bmatrix};$$

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

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

Thus:

$$\begin{aligned}
\widehat{Var}(S^{-1} \sum \hat{I}_i) \approx & \hat{\sigma}_1^2 a_1^2 + 2\hat{\sigma}_{12} a_1 a_2 + 2\hat{\sigma}_{13} a_1 a_3 + 2\hat{\sigma}_{14} a_1 a_4 + 2\hat{\sigma}_{15} a_1 a_5 \\
& + \hat{\sigma}_2^2 a_2^2 + 2\hat{\sigma}_{23} a_2 a_3 + 2\hat{\sigma}_{24} a_2 a_4 + 2\hat{\sigma}_{25} a_2 a_5 \\
& + \hat{\sigma}_3^2 a_3^2 + 2\hat{\sigma}_{34} a_3 a_4 + 2\hat{\sigma}_{35} a_3 a_5 \\
& + \hat{\sigma}_4^2 a_4^2 + 2\hat{\sigma}_{45} a_4 a_5 \\
& + \hat{\sigma}_5^2 a_5^2,
\end{aligned}$$

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

$$\sqrt{\widehat{Var}(S^{-1} \sum \hat{W}_i)} = \sqrt{\widehat{Var}(\hat{D}) + \widehat{Var}(S^{-1} \sum \hat{I}_i) + 2\widehat{Cov}(\hat{D}, S^{-1} \sum \hat{I}_i)}.$$

## 4 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.<sup>23</sup> 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

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<sup>23</sup>In Appendix ??, I verify the robustness of results by re-estimating the model using a sample that includes the NCR.

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 surprising to see (in Tables ?? and ??) large differences in the submission rates between the Luzon, Visayas, and Mindanao areas.

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

A crucial issue is whether selection into the sample could be systematically related to the 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.<sup>24</sup>

Now, the rate of full compliance among the treated is  $\frac{232}{606} * \frac{231}{232} = 38\%$ . (As shown in Table ??, 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 ??, there are 788 untreated municipalities whose 2011 and/or 2014 mayor submitted her SALN. To demonstrate that untreated municipalities, had they been treated, 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  $61 * 99.6\% = 60.76\%$ .<sup>25</sup> 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

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<sup>24</sup>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 ??, 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*.

<sup>25</sup>In fact, Table ?? 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.

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 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 ?? and ?? 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.<sup>26</sup>

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.<sup>27</sup> 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).

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

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<sup>26</sup>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%.

<sup>27</sup>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>.

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.<sup>28</sup> 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.

## 5 Descriptive Statistics

Appendix ?? presents summary statistics of the proxy variables in multiple tables. The first table, Table ??, uses all 1,620 municipalities. Table ?? uses only the 606 municipalities that were 'treated' with re-election or no turnover—the intended sample, while Table ?? uses the 231 municipalities from this subset whose mayor submitted the SALN in 2011 and 2014—the selected sample. Table ?? uses the 1,014 'untreated' municipalities that had a turnover and thus had two mayors in the sample period, while Table ?? 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 ?? shows that between 2011 and 2014, on average, a

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<sup>28</sup>The high attrition rates in both the main and placebo samples are thus unsurprising. Also, as shown in Appendix ??, incidences of misreporting in some components of the mayor's net worth are also apparent in the sample.

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  $-0.044$  (Table ??). 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 ?? are close to those in Table ?. However, mean *ira* seems lower in municipalities that had no turnover than those that had (Tables ?? and ??). Also, while the mean *ira* among municipalities with no turnover is 90 (million pesos—see Table ??), the subset selected into the main sample has higher mean *ira* at 98.5 (Table ??). On the other hand, while mean *ira* among municipalities that experienced a turnover is 105 (see Table ??), the subset selected into the placebo sample has mean *ira* equal to 120 (Table ??). 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 ?? 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 ?? 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  $\lambda$ . Note, however, that when controlling for these variables, *ira* itself is insignificant.

