Public Goods, Corruption, and the Political Resource Curse

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Abstract

When do resource revenues increase corruption? I develop a model of public good provision by a politician who obtains rents by stealing government revenues or extracting bribes in exchange for public goods spending. I show there is a threshold level of revenues below which the politician does not steal, and therefore obtains rents only from bribes. Higher revenues unambiguously increase public goods spending, and decrease corruption (in the form of bribes) if the marginal social value of the public goods is sufficiently high. Above this threshold, revenues have no effect on spending, but unambiguously increases corruption (in the form of theft). Hence, a political resource curse emerges when resources provide 'too much' government revenues — that is, beyond a threshold level that corrupt politicians would credibly spend on public goods.

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1 Introduction

Mounting empirical evidence suggests that government revenues from oil, natural resources, and other windfall gains increase corruption.[1] Formal models of the political resource curse posit that resource revenues provide rents which can be appropriated by corrupt public officials at the expense of public good provision. This mechanism reveals that corruption and public goods spending are intrinsically related.

Indeed, many papers demonstrate that public good provision can provide opportunities for corruption. Olken (2006, 2007), Olken and Pande (2012), Renikka and Svensson (2004), and Niehaus and Sukhtankar (2013) use micro-level data to reveal sizeable leakages in the implementation of public programs in some developing countries. Mauro (1998), Tanzi and Davoodi (1997, 2001), Gupta, Davoodi and Tiongson (2001), and Gupta, de Melo and Sharan (2001) show a positive association between corruption and government expenditures across countries, suggesting that military spending and public works generate large bribes and kickbacks.

If corruption and public spending are indeed related, such association should be more pronounced when the revenues that fund spending largely come from natural resources and similar windfall incomes. Yet even a cursory look at cross-country data suggests the opposite. Figure 1 shows that while, overall, the incidence of bribery increases with military spending, such association is only apparent for countries with little reliance on oil. In fact, for countries whose oil rents are greater than 10 percent of GDP, the association disappears.

Empirical and theoretical results on the political resource curse remain incongruous essentially because the relationship between corruption and public good provision is undertheorized. On the one hand, canonical models of the rent-seeking political agent – Barro (1973), Ferejohn (1986), Persson and Tabellini (2000), Bueno de Mesquita et al. (1999, 2003, 2010), which are applied to

[1]See, e.g., Ross (2015), Tyburski (2014), Caselli and Michaels (2013), Brollo et al. (2013), Sala-i-Martin and Subramanian (2013), Berdiev et al. (2013), Abdih et al. (2012), Ahmed (2012), Ferraz et al. (2012), Arezki and Bruckner (2011), Vicente (2010), Leite and Weidmann (1999), La Porta et al. (1999).

resource curse phenomena in Brollo et al. (2013), Abdih et al. (2012), Ahmed (2012), Smith (2008), and Robinson et al. (2006), show that public good provision is associated with less corruption. In these models, the agent can either spend government revenues on public goods, which benefit all citizens, or appropriate it for her own consumption and/or to buy political support. Corruption is tantamount to theft of government revenues. In this case, the agent is *revenue-seeking*. When the agent is revenue-seeking, public spending and corruption necessarily move in opposite directions, as more spending simply leaves less revenues for the agents' private use/consumption.

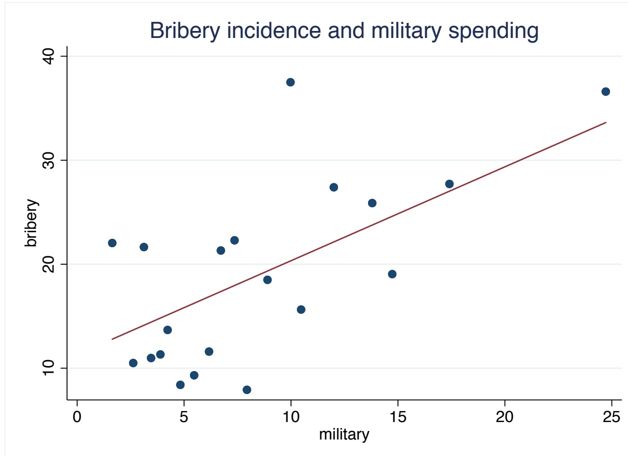
On the other hand, the agent might want to increase spending in order to obtain rents — that is, she could be *expenditure-seeking*. This type of rent-seeking is captured in the common agency models of bribery, pioneered by Bernheim and Whinston (1986a, 1986b), Dixit, Grossman, and Helpman (1997), and Grossman and Helpman (1994, 2001), in which principals from the private sector offer bribes to their common political agent in exchange for their preferred policy, e.g. higher public-good spending.

What is required is a model that allows for agents to be *both* revenue and expenditure-seeking. I provide what is—to the best of my knowledge—the first such model. The theoretical framework I propose not only generates novel insights into the relationship between public goods spending and corruption but, in so doing, also clarifies the conditions under which a political resource curse occurs.

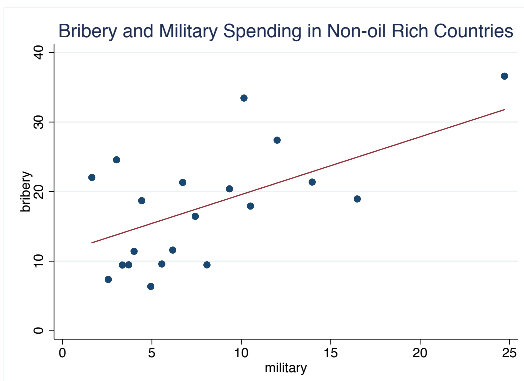
I build on the work of Grossman and Helpman (2001) who apply the common agency model with complete information to the problem of the optimal allocation of government revenues between two sets of principals, one of which offers bribes in order to influence the agent to spend relatively more revenues towards that principal. Grossman and Helpman (2001) assume, however, that the agent spends all of the revenues and, thus, obtains rents only by receiving bribes. Since the bribes are given in exchange for spending, and more spending also increases the principals' utility, an increase in government revenues always induces higher total spending.

In my model, I allow for the possibility that the agent steals the revenues. In this case, the

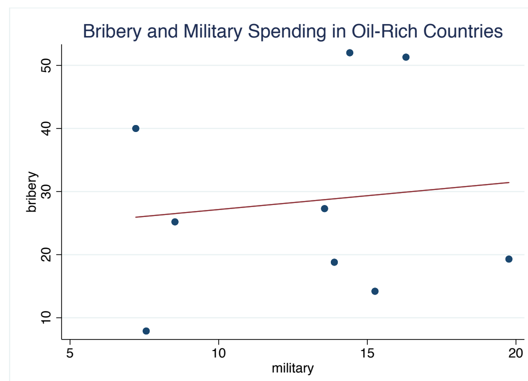
Figure 1: Does Corruption Increase with Military Spending?



(a) All available World Bank country-level data between 1997-2012



(b) Countries with oil rents less than 10% of GDP



(c) Countries with oil rents greater than 10% of GDP

This figure shows binned scatterplots of military spending and the incidence of bribery. Data used are from a pooled cross-section of countries for which some World Development Indicators are available between years 1997 to 2012 — specifically: *bribery*, which is the percentage of firms experiencing at least one bribe payment request; *military*, which is military expenditure as a percentage of GDP; and *oil*, which is oil rents as a percentage of GDP. Graph (a) uses all available data, while graphs (b) and (c) use subsets of the data for which oil rents are, respectively, less than and greater than 10% of GDP

effect of increased revenues on spending is not obvious. The agent might spend all of the additional revenues in exchange for more bribes, but she might also want to keep them for herself. By incorporating theft into the model, I show that there is a threshold level of spending that the agent maintains. If revenues are at or below this threshold, the agent spends all of the revenues and, therefore, obtains rents only from bribes. In this case, increasing revenues up to the threshold unambiguously increases public spending. When revenues are larger than the threshold spending, the agent maintains the latter and steals all the extra revenues above the threshold. In equilibrium, any increase in revenues beyond the threshold has no effect on public spending, nor on bribes.

The intuition is that the bribing principal can obtain a higher share in the revenues only if those revenues are spent in the first place. Thus, unless the agent willingly spends the revenues, the bribe has to be sufficiently high so as to induce the agent to spend the revenues and to allocate more of it towards the bribing principal. However, the latter would not be willing to pay this much since inducing the agent to spend benefits *all* principals. In equilibrium, the amount of the bribe cannot prevent the theft of revenues – it can only pay for a higher share of the revenues that the agent is willing to spend. At some point, the agent will not want to keep increasing spending precisely because she can steal the revenues instead. The agent only needs to meet, at most, a threshold level of public spending, that is, without suffering the consequence of being removed from office. This is because the agent can use her rents from bribes and stolen revenues to gain political advantage by, say, swaying electoral outcomes.

The model thus has important implications for the political resource curse. Government revenues increase corruption at the expense of public good spending when the revenues are larger than some threshold. This suggests that countries that are heavily reliant on resource revenues are more likely to exceed the threshold, which enables corrupt politicians to engage in revenue-seeking, rather than expenditure-seeking, behavior. The reverse holds for countries that are less dependent on windfall incomes. This would explain the seemingly paradoxical pattern shown in Figure 1. The lack of association between bribery and spending in oil-rent rich economies need not imply that there is no corruption, but that the rent-seeking is in the form of theft, rather than bribery.

While existing datasets on corruption do not distinguish between theft and bribery, some anecdotal evidence may render initial support to the model's findings. Note, in particular, two of the biggest corruption scandals to date. In 2015, former Prime Minister Najib Razak was accused of stealing \$ 700 million from the government development company 1MDB. In 2014, public officials at Brazilian oil company Petrobras corporation were alleged to have taken \$ 350 million in bribes in exchange for awarding contracts to construction company Odebrecht. Both 1MDB and Petrobras are funded by oil revenues, but why did corruption occur in the form of theft in Malaysia and of bribery in Brazil? For Malaysia to have exceeded the threshold level of revenues that triggers theft, it must be that Malaysia's economy is more dependent on resource revenues than Brazil's. Indeed, Malaysia's average income from natural resources over the period 1970-2016 is 17.64% of GDP, while Brazil's is only 2.64%.[2]

The next section formally derives results, and section 3 interprets the political resource curse in the light of the results. In section 4, I explicitly show that the revenue– and expenditure-seeking behavior of the agent occurs even when she can be made accountable to her principals through elections — such political accountability is imperfect because the rents from office can be used to influence electoral outcomes. Section 5 concludes with a summary of the contributions of the model.

2 A Model of Theft and Bribery

Let T be government revenues that are to be spent on principal 1 and principal 2 by their common agent – a public official that has discretion over the use of T. Denote g_1 as the public good spending that the agent allocates to principal 1 and g_2 to principal 2. Principal 1 derives gross benefit $V(g_1)$, while principal 2 derives benefit $V(g_2)$, with $V'(\cdot) > 0, V''(\cdot) < 0$. Principal 1 offers the agent bribe b in exchange for g_1. Its net benefit from public spending is thus $V(g_1) - b$. The agent then chooses an allocation (g_1, g_2). It values rents, but also cares about social welfare.

Grossman and Helpman (2001) analyze a similar game in which the only source of rents for the agent is the bribe payment. In contrast, I consider the possibility that the agent can also steal government revenues. Thus, let total rents R include both bribes and unspent revenues (which the government steals), i.e. $R = T - g_1 - g_2 + b$. The agent's utility is thus given by

[2]See theglobaleconomy.com. The 1MDB company was originally the Terangganu Investment Authority (TIA), which was funded by royalties and additional guarantees by the government based on future oil revenues. (See https://en.wikipedia.org/wiki/1Malaysia_Development_Berhad.)

$U = \lambda[V(g_1) + V(g_2)] + (1 - \lambda)(T - g_1 - g_2 + b)$, where $\lambda \in (0, 1)$ is the weight it attaches to social welfare which, for now, is taken as given.

As standard in common agency models with complete information, the equilibrium spending allocation and bribe payment are jointly efficient for the agent and the principal who offers the bribe. That is, it is obtained by solving

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

where $\overline{U}$ is the agent's reservation utility - what it would obtain if it rejects principal 1's offer. Constraint (a) requires that the agent's utility when it accepts the bribe is at least as large as when it rejects it. The possibility of theft is captured by constraint (b) - if it is binding, i.e. $g_1 + g_2 = T$, then all revenues are spent and theft is not possible. If it is slack, then theft occurs, with the amount of stolen revenues equal to $T - g_1 - g_2$. I thus call constraint (b) the "no-theft constraint".

Restricting the analysis to interior solutions, suppose that constraint (b) binds. Then $g_2 = T - g_1$ and problem (1) becomes

$$\begin{aligned} &\max_{g_1, b} V(g_1) - b \\ s.t.\ &\lambda[V(g_1) + V(T - g_1)] + (1 - \lambda)(b) \geq \overline{U} \end{aligned} \tag{2}$$

In equilibrium, the above constraint binds with equality, which allows one to obtain the following expression for b:

$$b = \big(\frac{1}{1 - \lambda}\big) \big[\overline{U} - \lambda[V(g_1) + V(T - g_1)]\big], \tag{3}$$

which, when plugged into the maximand in (2), transforms (2) into the following unconstrained problem:

$$\max_{g_1} V(g_1) - \big(\frac{1}{1-\lambda}\big)\big[\overline{U} - \lambda[V(g_1) + V(T-g_1)]\big]. \tag{4}$$

Equilibrium g_1^* thus satisfies the first-order condition (FOC) $F = V'(g_1^*) + \frac{\lambda}{1-\lambda}V'(g_1^*) - \frac{\lambda}{1-\lambda}V'(T - g_1^*) = 0$, or

$$V'(g_1^*) = \lambda V'(T - g_1^*). \tag{5}$$

That is, the equilibrium allocation attaches more weight to the marginal benefit from spending of the principal that offers a bribe, implying that $g_1^* > g_2^* = T - g_1^*$.

Meanwhile, the equation (3) requires an expression for $\overline{U}$ — which is the utility that the agent would obtain if she rejected principal 1's bribe offer. In this case, the agent's utility would be given by $\lambda[V(g_1)+V(T-g_1)]$, which she could maximize by choosing the first-best, socially optimal level of spending, i.e. g_1^0. To see this, note that maximizing $\lambda[V(g_1) + V(T - g_1)]$ yields FOC $V'(g_1^0) = V'(T - g_1^0)$, which implies an equal allocation of T between sectors, that is, $g_1^0 = (T - g_1^0) = \frac{T}{2}$. Thus, if the agent rejects the bribe offer, she gets $\overline{U} = \lambda[V(\frac{T}{2}) + V(\frac{T}{2})] = 2\lambda V(\frac{T}{2})$ which, when plugged into equation (3) gives the equilibrium amount of bribes:

$$b^* = \frac{\lambda}{1-\lambda}\big[2V(\frac{T}{2}) - V(g_1^*) - V(T - g_1^*)\big]. \tag{6}$$

Thus, in equilibrium, the bribe compensates the agent for a fraction $\frac{\lambda}{1-\lambda}$ of the loss in social welfare.

The following result is obtained.

Proposition 1. *If the no-theft constraint binds, then government revenues unambiguously increase public spending, and decreases (increases) bribes if the marginal value of public-good spending is sufficiently high (low).*

(All proofs are in the Supplemental Information (SI) file.)

What if the no-theft constraint does not bind? With constraint (a) binding in equality, one can also write problem (1) as

$$\max_{g_1,g_2} V(g_1) - \frac{1}{1-\lambda}[\overline{U} - \lambda[V(g_1)+V(g_2)]] + T - g_1 - g_2 \qquad s.t.\ g_1 + g_2 - T \leq 0 \tag{7}$$

The necessary conditions for optimal g_1^*, g_2^*, γ^* are given by the following Kuhn-Tucker conditions:

$$V'(g_1^*) + \frac{\lambda}{1-\lambda}V'(g_1^*) - 1 - \gamma^* = 0 \tag{8}$$

$$\frac{\lambda}{1-\lambda}V'(g_2^*) - 1 - \gamma^* = 0 \tag{9}$$

$$\gamma^*(g_1^* + g_2^* - T) = 0, \tag{10}$$

where γ^* is the Lagrange multiplier — the 'shadow price' of preventing theft. Thus, to solve for the equilibrium when the no-theft constraint is slack, one can set $\gamma^* = 0$.

Then, from constraint (a), one can obtain the following expression for equilibrium bribes: $b^* = \frac{1}{1-\lambda}[\overline{U} - \lambda[V(g_1^*) + V(g_2^*)]] + T - g_1^* - g_2^*$. To get the agent's reservation utility $\overline{U}$, note that if the agent rejects the bribe offer, she will obtain utility from social welfare and stolen revenues, which she can maximize by choosing g_1^0, g_2^0 via the following optimization problem:

$$\max_{g_1,g_2} \lambda[V(g_1)+V(g_2)]] + (1-\lambda)(T - g_1 - g_2) \qquad s.t.\ g_1 + g_2 - T \leq 0 \tag{11}$$

Necessary for g_1^0, g_2^0, γ^0 are the following Kuhn-Tucker conditions:

$$\lambda V'(g_1^0) - (1-\lambda) - \gamma^0 = 0 \tag{12}$$

$$\lambda V'(g_2^0) - (1-\lambda) - \gamma^0 = 0 \tag{13}$$

$$\gamma^0(g_1^0 + g_2^0 - T) = 0 \tag{14}$$

Thus, if the agent rejects the bribe offer, she obtains utility $\overline{U} = \lambda[V(g_1^0)+V(g_2^0)]+(1-\lambda)(T-g_1^0-g_2^0)$ which, when plugged into the expression for b^*, gives the equilibrium amount of bribes:

$$b^* = \frac{\lambda}{1-\lambda}[V(g_1^0) + V(g_2^0) - V(g_1^*) - V(g_2^*)] - (g_1^0 + g_2^0 - g_1^* - g_2^*). \tag{15}$$

We now get a markedly different result:

Proposition 2. *If the no-theft constraint does not bind, then government revenues have no effect on public-good spending, nor on bribes.*

Lastly, Proposition 3 establishes a threshold level of revenues at and below which the no-theft constraint binds, and above which it is slack.

Proposition 3. *There exists a threshold level of revenues $\bar{T}$ such that:*

1. *if $T \leq \bar{T}$, then the no-theft constraint binds, and g_1^* and g_2^* increase with T, while b^* decreases (increases) with T if the marginal value of public-good spending is sufficiently high (low).*
2. *if $T > \bar{T}$, then the no-theft constraint does not bind, and neither g_1^*, g_2^*, nor b^* change with T.*

Figure 2 depicts the effect of government revenues on public spending and corruption. Proposition 3 implies that there is a threshold amount of revenues $\overline{T}$ at and below which total spending is increasing, but beyond which it does not increase further. Since the no-theft constraint fully binds at and below the threshold, all revenues are spent. Total public-good spending $S = g_1 + g_2$ thus has slope equal to 1 below $\overline{T}$ and 0 thereafter. Meanwhile, bribes may increase or decrease. Consider, then, bribe curves b_1 and b_2 which show different possibilities below $\overline{T}$ but which, beyond $\overline{T}$, have slope 0. Lastly, total rents below $\overline{T}$ come solely from bribes (since there is no theft), in which case R_1 and R_2 coincide with b_1 and b_2, respectively. Above $\overline{T}$, rents come from both bribes and theft, with the amount of bribes fixed at b_1 and b_2, and all additional revenues are stolen since public spending is fixed. Thus, above $\overline{T}$, R_1 and R_2 have as their y-intercepts their respective intersections with b_1 and b_2, and slope equal to 1.

The results are a direct consequence of the public official having quasi-linear preferences over the two kinds of rents – bribes and stolen revenues. Note how Figure 2 portrays a kind of income or, in this case, revenue, expansion path. Below threshold $\bar{T}$, all revenues are allocated to the pursuit of bribe-rents and, hence, all revenues are spent and stolen revenues are zero. Beyond the threshold, all revenues are allocated towards theft – in other words, all revenues are stolen, which means public spending does not change.

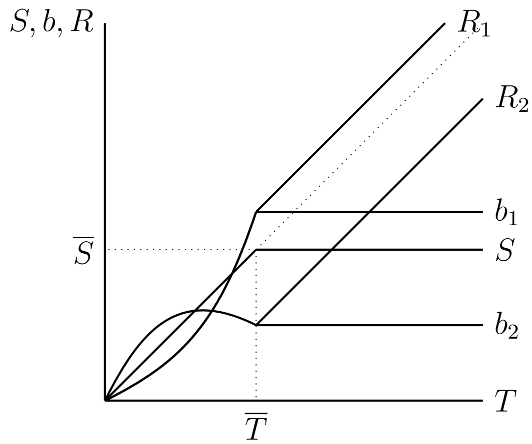
That preferences over such rents are quasi-linear captures a key distinction between theft and bribery. From the point of view of the public official, stolen revenues and bribe-rents ought to be perfect substitutes. However, stolen revenues are directly appropriated, whereas bribe-rents are obtained only in exchange for public-good spending, and therefore depend on the marginal value of the public goods. Unless the latter is equal to one or to some constant (e.g. pure transfers), bribe-rents and stolen revenues cannot be perfect substitutes. Utility over these rents are therefore additive, but quasi-linear.