Table A.3: Determinants of no turnover in 2013

VARIABLES	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 Population in 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)
Observations	278
R-squared	0.066

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

## 6 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

## 7 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 ?? that there is no selection bias if all other factors that affect government spending and rents (apart from revenues and  $\lambda$ ) 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  $\lambda$  and  $T$ , i.e. "selection on explanatory variables", or government spending and rents, i.e. "selection on outcome variables". In subsection ??, 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:

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

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

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

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

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

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 4. Independence from selection**

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

*Proof.* Under (a) and (e),  $E(\mathbf{y}_j | s_j = 1, \mathbf{x}_j) = \mathbf{x}_j\gamma_j + E(u_j | w_j > -\mathbf{v}_j\alpha, \mathbf{x}_j)$  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 5. 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  $\mathbf{v}_j = \mathbf{x}_j$ ,  $E(\mathbf{y}_j | s_j = 1, \mathbf{x}_j) = E(\mathbf{y}_j | w_j > -\mathbf{x}_j \alpha, \mathbf{x}_j)$ . 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. Selection on outcome variables**

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

*Proof.* With  $\mathbf{v}_j = \mathbf{y}_j$ ,  $E(\mathbf{y}_j | s_j = 1, \mathbf{x}_j) = E(\mathbf{v}_j | w_j > -\mathbf{v}_j \alpha, \mathbf{x}_j)$ . 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:

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

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 7. 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),  $E(\mathbf{y}_j | s_j = 1, \mathbf{x}_j) = \mathbf{x}_j \gamma_j + E(u_j | w_j > -\mathbf{v}_j \alpha - \delta r_j, \mathbf{x}_j)$  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 8. 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  $\mathbf{v}_j = \mathbf{x}_j$ ,  $E(\mathbf{y}_j | s_j = 1, \mathbf{x}_j) = E(\mathbf{y}_j | w_j > -\mathbf{x}_j \alpha - \delta r_j, \mathbf{x}_j)$ . 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 9. 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  $\mathbf{v}_j = \mathbf{y}_j$ ,  $E(\mathbf{y}_j | s_j = 1, \mathbf{x}_j) = E(\mathbf{v}_j | w_j > -\mathbf{v}_j \alpha - \delta r_j, \mathbf{x}_j)$ . 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  $\mathbf{x}_j \gamma_j$ . ■

## 8 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 \$ 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%.<sup>29</sup> Minimum wages grew by about 20%, from a monthly minimum wage of 7,995 (Philippine pesos ₱) 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 ₱), 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 ₱) in 2010 to 1,200,000 in 2014. Vehicle sales alone grew by 50%—4,000 (million ₱) 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.

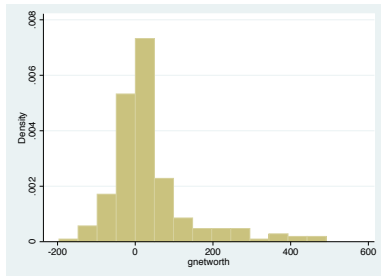
Of course, mayors may have other legitimate sources of income—from their interest in businesses, and/or their pre-existing assets. However, unless such businesses are in the mining sector, which grew by 115%, or construction, which grew by 50%, the growth in their business incomes would have still been 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.

Yet even allowing for the best-case scenario (e.g. high savings and investments, involvement in mining and construction, real estate holdings), Table ?? reveals that the implied growth rates of mayors' net worth, real assets, personal assets, and liabilities between 2011

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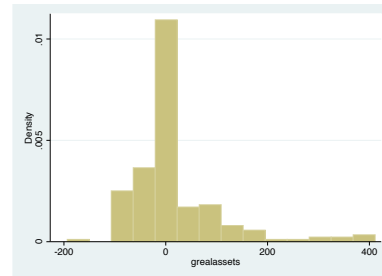
<sup>29</sup>Data on the Philippine economy are obtained from [tradingeconomics.com](http://tradingeconomics.com).

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%)

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%)

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 ?? in Appendix ?? shows the summary statistics for all mayors for which the growth in assets,



Figure A.3: Histogram of the percentage-growth of mayors' personal assets between 2011-2014

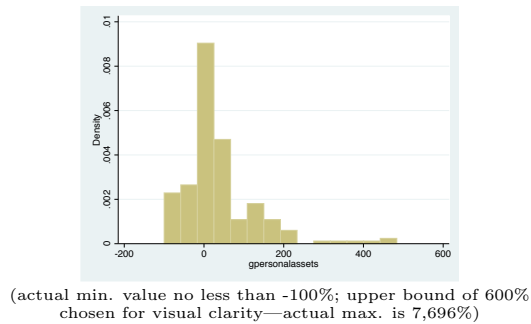
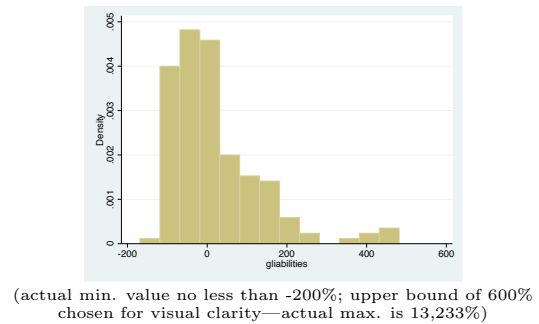


Figure A.4: Histogram of the percentage-growth of mayors' liabilities between 2011-2014



personal assets, liabilities and net worth are available and can be computed. (Growth rates could not be obtained 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 ?? 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 ?? and ??.)

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 ?? and ??, 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.<sup>30</sup>

To further strengthen the plausibility of this argument, Table ?? 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

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<sup>30</sup>In Appendix ??, 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.

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.

## 9 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

## 10 Robustness Checks

I perform a number of robustness checks summarized below. Details are given in section ??.

**Other proxies for spending  $\frac{q_1}{S}$**  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 section ?? 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  $\frac{q_1}{S}$  produces exactly the same direct, indirect, and total effects.

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

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) 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

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VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) 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

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VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) 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

**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—the IRA decreases the change in net worth (per spending). However, the estimated total effect (from the structural model) of the IRA is now positive. For a municipality with mean IRA, a 1-unit increase in the IRA i.e. an additional ₱1 million, increases a mayor’s rents by  $\text{₱}145.72m \times (0.0000404) = \text{₱}5,887.08$ . 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

Table A.12: Summary statistics for all mayors in ?? 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

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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

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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

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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

mean IRA.

**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.

Table A.13: Summary statistics for all mayors in ?? 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

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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 ?? 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 ?? 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 ?? 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

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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

Figure A.5: The effect of increasing the Internal Revenue Allotment (*ira*) by ₱ 1 million on theft, public spending, and bribe payments, simulated for a municipality with mean *ira*; sample includes NCR

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

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

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.

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%

Figure A.6: The effect of increasing the Internal Revenue Allotment (*ira*) by ₱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  $3$

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

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

Figure A.7: The effect of increasing the Internal Revenue Allotment (*ira*) by ₱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  $0.5$

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

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

Figure A.8: The effect of increasing the Internal Revenue Allotment (*ira*) by ₱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  $0.2$

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

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

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 ₱1 million in IRA would induce the mayor to 'return' or spend previously acquired rents equal to ₱2,506.38, such that additional spending equals ₱1,002,506.38. Such spending decreases bribe payments



by ₱ 3,016.40. Total rents thus decrease by  $2,506.38 + 3,016.40 = ₱ 5,522.78$ . 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 A.9: The effect of increasing the Internal Revenue Allotment (*ira*) by ₱ 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  $0.2$

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

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

**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 ₱ 98.52 million, while the mean allocated IRA is ₱ 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.)

Note, however, that there are 92 municipalities, or about 40% 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 A.10: The effect of increasing the Internal Revenue Allotment (*ira*) by ₱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

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

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

Figure A.11: The effect of increasing the Internal Revenue Allotment (*ira*) by ₱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

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

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

### Other proxies for *d*

Figure A.12: The effect of increasing the Internal Revenue Allotment (*ira*) by ₱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

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

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

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

Figure A.13: The effect of increasing the Internal Revenue Allotment (*ira*) by ₱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

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

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

are more visible and vulnerable to scrutiny in dense areas.<sup>31</sup> 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 total corruption.

## 11 Details of Robustness Checks

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

Recall from the model 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

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<sup>31</sup>Technically, however, these proxies do not/cannot be caused by revenues and  $\lambda$ , although they may be correlated with them. For this reason, *No Debt* is still the most conceptually suitable proxy.