Nevertheless, a weaker result may be obtained for any non-homothetic preferences that depict bribe-rents as an inferior good, and stolen revenues as a normal good. Initially, bribe-rents and stolen revenues can both increase with revenues, but there will be some threshold at which bribe-rents start to decrease, and total rents will increasingly come from stolen revenues.

3 An Application to the Political Resource Curse

The model demonstrates that the nature of the relationship between corruption and public-good spending depends on the existence of some threshold level of revenues. For an economy with government revenues above the threshold, the agent can keep public-good spending constant even while revenues are increasing. This implies that she can do so while remaining in office. In section 4, I propose a model that can sustain this equilibrium — one in which the corrupt agent survives electoral competition by using her rents to buy votes. By such mechanism, the amount of public

Figure 2: Effect of Revenues on Public Spending and Corruption



This figure depicts a threshold level of revenues $\overline{T}$ below which theft is not possible, in which case all revenues are spent and the only source of rents are bribes which may increase or decrease with revenues. Above $\overline{T}$, all additional revenues are stolen, public-good spending remains constant, and total rents come from a fixed amount of bribes and stolen revenues that are increasing at the same rate as revenues.

spending associated with the threshold level of revenues captures, as it were, the maximum value of public goods that is credibly demanded by the electorate. Beyond that level, it must be that their marginal utility from directly sharing in the agent's rents, i.e. from selling their votes, is greater than that from obtaining additional public goods.

When might government revenues exceed the threshold? I conjecture that an economy is more likely to be above the threshold the greater its reliance on revenues from oil, natural resources, and other windfall gains. A large influx of windfall income that flow directly to public coffers might be more easily captured through direct appropriation rather than indirectly by spending the windfall on public goods and extracting bribes therefrom. Thus, in equilibrium, a corrupt agent overseeing an economy with considerable windfall revenues would be more likely to increase her rents as revenues increase by engaging in more theft, rather than more bribery.[3] In contrast, an

[3] This is indeed consistent with the formal literature on the political resource curse, where rent-seeking is modeled as theft or the appropriation of resource revenues (see Desierto (2018)). The results here thus provide explicit justification for why corruption is more aptly modeled as theft, rather than bribe-taking, when depicting a political resource curse.

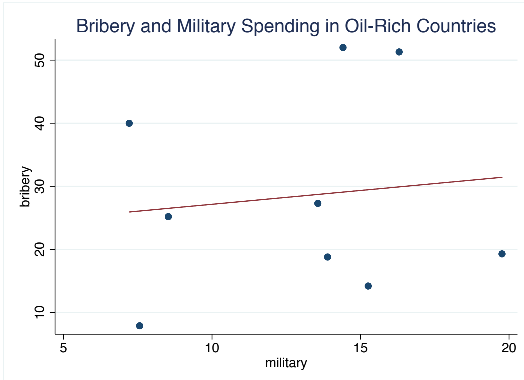
economy that relies more heavily on tax revenues would be more likely to be below the threshold, in which case the agent can only keep extracting (bribe-)rents by spending more.

To show indirectly that such conjecture is plausible, Figure 3 plots military spending and corruption among countries that are reliant on oil revenues — those with oil rents greater than 10 percent of GDP. In lieu of a measure for the theft of revenues, for which data are unavailable, panel (a) uses (the incidence of) bribery, while panel (b) proxies for bribery by using a measure of corruption that describes the lack of transparency in the public sector. There appears to be no association between military spending and bribery, which would be consistent with the model since the latter predicts that an economy above the threshold level of revenues would remain at a fixed level of public spending and, thus, of bribe-rents. That is, if, above the threshold, the government increases rents by stealing more (and keeping spending fixed) rather than taking more bribes from higher spending, then spending and bribery would be unrelated. Note that the same pattern roughly holds when the extent of reliance on oil is increased to greater than 20 percent of GDP (panels (c) and (d).) In contrast, Figure 4 plots military spending and bribery among countries with less reliance on oil, and shows that the two variables increase together. If such countries were indeed below the threshold (and the marginal value of the public goods from which bribes are extracted is sufficiently low), the model predicts that both bribe-rents and public spending would increase with revenues, and would thus be positively associated.

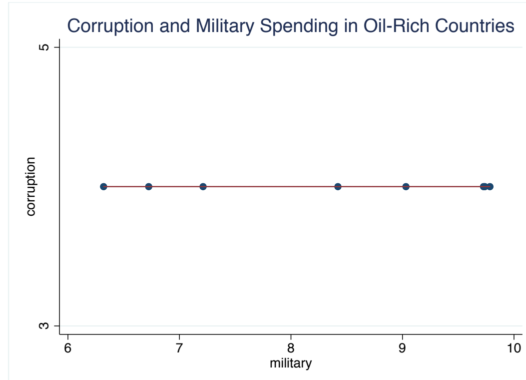
Figure 5 confirms the patterns for countries that are more, and less, reliant on other types of windfall income, e.g. revenues from minerals and foreign aid.

The model can thus be used to explain the political resource curse. An increase in government revenues unambiguously increases corruption (in the form of theft) at the expense of public goods — that is, the political resource curse always exists, when revenues exceed the minimum amount of public spending that (just) satisfies the credible level of demand for public goods.

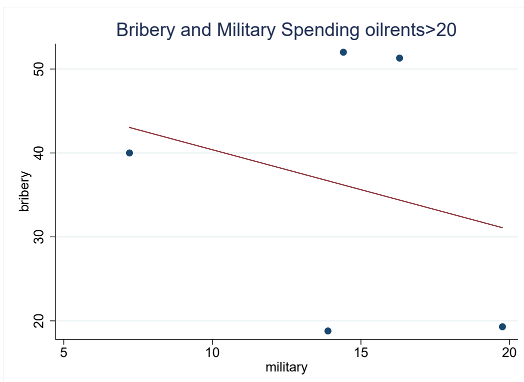
Figure 3: Bribery and Spending Unrelated Above the Threshold



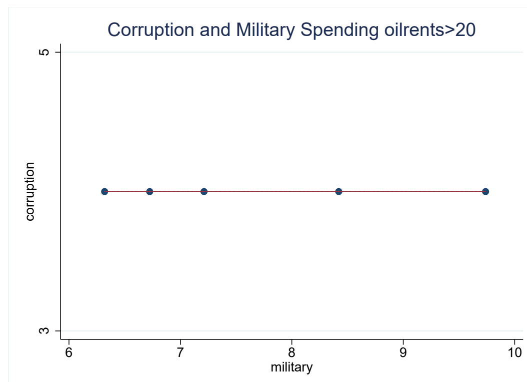
(a) Countries with oil rents greater than 10% of GDP



(b) Countries with oil rents greater than 10% of GDP



(c) Countries with oil rents greater than 20% of GDP



(d) Countries with oil rents greater than 20% of GDP

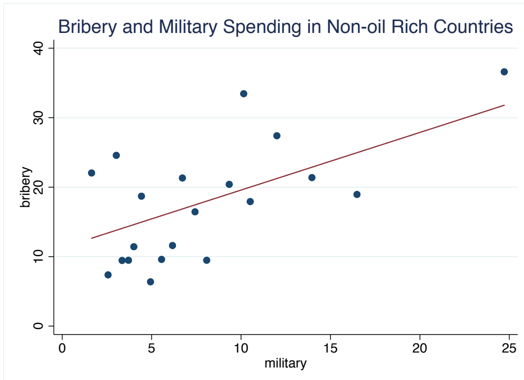
This figure shows binned scatterplots of military spending and two alternative measures of corruption, for countries that are more reliant on oil. Data used are from a pooled cross-section of countries for which some World Development Indicators are available between years 1997 to 2012 — specifically: *bribery*, which is the percentage of firms experiencing at least one bribe payment request; *corruption*, which is the CPIA transparency, accountability, and corruption in the public sector rating (with 1 re-coded as most, and 6 least, transparent); *military*, which is military expenditure as a percentage of GDP; and *oil*, which is oil rents as a percentage of GDP

4 Political Competition

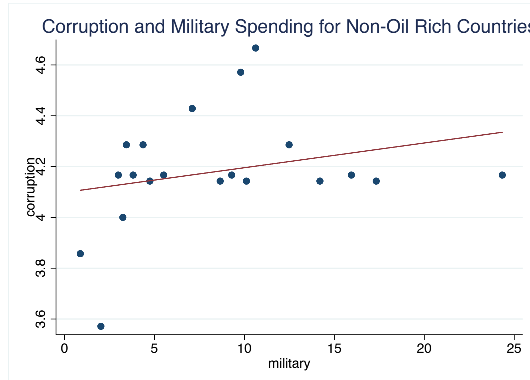
The model thus far establishes the existence of a threshold level of revenues that determines the composition of rents obtained by a public official who has discretion over the revenues. Above the threshold, the official earns both bribe-rents and can steal government revenues. What determines the relative sizes of these rents?

From the expression for equilibrium bribes b^*, and the necessary conditions for equilibrium

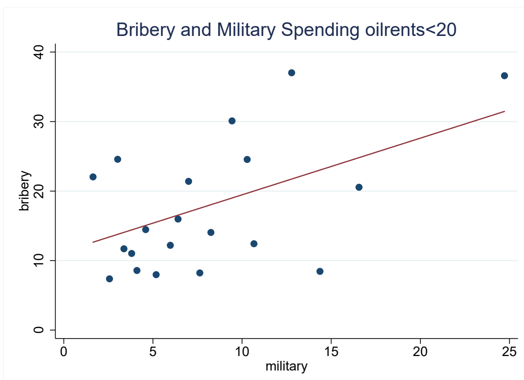
Figure 4: Bribery and Spending Positively Associated Below the Threshold



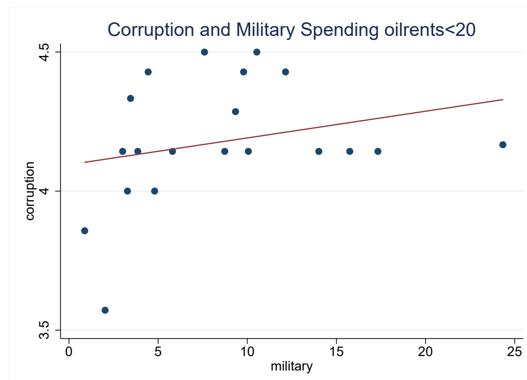
(a) Countries with oil rents less than 10% of GDP