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  $\frac{g_2}{S} + \frac{g_3}{S} + \dots + \frac{g_K}{S} = \frac{S-g_1}{S}$  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  $\delta_g$  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  $\frac{g_k}{S}$ ,  $k = 1, 2, \dots, K$ , the value of  $\delta_g$  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

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

or:

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

where  $\gamma^E \equiv \Phi(\mathbf{x}_i\alpha)(\beta^1 + \delta) + (1 - \Phi(\mathbf{x}_i\alpha))(\beta^2 + \delta)$ . One can then express  $\frac{R}{S}_i$  as:

$$\frac{R}{S}_i = \gamma_{R0_i}^E + \gamma_{R\lambda_i}^E\lambda_i + \gamma_{RT_i}^E T_i + v_{R_i},$$

where:

$$\begin{aligned}
\gamma_{R0_i}^E &= \Phi(\mathbf{x}_i\alpha)(\beta_{R0}^1 + \delta_{R0}) + (1 - \Phi(\mathbf{x}_i\alpha))(\beta_{R0}^2 + \delta_{R0}) \\
\gamma_{R\lambda_i}^E &= \Phi(\mathbf{x}_i\alpha)(\beta_{R\lambda}^1 + \delta_{R\lambda}) + (1 - \Phi(\mathbf{x}_i\alpha))(\beta_{R\lambda}^2 + \delta_{R\lambda}), \\
\gamma_{RT_i}^E &= \Phi(\mathbf{x}_i\alpha)(\beta_{RT}^1 + \delta_{RT}) + (1 - \Phi(\mathbf{x}_i\alpha))(\beta_{RT}^2 + \delta_{RT}), \\
\beta^1_R &= [\beta_{R0}^1 \quad \beta_{R\lambda}^1 \quad \beta_{RT}^1]^T \text{ and } \beta^2_R = [\beta_{R0}^2 \quad \beta_{R\lambda}^2 \quad \beta_{RT}^2]^T.
\end{aligned}$$

(16)

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

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

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

$$E\left[\left(\frac{R}{S_i}\right)|\mathbf{x}_i\right] = \Phi(\mathbf{x}_i\alpha)[(\beta_{R0}^1 - \beta_{R0}^2) + (\beta_{R\lambda}^1 - \beta_{R\lambda}^2)\lambda_i + (\beta_{RT}^1 - \beta_{RT}^2)T_i] + \beta_{R0}^2 + \beta_{R\lambda}^2\lambda_i + \beta_{RT}^2T_i,$$

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

$$\frac{dE\left[\left(\frac{R}{S_i}\right)|\mathbf{x}_i\right]}{dT_i} = [\Phi(\mathbf{x}_i\alpha) + \phi(\mathbf{x}_i\alpha)\alpha_T T_i](\beta_{RT}^1 - \beta_{RT}^2) + \phi(\mathbf{x}_i\alpha)\alpha_T [(\beta_{R0}^1 - \beta_{R0}^2) + (\beta_{R\lambda}^1 - \beta_{R\lambda}^2)\lambda_i] + \beta_{RT}^2,$$

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 ?? to ?? show that using different components of spending gives the exact

same results.

Table A.17: 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.18: 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.19: 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.20: 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.21: 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.22: 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 ?? estimates the reduced-form model, while Table ?? estimates the structural model, using a sample that includes municipalities from NCR/Metro Manila.

Table A.23: 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 (0.140)		-0.00524 (0.0375)		-0.00360 (0.0448)
Internal Revenue Allotment	-7.06e-06* (3.69e-06)	-4.40e-06 (1.51e-05)	0 (5.63e-07)	3.03e-08 (4.39e-06)	0 (3.54e-06)	-7.99e-08 (4.31e-06)
Constant	0.00778*** (0.00192)	0.0271 (0.0273)	0 (0.000587)	0.00110 (0.00725)	0 (0.000892)	0.000744 (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

Table A.24: 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)	(2)	(3)
	Change in NET WORTH per Spending	Change in REAL ASSETS per Spending	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

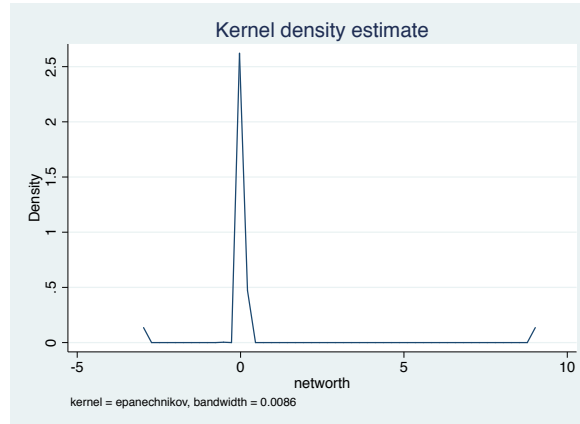
## C Removal of Outliers

Figures A.5a–c 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 ?? reports results for the case when *networth* is restricted to values between  $-3$  and  $3$ , Table ?? for when *realassets* is between  $-0.5$  and  $0.5$ , Table ?? for when *liabilities* is between  $-0.2$  and  $0.2$ , and Table ?? for when *networth*

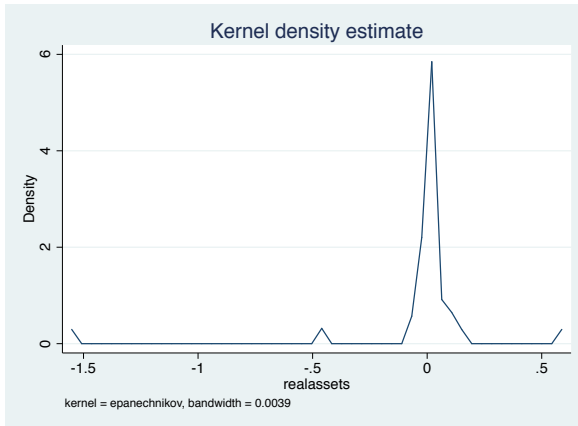


is further restricted to values between  $-0.2$  and  $0.2$ .

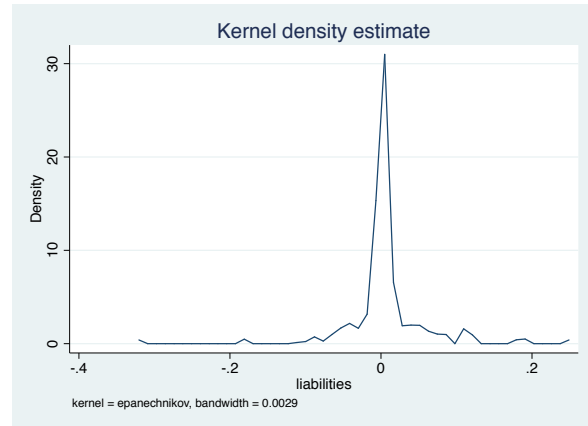
Figure A.14: Kdensity Plots



(a)  $networth \in (-3, 3)$  approx. symmetric around zero



(b)  $realassets \in (-0.5, 0.5)$  approx. symmetric around zero



(c)  $liabilities \in (-0.2, 0.2)$  approx. symmetric around zero

Table A.25: 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.26: 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.27: 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	-.0000003
(s.e.)	(.000217)	(.000054)	(.00002)
Observations	197	197	197

## 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.)

Received IRA vs. Allocated IRA

Table A.28: 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)	(2)	(3)
	Change in NET WORTH per Spending	Change in REAL ASSETS per Spending	Change in LIABILITIES per Spending
Direct Effect	-0.000172	-0.000255	-0.000255
(s.e.)	(.000028)	(.0000268)	(.0000171)
Indirect Effect	-0.000207	.0000005	.0000154
(s.e.)	(.0000265)	(.00003)	(.0000206)
Total Effect	-0.000379	-0.00025	-0.000101
(s.e.)	(.0000291)	(.0000316)	(.0000215)
Observations	185	185	185

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 ?? to ?? 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.29: 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 results are different—while the direct effect is still positive, and the indirect effect still negative, the total effect is now positive (See Table ??.)