(b) Countries with oil rents less than 10% of GDP



(c) Countries with oil rents less than 20% of GDP



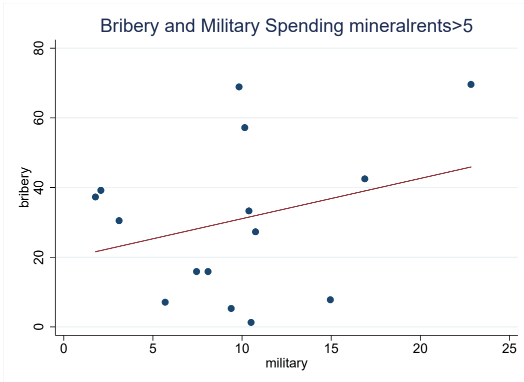
(d) Countries with oil rents less than 20% of GDP

This figure shows binned scatterplots of military spending and two alternative measures of corruption, for countries that are less reliant on oil. Data used are from a pooled cross-section of countries for which some World Development Indicators are available between years 1997 to 2012 — specifically: *bribery*, which is the percentage of firms experiencing at least one bribe payment request; *corruption*, which is the CPIA transparency, accountability, and corruption in the public sector rating (with 1 re-coded as most, and 6 least, transparent); *military*, which is military expenditure as a percentage of GDP; and *oil*, which is oil rents as a percentage of GDP

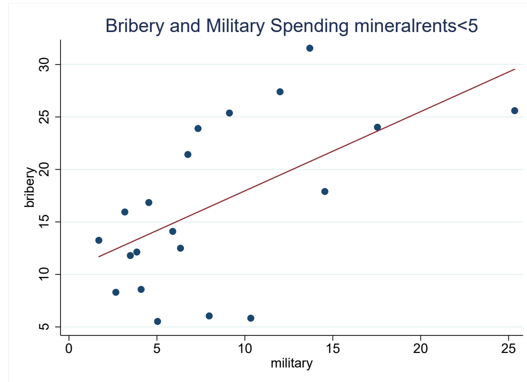
public spending g_1^* and g_2^*, an important variable is λ – the extent to which the public official values social welfare over rents. This variable can capture institutional checks that limit the extent of rent-seeking by the government. However, it can also describe the extent of political competition which pressures the government to be more accountable to citizens. I now endogenize λ by modeling electoral competition between candidates who can share rents with the electorate by buying votes.[4]

[4]This is only one example. One can envisage situations in which politicians share rents through other forms of patronage. Neither is electoral competition the only mechanism of (imperfect) political accountability that could support a rent-seeking equilibrium — a similar logic can operate under alternative forms of competition, e.g. via

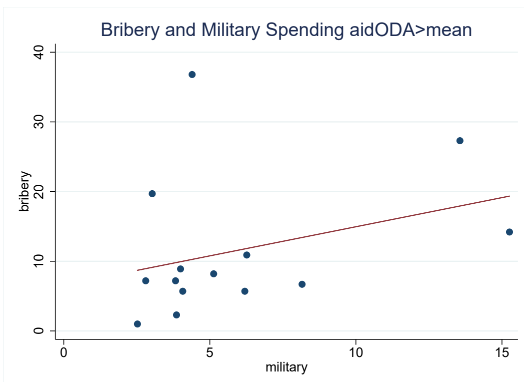
Figure 5: Positive Association Between Bribery and Spending More Apparent Below the Threshold



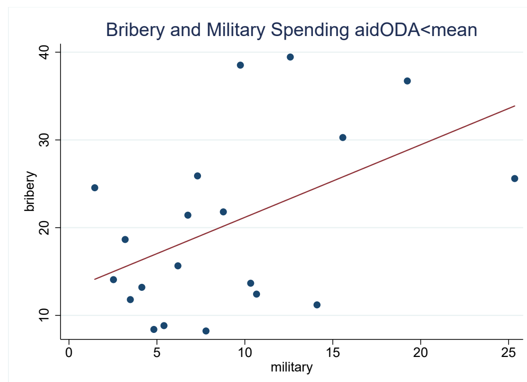
(a) Countries with mineral rents greater than 5% of GDP



(b) Countries with mineral rents less than 5% of GDP



(c) Countries receiving foreign aid greater than the mean amount in the sample



(d) Countries receiving foreign aid less than the mean amount in the sample

This figure shows binned scatterplots of military spending and the incidence of bribery, for countries that are more reliant, and those that are less reliant, on mineral rents and foreign aid. Data used are from a pooled cross-section of countries for which some World Development Indicators are available between years 1997 to 2012 — specifically: *bribery*, which is the percentage of firms experiencing at least one bribe payment request; *military*, which is military expenditure as a percentage of GDP; *oil*, which is oil rents as a percentage of GDP; *mineralrents*, which is mineral rents as a percentage of GDP; and *aidODA*, which is the net official development assistance and official aid received (in constant 2012 US$)

In particular, there are two candidates who essentially have different utilities over social welfare and rents because of two things – their relative abilities to improve social welfare (through public-good spending), and their relative proclivities for stealing government revenues once in office. Principal 1 offers bribes to each of them in exchange for a higher share in spending allocations. Each candidate then uses their respective bribes, along with any revenues they plan to steal, to

selectorate models in which the politician forms a coalition of supporters by offering to transfer some of her rents to coalition members.

buy votes. Existing results (Grossman and Helpman 2001) have established that when bribes are the only source of rents, the candidate that is more likely to win would allocate less spending to the bribing principal, which induces the latter to offer a bribe amount that is larger than what it offers to the other candidate. That is, campaign money (bribes) follows the more advantaged, i.e. popular, candidate.[5] I show, however, that when candidates can also use stolen revenues as additional funds, the more popular candidate does not necessarily obtain a larger bribe. In this case, the bribe amounts that each candidate obtains depends on their relative proclivity to steal and their relative ability to increase social welfare. I show that the larger bribe goes either to the candidate who is relatively worse in both respects, or to the candidate who is relatively worse only in the proclivity to steal (and relatively better at increasing social welfare), provided that such disadvantage is sufficiently large. In this manner, the money (bribes) follows the candidate that is relatively worse at finding other sources of campaign funds.

To proceed, let principal $i = \{1, 2\}$ consist of a group of individuals who choose the public official – the agent, by electing a party or candidate $k = \{A, B\}$. The game proceeds similarly, but with an additional last stage in which the agent is selected. Specifically, the leader of group 1 offers bribes to each candidate, who then announce her own policy (i.e. public-good spending allocation). Each member of each group then vote for either candidate A or B.

Apart from taking bribes, candidates can also steal revenues when they are in office. The candidates' campaign funds thus consist of the bribe rents and anticipated stolen revenues, which they use in order to buy 'impressionable' voters.[6] Other voters are 'strategic' in that they vote according to their policy preference.

To be precise, there are $N = N_1 + N_2$ voters, with $N_1 > 0$ voters belonging to group 1 and $N_2 > 0$ to group 2. Group 2 is an unorganized sector that is not capable of offering bribes, while group 1 can offer bribes. A voter can either be strategic or impressionable. A strategic voter

[5]See SI for details.

[6]Candidates either advance the 'payment' to impressionable voters, or promise to pay them after the election. The model also ignores the timing of bribe payments, as it only solves for the equilibrium bribe *offer*.

j in group i has utility $V(g_i^k) + v_{ji}^k$, where $k = \{A, B\}$ indexes the candidate, with $V'(\cdot) > 0$, $V''(\cdot) < 0$. That is, $V(g_i^k)$ is the utility obtained from public spending to be allocated by k to group i, and is thus group-specific, whereas v_{ji}^k captures the voter's particular preference for k, and is thus voter-specific.[7]

Let $v_{ji} = v_{ji}^B - v_{ji}^A$ denote the relative preference of voter j in group i for B over candidate A. For both groups, let v_{ji} be uniformly distributed, with mean b/f and density f.

Strategic voter j in group i votes for A if and only if $v_{ji} \leq V(g_i^A) - V(g_i^B)$. This implies that the fraction of the strategic voters in group i who vote for A is:[8]

$$s_i^S = \frac{1}{2} - b + f[V(g_i^A) - V(g_i^B)] \tag{16}$$

With $\sum N_i s_i^S = s^S N$, one can solve for the fraction of total strategic voters s^S who vote for A:

$$s^S = \frac{1}{2} - b + f\Big[\frac{N_1}{N}[V(g_1^A) - V(g_1^B)] + \frac{N_2}{N}[V(g_2^A) - V(g_2^B)]\Big]. \tag{17}$$

Now assume that for each group i, there is a fraction μ of strategic voters, and a fraction $1 - \mu$ of impressionable voters who are influenced by campaign spending. With candidate k's campaign funds consisting of bribe-rents b^k and stolen revenues $T - g_1^k - g_2^k$, the vote share of A among impressionable voters is $s^I = \frac{1}{2} - b + e(b^A - b^B + (T - g_1^A - g_2^A) - (T - g_1^B - g_2^B)) = \frac{1}{2} - b + e(b^A - b^B + g_1^B - g_1^A + g_2^B - g_2^A)$, with e denoting a function that maps A's campaign-fund advantage to vote share. The total vote share of A is then:

[7] In Grossman and Helpman, the strategic voter's utility is $V_i(\mathbf{g}^k) + v_{ji}^k$, where $\mathbf{g}$ is the vector of policies, which in this case is $\mathbf{g} = (g_1, g_2)$. I simplify here by letting the first term be $V(g_i^k)$ - voter j only cares about the spending allocated to its own group, and by assuming that V takes the same functional form across groups.

[8] With mean b/f and density f, v_{ji} is uniformly distributed on the interval $\left[\frac{2b-1}{2f}, \frac{2b+1}{2f}\right]$. The share of strategic voters in group i who vote for A is thus $f[V(g_i^A) - V(g_i^B) - (\frac{2b-1}{2f})]$.

$$s = \frac{1}{2} - b + \mu f \Big[\frac{N_1}{N}[V(g_1^A) - V(g_1^B)] + \frac{N_2}{N}[V(g_2^A) - V(g_2^B)]\Big] + (1-\mu)e(b^A - b^B + g_1^B - g_1^A + g_2^B - g_2^A). \quad (18)$$

Thus, A and B's respective probability of winning are highest when the following are maximized:

$$U^A = \mu f[\frac{N_1}{N}V(g_1^A) + \frac{N_2}{N}V(g_2^A)] + (1-\mu)e(b^A - g_1^A - g_2^A) \quad (19)$$

$$U^B = \mu f[\frac{N_1}{N}V(g_1^B) + \frac{N_2}{N}V(g_2^B)] + (1-\mu)e(b^B - g_1^B - g_2^B). \quad (20)$$

Notice that U^k resembles the public official's utility in section 2. The weight λ that the candidate attaches to social welfare is here captured by μ, f, and e – parameters that describe the strength of political competition. With larger values of μf and smaller values of e, the candidate's utility increases more when satisfying strategic voters, rather than impressionable ones who share in rents. There is thus less need to obtain rents, which allows the candidate to value social welfare more.

Note that the ex-ante probability that A is elected is $F(\Delta)$, where

$$\Delta = U^A - U^B = \mu f \Big[\frac{N_1}{N}[V(g_1^A) - V(g_1^B)] + \frac{N_2}{N}[V(g_2^A) - V(g_2^B)]\Big] + (1-\mu)e(b^A - b^B - (g_1^A + g_2^A) + (g_1^B + g_2^B)). \quad (21)$$

Group 1 thus solves:

$$\begin{aligned} &\max_{g_i^k, b^k} F(\Delta)N_1V(g_1^A) + (1 - F(\Delta))N_1V(g_1^B) - \sum_k b_T^k \\ &s.t.\ \mu f[\frac{N_1}{N}V(g_1^k) + \frac{N_2}{N}V(g_2^k)] + (1-\mu)e(b_T^k - g_1^k - g_2^k) \geq \overline{U_T^k} \quad (a) \\ &g_1^k + g_2^k \leq T \quad (b), \end{aligned} \quad (22)$$

for each $k = \{A, B\}$, and bribes b_T^k and the agent's reservation utility $\overline{U_T^k}$ are subscripted by T to highlight the fact that theft of revenues can occur, in which case constraint (b) does not bind.

One gets the following expression for bribes by letting constraint (a) bind with equality:

$$b_T^k = \left[\frac{1}{(1-\mu)e}\right]\left[\overline{U_T^k} - \mu f[\frac{N_1}{N}V(g_1^k) + \frac{N_2}{N}V(g_2^k)]\right] + g_1^k + g_2^k, \tag{23}$$

where the reservation utilities are given by $\overline{U_T^k} = \mu f[\frac{N_1}{N}V(g_1^{k^0}) + \frac{N_2}{N}V(g_2^{k^0})] - (1-\mu)e(g_1^{k^0} + g_2^{k^0})$, i.e. when bribes are rejected. Plugging this expression into the maximand, the problem then becomes:

$$\begin{aligned} &\max_{g_1^k, g_2^k} F(\Delta)N_1V(g_1^A) + (1-F(\Delta))N_1V(g_1^B) \\ &-\left[\frac{1}{(1-\mu)e}\right]\left[(\overline{U_T^A} + \overline{U_T^B}) - \mu f[\frac{N_1}{N}(V(g_1^A) + V(g_1^B)) + \frac{N_2}{N}(V(g_2^A) + V(g_2^B))]\right] - (g_1^A + g_2^A) - (g_1^B + g_2^B), \\ &s.t.\ g_1^A + g_2^A - T \leq 0;\ g_1^B + g_2^B - T \leq 0. \end{aligned} \tag{24}$$

The necessary (Kuhn-Tucker) conditions are:[9]

$$\begin{aligned} N_1F(\Delta)V'(g_1^{A^*}) + 1 - \lambda^{A^*} - \frac{\partial\Delta}{\partial g_1^{A^*}}\left[N_1\frac{\partial F}{\partial\Delta}[V(g_1^{B^*}) - V(g_1^{A^*})] - \frac{1}{(1-\mu)e}\right] &= 0 \quad (25) \\ 1 - \lambda^{A^*} - \frac{\partial\Delta}{\partial g_2^{A^*}}\left[N_1\frac{\partial F}{\partial\Delta}[V(g_1^{B^*}) - V(g_1^{A^*})] - \frac{1}{(1-\mu)e}\right] &= 0 \quad (26) \\ N_1(1-F(\Delta))V'(g_1^{B^*}) - 1 - \lambda^{B^*} - \frac{\partial\Delta}{\partial g_1^{B^*}}\left[N_1\frac{\partial F}{\partial\Delta}[V(g_1^{B^*}) - V(g_1^{A^*})] + \frac{1}{(1-\mu)e}\right] &= 0 \quad (27) \\ -1 - \lambda^{B^*} - \frac{\partial\Delta}{\partial g_2^{B^*}}\left[N_1\frac{\partial F}{\partial\Delta}[V(g_1^{B^*}) - V(g_1^{A^*})] + \frac{1}{(1-\mu)e}\right] &= 0 \quad (28) \\ \lambda^{A^*}(g_1^{A^*} + g_2^{A^*} - T) &= 0 \quad (29) \\ \lambda^{B^*}(g_1^{B^*} + g_2^{B^*} - T) &= 0, \quad (30) \end{aligned}$$

where λ^{k^*} are the Lagrange multipliers.

To obtain the equilibrium when the constraints are slack and, thus, theft occurs, one imposes $\lambda^{A^*} = \lambda^{B^*} = 0$. Condition (29) then implies $g_1^{A^*} + g_2^{A^*} < T$ while (25) and (26) imply (i) $N_1 = (\frac{\partial g_2^{A^*}}{\partial g_1^{A^*}} - 1)(\frac{1}{V'(g_1^{A^*})F(\Delta)})$, where $\frac{\partial g_2^{A^*}}{\partial g_1^{A^*}} = \frac{\partial\Delta}{\partial g_1^{A^*}}\frac{\partial g_2^{A^*}}{\partial\Delta} = \frac{\mu f\frac{N_1}{N}V'(g_1^{A^*}) - (1-\mu)e}{\mu f\frac{N_2}{N}V'(g_2^{A^*}) - (1-\mu)e}$. Meanwhile, condition (30)

[9] See SI for the derivation.

implies $g_1^{B^*} + g_2^{B^*} < T$ while (27) and (28) imply (ii) $N_1 = (1 - \frac{\partial g_2^{B^*}}{\partial g_1^{B^*}})(\frac{1}{V'(g_1^{B^*})(1-F(\Delta)})$, where $\frac{\partial g_2^{B^*}}{\partial g_1^{B^*}} = \frac{\partial \Delta}{\partial g_1^{B^*}} \frac{\partial g_2^{B^*}}{\partial \Delta} = \frac{-\mu f \frac{N_1}{N} V'(g_1^{B^*}) + (1-\mu)e}{-\mu f \frac{N_2}{N} V'(g_2^{B^*}) + (1-\mu)e}$. Equating (i) and (ii) and re-arranging, the equilibrium when theft occurs thus satisfies:

$$\frac{V'(g_1^{A^*})}{V'(g_1^{B^*})} = \frac{(1 - F(\Delta))(\frac{\partial g_2^{A^*}}{\partial g_1^{A^*}} - 1)}{F(\Delta)(1 - \frac{\partial g_2^{B^*}}{\partial g_1^{B^*}})} \tag{31}$$

The following result is obtained.

Proposition 4. *Let* $w \equiv (\frac{\partial g_2^{A^*}}{\partial g_1^{A^*}} - 1)(\frac{\partial g_2^{A^*}}{\partial g_1^{A^*}} - \frac{\partial g_2^{B^*}}{\partial g_1^{B^*}})$.

(i) $F(\Delta) > w \Longleftrightarrow g_1^{A^*} < g_1^{B^*}$.

(ii) $F(\Delta) < w \Longleftrightarrow g_1^{A^*} > g_1^{B^*}$.

(iii) $F(\Delta) = w \Longleftrightarrow g_1^{A^*} = g_1^{B^*}$.

Proposition 4 thus implies that the candidate that has a relatively higher probability of being elected would allocate relatively more spending to group 1.[10]

To compare the equilibrium bribe offers to candidates A and B, plug $\overline{U_T^k}$ into (23) to get

$$b_T^{k^*} = \Big[\frac{1}{(1-\mu)e}\Big]\Big[\mu f[\frac{N_1}{N}(V(g_1^{k^0}) - V(g_1^{k^*})) + \frac{N_2}{N}(V(g_2^{k^0}) - V(g_2^{k^*}))]\Big] + g_1^{k^*} + g_2^{k^*} - (g_1^{k^0} + g_2^{k^0}). \tag{32}$$

[10] To see this, note that $F(\Delta) \gtreqless w \Longleftrightarrow 1 - F(\Delta) \lesseqgtr 1 - w$, while $F(\Delta) = w \Longleftrightarrow 1 - F(\Delta) = 1 - w$. Now it must be that w is between 0 and 1. (Otherwise, if $w < 0$ or $w > 1$, then $1 - F(\Delta) > 1 - w$ and $F(\Delta) < w$ cannot both be true.) This implies that when $g_1^{A^*} = g_1^{B^*}$, for both $F(\Delta) = w$ and $1 - F(\Delta) = 1 - w$ to be true, it must be that $w = \frac{1}{2}$, which means that $F(\Delta) = \frac{1}{2} = 1 - F(\Delta)$. That is, candidates A and B have equal probability of being elected. Now, when $g_1^{A^*} > g_1^{B^*}$, for both $F(\Delta) < w$ and $1 - F(\Delta) > 1 - w$ to be true when $w \in (0, 1)$, it must be that $F(\Delta) < 1 - F(\Delta)$. Analogously, when $g_1^{A^*} < g_1^{B^*}$, for both $F(\Delta) > w$ and $1 - F(\Delta) < 1 - w$ to be true when $w \in (0, 1)$, it must be that $F(\Delta) > 1 - F(\Delta)$.

One can then take the difference:

$$
\begin{aligned}
b_T^{A^*} - b_T^{B^*} = \Big[\frac{1}{(1-\mu)e}\Big]\Big[\mu f[\frac{N_1}{N}(V(g_1^{A^0}) - V(g_1^{A^*}) + V(g_1^{B^*}) - V(g_1^{B^0})) \\
+\frac{N_2}{N}(V(g_2^{A^0}) - V(g_2^{A^*}) + V(g_2^{B^*}) - V(g_2^{B^0}))]\Big] \\
+(g_1^{A^*} + g_2^{A^*}) - (g_1^{A^0} + g_2^{A^0}) + (g_1^{B^0} + g_2^{B^0}) - (g_1^{B^*} + g_2^{B^*}).
\end{aligned} \tag{33}
$$

It is not always the case that $g_1^{A^0} = g_1^{B^0}$ and $g_2^{A^0} = g_2^{B^0}$, since $g_i^{k^0}$ only requires $\frac{V'(g_1^{k^0})}{V'(g_2^{k^0})} = \frac{N_2}{N_1}$ for each $k = \{A, B\}$.[11] However, the latter implies that if $g_1^{A^0} = g_1^{B^0}$, then $g_2^{A^0} = g_2^{B^0}$, and vice versa. The following result thus only needs to assume that there would be no difference in the candidates' behavior toward principal 1 if they were to reject the latter's offer, i.e. $g_1^{A^0} = g_1^{B^0}$.