Table A.30: 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

	<i>No Debt</i> = 1		<i>No Debt</i> = 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 (76.08)	2.042 (6.754)	-211.5 (339.3)	-0.912 (2.186)
Internal Revenue Allotment (Allocated)	0.166*** (0.0163)	-6.50e-05 (0.00145)	0.276*** (0.0286)	0.000134 (0.000184)
Constant	-11.36 (14.75)	-0.229 (1.310)	35.01 (65.45)	0.148 (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.31: 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

	<i>No Debt</i> = 1		<i>No Debt</i> = 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 (76.08)	-0.0113 (0.441)	-211.5 (339.3)	-0.358 (1.221)
Internal Revenue Allotment (Allocated)	0.166*** (0.0163)	-7.05e-05 (9.47e-05)	0.276*** (0.0286)	3.42e-05 (0.000103)
Constant	-11.36 (14.75)	0.0133 (0.0856)	35.01 (65.45)	0.0579 (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

Table A.32: 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

	<i>No Debt</i> = 1		<i>No Debt</i> = 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 (76.08)	0.00741 (0.222)	-211.5 (339.3)	0.130 (0.368)
Internal Revenue Allotment (Allocated)	0.166*** (0.0163)	1.13e-05 (4.77e-05)	0.276*** (0.0286)	-3.29e-05 (3.10e-05)
Constant	-11.36 (14.75)	-0.00541 (0.0431)	35.01 (65.45)	-0.0114 (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.33: 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

## 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 municipalities. As Tables ?? and ?? 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.

Table A.34: 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.35: 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.36: 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

## 12 Additional Tables

Table A.37: Direct, Indirect, and Total Effects of municipal revenues on a mayor's accumulated net worth through construction spending, using different proxies for  $\lambda$

	Change in NET WORTH per Spending, using as $\lambda$ 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.38: 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.39: 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

	<i>No Debt</i> = 1		<i>No Debt</i> = 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 (72.80)	-1.299 (0.953)	-179.5 (169.2)	0.630 (0.784)
Internal Revenue Allotment	0.0857*** (0.0213)	-4.93e-05 (0.000279)	0.160*** (0.0113)	-6.53e-06 (5.22e-05)
Constant	-20.82 (14.44)	0.294 (0.189)	33.18 (33.74)	-0.118 (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.40: 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

	<i>No Debt</i> = 1		<i>No Debt</i> = 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 (89.78)	3.533 (8.278)	218.6 (559.6)	-5.185 (4.493)
Internal Revenue Allotment	0.167*** (0.0183)	-0.000135 (0.00169)	0.524*** (0.0518)	0.000435 (0.000416)
Constant	-16.16 (17.19)	-0.460 (1.585)	-65.15 (105.5)	0.915 (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.41: 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.42: 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.43: 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

	<i>No Debt</i> = 1		<i>No Debt</i> = 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 (249.0)	1.336 (2.961)	8.675 (249.0)	0.463 (8.447)
Internal Revenue Allotment	0.197*** (0.0281)	7.05e-05 (0.000334)	0.191*** (0.0196)	0.000309 (0.000666)
Constant	-4.772 (48.49)	-0.289 (0.577)	-6.022 (48.37)	-0.223 (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.44: 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

	<i>No Debt</i> = 1		<i>No Debt</i> = 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 (249.0)	-0.600 (7.395)	8.675 (249.0)	-0.376 (1.205)
Internal Revenue Allotment	0.197*** (0.0281)	-0.000199 (0.000835)	0.191*** (0.0196)	-5.34e-05 (9.50e-05)
Constant	-4.772 (48.49)	0.178 (1.440)	-6.022 (48.37)	0.0923 (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.45: 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

	<i>No Debt</i> = 1		<i>No Debt</i> = 0	
	(1) Construction spending	(2) Difference in LIABILITIES per spending	(3) Construction spending	(4) Difference in LIABILITIES per spending
Proportion of Population Aged 15-24	-13.69 (249.0)	-2.196 (10.24)	8.675 (249.0)	-0.716 (1.154)
Internal Revenue Allotment	0.197*** (0.0281)	-0.000388 (0.00116)	0.191*** (0.0196)	-9.22e-05 (9.10e-05)
Constant	-4.772 (48.49)	0.553 (1.993)	-6.022 (48.37)	0.180 (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