Proposition 5. *Let $g_1^{A^0} = g_1^{B^0}$. Define $x \equiv (T - g_1^{A^*} - g_2^{A^*}) - (T - g_1^{B^*} - g_2^{B^*}) = (g_1^{B^*} + g_2^{B^*}) - (g_1^{A^*} + g_2^{A^*})$ as the difference in stolen revenues from electing candidate A over B, and $y \equiv [\frac{N_1}{N}V(g_1^{B^*}) + \frac{N_2}{N}V(g_2^{B^*})] - [\frac{N_1}{N}V(g_1^{A^*}) + \frac{N_2}{N}V(g_2^{A^*})]$ as the difference in social welfare from electing candidate B over A. Then:*

(i) $x < [\frac{\mu f}{(1-\mu)e}]y \iff b_T^{A^*} > b_T^{B^*}$.

(ii) $x > [\frac{\mu f}{(1-\mu)e}]y \iff b_T^{A^*} < b_T^{B^*}$.

(iii) $x = [\frac{\mu f}{(1-\mu)e}]y \iff b_T^{A^*} = b_T^{B^*}$.

Thus, by Proposition 5, bribes augment stolen revenues such that the candidate that obtains larger bribes is either: (i) one who is relatively worse both in her proclivity to steal revenues and the ability to increase social welfare, i.e. $x < 0$ and $y > 0$, or, $x > 0$ and $y < 0$; or, when one is relatively worse in one respect but better in the other, i.e. $x, y < 0$ or $x, y > 0$, (ii) to the candidate who is less inclined to steal revenues provided that the relative disadvantage is sufficiently high, i.e. $\frac{x}{y} > \frac{\mu f}{(1-\mu)e} \equiv \bar{\mu}$. To see the latter, note that if $x, y < 0$, A is worse at stealing but better at

[11] If k were to reject the bribe, she would choose $g_i^{k^0}$ by solving $\max_{g_1^k, g_2^k} U_T^k = \mu f[\frac{N_1}{N}V(g_1^{k^0}) + \frac{N_2}{N}V(g_2^{k^0})] - (1-\mu)e(g_1^{k^0} + g_2^{k^0})$, *s.t.* $g_1^{k^0} + g_2^{k^0} \leq T$ when the constraint is slack, which yields $\frac{V'(g_1^{k^0})}{V'(g_2^{k^0})} = \frac{N_2}{N_1}$.

improving social welfare. In this case, Proposition 5 implies that $\frac{x}{y} > \bar{\mu} \Longleftrightarrow b_T^A > b_T^B$ — A obtains higher bribes. If $x, y > 0$, B is worse at stealing but better at improving social welfare. In this case, $\frac{x}{y} > \bar{\mu} \Longleftrightarrow b_T^A < b_T^B$ — B obtains higher bribes.

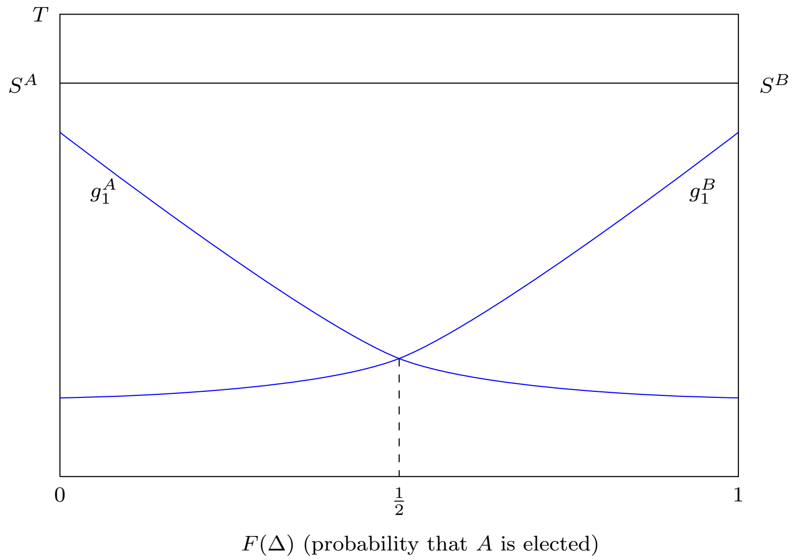
In what follows, I graphically depict the results established by Propositions 4 and 5. First, Figures 6 and 7 illustrate the public spending allocations of candidates A and B. By Proposition 4, the candidate with the higher probability of being elected allocates relatively less spending to group 1. Note, then, that the g_1^A curve lies below (above) the g_1^B curve at values of $F(\Delta)$ greater (less) than $\frac{1}{2}$, with the curves intersecting at $F(\Delta) = \frac{1}{2}$. Since theft is possible, the total amount of spending $S^k \equiv g_1^k + g_2^k$ of each candidate $k \in \{A, B\}$ need not equal revenues T — the S^A and S^B curves can lie below T. Also, $g_1^A < g_1^B$ does not imply $g_2^A > g_2^B$ because the candidates may differ in the total amounts S^k that each would spend and, therefore, in the amounts $T - S^k$ that each would steal.

I depict two special cases. In Figure 6, the candidates always steal the same amount of revenues, in which case the spending curves S^A and S^B intersect at all values of $F(\Delta)$. Notice that a relatively higher allocation to group 1 implies a relatively lower allocation to group 2. Thus, $F(\Delta) \lesseqgtr \frac{1}{2} \Longleftrightarrow g_1^A \gtreqless g_1^B \Longleftrightarrow g_2^A \lesseqgtr g_2^B$. In Figure 7, the candidates steal an amount that is each a fixed proportion of each of their allocations to group 1, i.e. $S^k \propto g_1^k$. In this case, S^A and S^B intersect at a unique point – panel (a) shows them intersecting at the point at which $F(\Delta) = A_1$, with $A_1 \in [0, \frac{1}{2})$, while panel (b) shows the intersection at $F(\Delta) = A_2$, with $A_2 \in (\frac{1}{2}, 1]$.[12] Notice that when the spending curves intersect at $F(\Delta) = A_1$, then $g_1^A < g_2^B$ at all values of $F(\Delta)$. When they intersect at $F(\Delta) = A_2$, then $g_2^A > g_2^B$ at all values of $F(\Delta)$. That is, the candidate that steals at a higher rate, i.e. for which the vertical distance between S^k and g_1^k is smaller, always allocates relatively less spending to group 2.

Next, I infer the equilibrium amount of bribes that group 1 would offer to candidates A and

[12] There are many other equilibria depending on how much revenues each candidate would steal at each value of $F(\Delta)$. The S^k curves may not intersect, or intersect at multiple points.

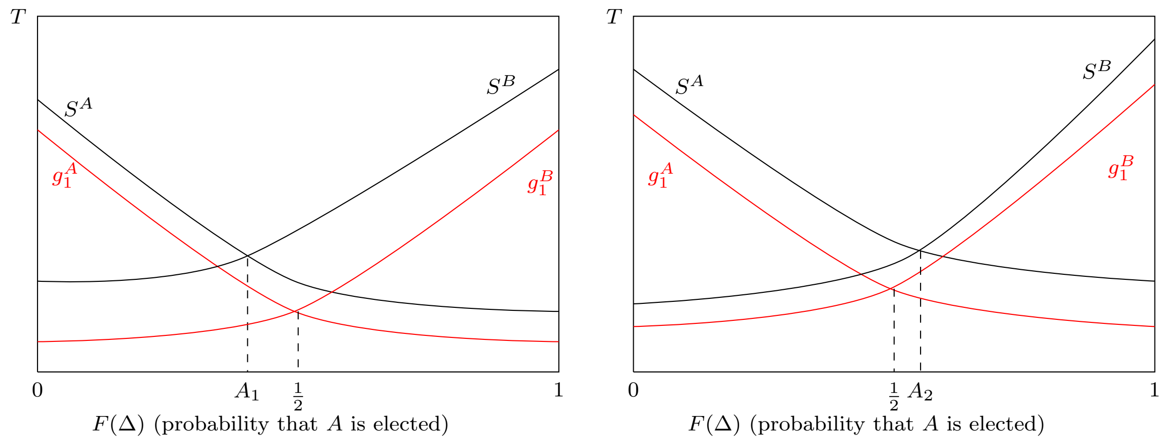
Figure 6: Public Spending by Candidates A and B, with A and B Stealing the Same Amount of Revenues



This figure plots the amount of public spending that each candidate A and B, if elected, would allocate to group 1 (respectively depicted by red curves g_1^A and g_1^B) on the probability $F(\Delta)$ that A is elected, assuming that A and B would always the spend the same total amount, i.e. the total spending curves $S^A \equiv g_1^A + g_2^A$ and $S^B \equiv g_1^B + g_2^B$ intersect at all values of $F(\Delta)$. (The amounts A and B would each allocate to group 2, i.e. g_2^A and g_2^B, are given by the vertical distance between S^A and g_1^A, and between S^B and g_1^B, respectively.) This means that the candidates would also steal the same amount of revenues, given by the vertical distance between revenues T and S^A or S^B. The candidate that has relatively lower probability of being elected would allocate relatively more spending to group 1 – when $F(\Delta)$ is less (greater) than $\frac{1}{2}$, the g_1^A curve lies above (below) the g_1^B curve. At $F(\Delta) = \frac{1}{2}$, $g_1^A = g_1^B$. Because total spending is the same for both candidates, the reverse pattern holds for g_2^A, g_2^B, i.e. $g_2^A \gtrless g_2^B$ when $F(\Delta) \lessgtr \frac{1}{2}$.

B using Proposition 5. In Figure 6, $S^A = S^B$ and, at $F(\Delta) = \frac{1}{2}$, $g_1^A = g_1^B$. Thus, x and y from Proposition 5 are equal to zero, which implies that group 1 offers the same amount of bribes to the candidates, i.e. $b_T^A = b_T^B$. In the region $F(\Delta) \in (\frac{1}{2}, 1]$, $g_1^A < g_1^B$. Since $S^A = S^B$, then $x = 0$ and, in addition, because g_1^A and g_1^B are symmetric, then $|g_1^A - g_1^B| = |g_2^A - g_2^B|$, which means $y = 0$. Thus, with $x, y = 0$, $b_T^A = b_T^B$. Lastly, when $F(\Delta) \in [0, \frac{1}{2})$, $g_1^A > g_1^B$, but since $S^A = S^B$ and g_1^A and g_1^B are symmetric, it is still the case that both x and y are zero and, hence, $b_T^A = b_T^B$. Thus, if the candidates would always steal the same amount, they would always obtain the same amount of bribes. This is because if the bribe offers are rejected, the candidates would still get the same amount of rents (in

Figure 7: Public Spending by Candidates A and B, with A and B Stealing at Fixed Rates



(a) candidate A stealing at a higher rate than B

(b) candidate B stealing at a higher rate than A

This figure plots the amount of public spending that each candidate A and B, if elected, would allocate to group 1 (respectively depicted by red curves g_1^A and g_1^B) on the probability $F(\Delta)$ that A is elected, assuming that each steals an amount that is each a fixed proportion of each of their allocations to group 1. In panel (a), A steals at a higher rate than B, such that the candidates' respective total spending curves $S^A \equiv g_1^A + g_2^A$ and $S^B \equiv g_1^B + g_2^B$ intersect at $F(\Delta) = A_1 < \frac{1}{2}$, while in panel (b), where B steals at a higher rate than A, the spending curves intersect at $A_2 > \frac{1}{2}$. The amounts that each candidate would allocate to group 2, i.e. g_2^A and g_2^B, are given by the respective distances between S^A and g_1^A, and between S^B and g_1^B. Notice, then, that the candidate that steals at a higher rate spends relatively less on group 2. From (a), when S^A and S^B intersect (only) at a value of $F(\Delta)$ that is less than $\frac{1}{2}$, it is always the case that $g_2^A < g_2^B$. From (b), when the point of intersection is at some value of $F(\Delta)$ greater than $\frac{1}{2}$, then $g_2^A > g_2^B$. As for the spending on group 1, it is still the case (as in Figure 6) that when $F(\Delta) \gtreqless \frac{1}{2}$, $g_1^A \lesseqgtr g_1^B$.

the form of stolen revenues) and, thus, still have the same ability to sway impressionable voters.[13]

In Figure 7, where each candidate steals at a fixed rate, S^A is equal to S^B only at some unique value of $F(\Delta)$ – that is, at $A_1 < \frac{1}{2}$ in panel (a), and $A_2 > \frac{1}{2}$ in panel (b). Recall that when S^A and S^B intersect at a value of $F(\Delta)$ less (greater) than $\frac{1}{2}$, then it is always the case that $g_2^A < g_2^B$ ($g_2^A > g_2^B$). Now in panel (a), note that at $F(\Delta) \in [0, A_1)$, $S^A > S^B$, which means that $x < 0$. It is also the case that $g_1^A > g_1^B$. For $x < 0$ to hold, it must be that $g_1^B - g_1^A < g_2^A - g_2^B$ which, with $g_2^A < g_2^B$, implies that $y > 0$. Since $x < 0$ and $y > 0$, then $b_T^A > b_T^B$ by Proposition 5. At $F(\Delta) = A_1$, $S^A = S^B$, which means $x = 0$. It is still the case that $g_1^A > g_1^B$. For $x = 0$ to hold, it must be that $g_1^B - g_1^A = g_2^A - g_2^B$ which, with $g_2^A < g_2^B$, implies that $y = 0$. Thus, $b_T^A = b_T^B$. At

[13]Note, then, from equation (33) that when $S^A = S^B$ (and recalling the assumption $g_1^{A^0} = g_1^{B^0}$ in Proposition 5), the difference $b_T^A - b_T^B$ is equal to zero.

$F(\Delta) \in (A_1, \frac{1}{2})$, $S^A < S^B$, which means $x > 0$. It is still the case that $g_1^A > g_1^B$. For $x > 0$ to hold, it must be that $g_1^B - g_1^A > g_2^A - g_2^B$ which, with $g_2^A < g_2^B$, implies that $y < 0$. Thus, $b_T^A < b_T^B$. Finally, at $F(\Delta) \in (\frac{1}{2}, 1]$, $S^A < S^B$ and, hence, $x > 0$, which in turn requires $g_1^B - g_1^A > g_2^A - g_2^B$. However, it is now the case that $g_1^A < g_1^B$. Thus, for $g_1^B - g_1^A > g_2^A - g_2^B$ to hold when $g_2^A < g_2^B$, it must be that $y > 0$. With $x, y > 0$, $b_T^A \lesseqgtr b_T^B$ if $\frac{x}{y} \gtreqless \frac{\mu f}{(1-\mu)e} \equiv \bar{\mu}$, while $b_T^A = b_T^B$ if $\frac{x}{y} = \bar{\mu}$, where $\bar{\mu}$ is some threshold ratio of one candidate's relative proclivity to steal to the other candidate's relative ability to improve social welfare.

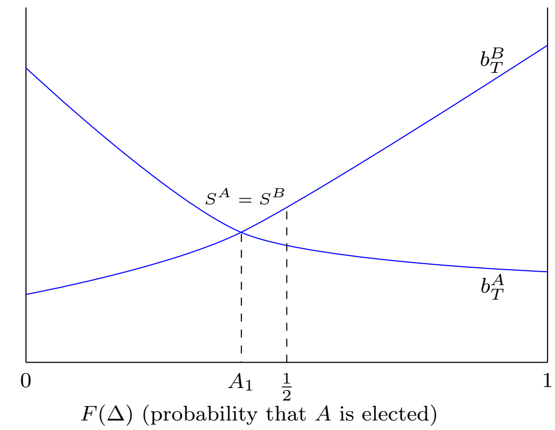
By symmetry, the case when S^A and S^B intersect at A_2 — see panel (b), can be viewed from B's perspective as the case when S^A and S^B intersect at A_1. Thus, the following summarizes the results for the special case in which candidates steal an amount of revenues that is each a fixed proportion of each candidate's allocations to group 1.

Let $S^A = S^B$ (only) at $F(\Delta) = A_1$, where $A_1 \in [0, \frac{1}{2})$. That is, candidate A steals at a higher rate than B. Then:

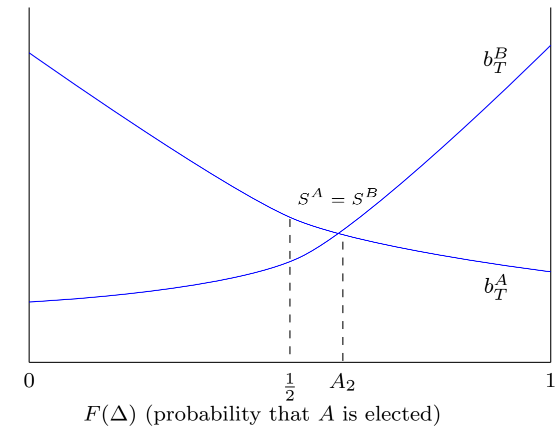
$$\begin{aligned} 0 &\leq F(\Delta) < A_1 \Longleftrightarrow g_1^A > g_1^B, S^A > S^B \Longleftrightarrow b_T^A > b_T^B \\ & \quad F(\Delta) = A_1 \Longleftrightarrow g_1^A > g_1^B, S^A = S^B \Longleftrightarrow b_T^A = b_T^B \\ A_1 &< F(\Delta) \leq \frac{1}{2} \Longleftrightarrow g_1^A \geq g_1^B, S^A < S^B \Longleftrightarrow b_T^A < b_T^B \\ \frac{1}{2} &< F(\Delta) \leq 1 \Longleftrightarrow g_1^A < g_1^B, S^A < S^B \Longleftrightarrow b_T^A \lesseqgtr b_T^B \text{ if } \frac{x}{y} \gtreqless \bar{\mu} (\text{otherwise } b_T^A = b_T^B) \end{aligned}$$

Let $S^A = S^B$ (only) at $F(\Delta) = A_2$, where $A_2 \in (\frac{1}{2}, 1]$. Then, by symmetry:

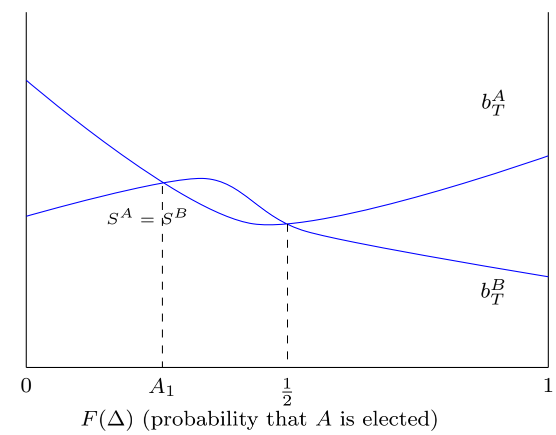
Figure 8: Bribe-Offers to Candidates A and B



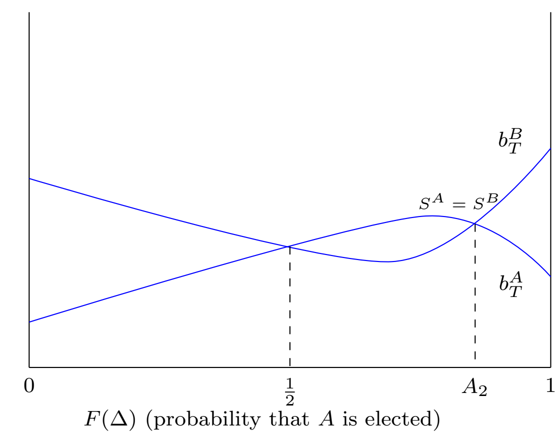
(a) candidate A steals at a higher rate than B; $\frac{x}{y} > \bar{\mu}$



(b) candidate B steals at a higher rate than A; $\frac{x}{y} > \bar{\mu}$



(c) candidate A steals at a higher rate than B; $\frac{x}{y} < \bar{\mu}$



(d) candidate B steals at a higher rate than A; $\frac{x}{y} < \bar{\mu}$

This figure plots the bribe-offers of group 1 to each candidate A and B (respectively depicted by blue curves b_T^A and b_T^B) on the probability $F(\Delta)$ that A is elected, assuming that A and B steal an amount of revenues that is each a fixed proportion of each candidate's allocation to group 1. That is, there is a unique value of $F(\Delta)$ at which A and B would spend the same amount, i.e. $S^A = S^B$. Below (above) this value, S^A is greater (less) than S^B and, hence, A would steal less (more) than B (in absolute amounts). Panels (a) and (b) illustrate the case when the ratio of A's relative ability to steal revenues, x, to B's relative ability to improve social welfare, y, is larger than threshold $\bar{\mu}$, i.e. $\frac{x}{y} > \bar{\mu}$, with (a) depicting the case when S^A and S^B intersect at $F(\Delta) = A_1 < \frac{1}{2}$, and (b) at $F(\Delta) = A_2 > \frac{1}{2}$. Panels (c) and (d) are when $\frac{x}{y} < \bar{\mu}$, with (c) depicting the case when S^A and S^B intersect at $F(\Delta) = A_1 < \frac{1}{2}$, and (d) at $F(\Delta) = A_2 > \frac{1}{2}$.

$$
\begin{aligned}
0 &\leq F(\Delta) < \frac{1}{2} \Longleftrightarrow g_1^A > g_1^B, S^A > S^B \Longleftrightarrow b_T^A \gtreqless b_T^B \text{ if } \frac{x}{y} \gtreqless \bar{\mu} (\text{ otherwise } b_T^A = b_T^B) \\
\frac{1}{2} &\leq F(\Delta) < A_2 \Longleftrightarrow g_1^A \leq g_1^B, S^A > S^B \Longleftrightarrow b_T^A > b_T^B \\
& \quad\; F(\Delta) = A_2 \Longleftrightarrow g_1^A < g_1^B, S^A = S^B \Longleftrightarrow b_T^A = b_T^B \\
A_2 &< F(\Delta) \leq 1 \Longleftrightarrow g_1^A < g_1^B, S^A < S^B \Longleftrightarrow b_T^A < b_T^B
\end{aligned}
$$

Figure 8 illustrates these results by plotting the relationship between the probability $F(\Delta)$ of A being elected and the bribes offered to A and B in cases in which S^A and S^B intersect (uniquely) at any value of $F(\Delta)$, i.e. at A_1, or A_2, where $A_1 \in [0, \frac{1}{2})$ and $A_2 \in (\frac{1}{2}, 1]$, and when the ratio of a candidate's relative proclivity to steal to its relative ability to improve social welfare, i.e. $\frac{x}{y}$, is higher, and when it is lower, than threshold $\bar{\mu}$.

Notice, then, that the candidate that is more likely to win does not always obtain larger bribes. In panels (a) and (c), candidate A receives more bribes than B when $F(\Delta)$ is between 0 and A_1, that is, when A has lower probability of being elected than B. Analogously, as seen in panels (b) and (d), candidate B obtains larger bribes even if its probability of winning is less than $\frac{1}{2}$, i.e. when $F(\Delta)$ is between A_2 and 1.

The results are a stark contrast to existing results in which the candidate that is more likely to be elected always obtains more bribes. This is not necessarily true when candidates can also use stolen revenues to sway impressionable voters. Generally, larger bribes are given to the candidate that is either disadvantaged both in the relative proclivity to steal and the relative ability to improve social welfare, i.e. $x < 0, y > 0$ or $x > 0, y < 0$ or, if one candidate is relatively worse in one respect but better in the other, to the candidate that is relatively worse at stealing, provided that such relative disadvantage is sufficiently high, i.e. $\frac{x}{y} > \bar{\mu}$. In this manner, bribes offset the relative disadvantage of one candidate over the other – whether in terms of ability to satisfy strategic voters, or willingness to use government revenues to buy the support of impressionable voters.

5 Conclusion

This paper formally analyzes public-good spending by a politician who can obtain rents by stealing government revenues or spending those revenues in exchange for bribes. To the best of my knowledge, the model I have proposed is the first to simultaneously consider these two types of 'grand' corruption. The analysis generates several important results.

The relationship between government revenues, corruption and public goods spending hinges on whether the revenues are above or below some threshold level. Below this threshold, the politician is constrained to spend all of the revenues and does not steal, but can obtain rents by spending the revenues in exchange for bribes. In this case where bribery is the only source of corruption, an increase in revenues unambiguously increases public-good spending because nothing is stolen, and can decrease corruption when the marginal value of the public goods from which bribes are extracted is sufficiently high.

The threshold level of revenues thus captures, in effect, the threshold demand for public-good spending that the politician is constrained to satisfy. If government revenues are larger than the threshold level, the politician can then steal the 'extra' revenues. I thus find that revenues above the threshold are stolen, and public spending does not increase any further. Because spending does not increase, bribes are also constant. However, corruption increases in the form of theft as revenues increase above the threshold.

The implication is that the political resource curse, whereby revenues increase corruption at the expense of public-good provision, occurs because revenues from oil, natural resources, and other kinds of windfall provide revenues that exceed the threshold level that a corrupt politician would credibly spend on public goods. There exists a point at which the politician prefers to obtain rents directly by stealing revenues, rather than obtain them indirectly by spending those revenues and receiving bribes in exchange for them.

That the politician can keep public-good spending unchanged even as revenues increase implies that she can do so while remaining in office. I demonstrate that such an equilibrium is sustained when the politician can use the rents for political advantage. As an example, I consider the case when candidates in elections use both bribe-rents and anticipated revenues to buy votes and influence electoral outcomes. I find, contrary to existing results, that the more popular candidate need not attract larger bribes. When revenues can also be used to buy votes, bribes act to level the playing field by augmenting the campaign funds of the candidate who would be less inclined to steal revenues. In this manner, a less popular candidate can actually extract larger bribes.

References

[1] Abdih, Y., Chami, R., Dagher, J., Montiel, P. 2012. "Remittances and institutions: are remittances a curse?" *World Development* 40: 657-666.

[2] Ahmed, Faisal Z. 2012. "The Perils of Unearned Foreign Income: Aid, Remittances, and Government Survival." *American Political Science Review* 106 (01):146-65.

[3] Arezki R, Bruckner M. 2011. "Oil rents, corruption, and state stability: evidence from panel data regressions. Eur. Econ. Rev. 55(7):955?63

[4] Barro, Robert J. 1973. "The Control of Politicians: An Economic Model." *Public Choice* 14: 19-42.

[5] Berdiev, Aziz N., Kim, Yoonbai, and Chang, Chun-Ping. 2013. "Remittances and Corruption." *Economics Letters* 118: 182-185.

[6] Bernheim, B. Douglas, and Whinston, Michael D. 1986a. "Menu Auctions, Resource Allocation, and Economic Influence". *The Quarterly Journal of Economics* 101(1): 1-31.

[7] Bernheim, B. Douglas, and Whinston, Michael D. 1986b. "Common Agency". *Econometrica* 54(4): 923-942.

[8] Bueno de Mesquita, Bruce, Morrow, James D., Siverson, Randolph M., and Alastair Smith. 1999. "An Institutional Explanation of the Democratic Peace." *American Political Science Review* 93(4): 791-807.

[9] Bueno de Mesquita, Bruce, Smith, Alastair, Siverson, Randolph M., and Morrow, James D. 2003. *The Logic of Political Survival*. Cambridge, MA: MIT Press.

[10] Bueno de Mesquita, Bruce, and Alastair Smith. 2010."Leader Survival, Revolutions, and the Nature of Government Finance." *American Journal of Political Science* 54:936-50.

[11] Brollo F, Nannicini T, Perotti R, Tabellini G. 2013. "The Political Resource Curse." *American Economic Review* 103(5):1759-9.

[12] Caselli F., Michaels G. 2013. "Do Oil Windfalls Improve Living Standards? Evidence from Brazil." *American Economic Journal: Applied Economics* 5(1): 208-38.

[13] Ferejohn, John. 1986. "Incumbent Performance and Electoral Control." *Public Choice* 50(1): 5-25.

[14] Ferraz, C, Finan F, Moreira D. 2012. "Corrupting Learning: Evidence from Missing Federal Education Funds in Brazil." *Journal of Public Economics* 96(9-10): 712-726.

[15] Desierto, Desiree A. 2018. "Formal Models of the Political Resource Curse." *Economics of Governance* 19(3): 225-259.

[16] Dixit, Avinash, Grossman, Gene M., and Helpman, Elhanan. 1997. "Common Agency and Coordination: General Theory and Application to Government Policy Making". *Journal of Political Economy* 105(4): 752-769.

[17] Grossman, Gene M. and Helpman, Elhanan. 1994. "Protection for Sale". *American Economic Review* 84(4): 833-850.

[18] Grossman, Gene M. and Helpman, Elhanan. 2001. *Special Interest Politics*. Cambridge, MA: MIT Press.

[19] Gupta, S. L. de Mello, and R. Sharan. 2001."Corruption and Military Spending". *European Journal of Political Economy* 17(4): 749-777.

[20] La Porta, R., Lopez-de-Silanes, F., Shleifer, A., and Vishny, R. W. 1999. "The Quality of Government." *The Journal of Law, Economics and Organization* 15: 222-279.

[21] Leite C, Weidmann J. 1999. "Does Mother Nature Corrupt? Natural Resources, Corruption, and Economic Growth." Tech. Rep. WP/99/85. Int. Monet. Fund, Washington, DC

[22] Mauro, P. 1998."Corruption and the Composition of Government Expenditure." *Journal of Public Economics* 69: 263-279.

[23] Neihaus, Paul and Sandip Sukhtankar. 2013. "Corruption Dynamics: The Golden Goose Effect." *American Economic Journal: Economic Policy* 5(4): 230-69.

[24] Olken, Benjamin A. 2006. "Corruption and the Costs of Redistribution: micro evidence from Indonesia." *Journal of Public Economics* 90: 853-70.

[25] Olken, Benjamin A. 2007. "Monitoring Corruption: Evidence from a Field Experiment in Indonesia." *Journal of Political Economy* 115: 200-49.

[26] Olken, Benjamin A., and Rohini Pande, 2012 "Corruption in Developing Countries," *Annual Review of Economics* 4: 479-509.

[27] Persson, Torsten and Guido Tabellini. 2000. *Political Economics: Explaining Economic Policy.* Cambridge, Mass: The MIT Press.

[28] Reinikka, Ritva and Jakob Svensson. 2004. "Local Capture: Evidence from a Central Government Transfer Program in Uganda." *Quarterly Journal of Economics* 119: 679-706.

[29] Robinson, James. A., Torvik, Ragnar, and Thierry Verdier. 2006. "Political Foundations of the Resource Curse." *Journal of Development Economics* 79(2): 447-68.

[30] Ross, Michael L. 2015. "What Have We Learned About the Resource Curse?" *Annual Review of Political Science* 18: 239-59.

[31] Sala-i-Martin X, Subramanian A. 2013. "Addressing the Natural Resource Curse: an Illustration from Nigeria." *Journal of African Economies*. 22(4):570-615

[32] Smith, Alastair. 2008. "The Perils of Unearned Income." *Journal of Politics* 70:780-93.

[33] Tanzi, V. and H. Davoodi. 2001. "Corruption, Growth, and Public Finances". In: Political Economy of Corruption, ed. By A.K. Jain (London: Routledge): 89-110.

[34] Tyburski, Michael. 2014. "Curse or Cure? Migrant Remittances and Corruption." *The Journal of Politics* 76(3): 814-824.

[35] Vicente PC. 2010. "Does Oil Corrupt? Evidence from a Natural Experiment in West Africa." *Journal of Development Economics* 92(1):28?38