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The Effect of Fiscal Policy and Corruption Control Mechanisms on Firm Growth and Social Welfare: Theory and Evidence

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Abstract

The paper investigates the conflict that arises between the government, its bureaucrats and businesses in the tax collection process. We examine the effect of fiscal policy and corruption control mechanisms on the prevalence of tax evasion and corruption behaviour, and their impact on firm growth and social welfare. We first model a situation where bureaucrats are homogeneous and have complete negotiation power over the firms with which they interact. We show that in such a situation the government can set an optimal tax rate and put in place a corruption control mechanism involving detection of corrupt bureaucrats in the framework of a no-corruption equilibrium. However, when the public administration is composed of heterogeneous types of bureaucrats with the specific capacity to impose red tape costs on firms, we show, in line with Acemoglu and Verdier (2000), that it might be optimal for the government to allow a certain level of corruption given the cost of monitoring activities. We also show that the government could face lose-lose as well as win-win situations in the conduct of its fiscal policies. We then verify the predictions of the model using firm-level data collected from 243 businesses in Uganda. We test the effect of monitoring on bribe and tax payments. We also test the effect of tax rates and corruption control mechanisms on firm growth. We compare the effect of actual corruption (as measured by bribe payments) with the effect of government corruption expectations on firms' growth.

Introduction

Corruption tends to distort the allocation of resources and slow down economic growth. Cross-country studies have shown that corruption can explain slower growth in developing countries through lower investment levels, higher bureaucratic control and institutional constraints (Mauro, 1995; Kauffman, 2001). Corruption has even been seen as an integral part of government activities often specifically devised to extract higher bribes (Kauffman, 2001; Svensson, 2003).

As emphasized by Shleifer and Vishny (1993), bribe payments to public officials lead to inequities and inefficiencies in tax administration, since they result in a transfer to private agents of public resources, thus reducing government revenues. They also constitute a major impediment to equitable and efficient tax administration, placing firms that do not engage in such practices at a competitive disadvantage. (Gauthier and Reinikka, 2001)

Various models have been put forward to examine the effect of bureaucratic corruption. In the context of tax collection activities, Basu, Bhattacharya and Mishra (1992) have examined the effect of corruption control mechanisms, such as penalties and the probability of detection of corrupt agents, within public hierarchies. Besley and McLaren (1993) have studied the use of optimal remuneration schemes in reducing corruption. Within general equilibrium models, Acemoglu and Verdier (1998, 2000) have examined the appearance of corruption in government regulatory activities in the context of imperfect propriety right enforcement. They note that corruption arises as part of an optimal allocation of government activities where there are incomplete contracts and incentive problems.

The purpose of this paper is to examine the relationship between tax levels and corruption activities. We develop a simple model to analyze the conflict between a government, bureaucrats and private firms in the context of the tax collection process. To finance its activities, the government needs to levy taxes on private firms. This requires the use of agents (bureaucrats) to obtain information about business activities and collect taxes. These bureaucrats are self-interested and, given their superior information, difficult to monitor. Indeed, bureaucrats often possess discretionary power over firms. A bureaucrat could, for instance, choose to strictly enforce tax rules or other regulations with firms, but could also threaten to impose penalties or delay the delivery of public services (licenses, permits, etc.) if the firm does not produce a bribe.[1] Side payments are then likely to take place between firms and bureaucrats.

We focus in this paper particularly on one mechanism for controlling corruption: detection of corrupt employees through monitoring activities. We first model a situation where bureaucrats are homogeneous and have complete negotiation power over the firms with which they interact. We show that in such a situation the government can set an optimal tax rate and put in place a corruption control mechanism involving detection in the framework of a no-corruption equilibrium.

However, when the public administration is composed of heterogeneous types of bureaucrats with the specific capacity to impose red tape costs on firms, we show, in line with Acemoglu and Verdier (2000), that it might be optimal for the government to allow a certain level of corruption given the cost of monitoring activities. We show in particular that net government revenues are maximized under a fiscal regime with some level of corruption activity. Where there are heterogeneous bureaucrats, social costs and firm costs might also be reduced under a fiscal regime with corruption at equilibrium.

Using firm-level data from the Uganda Private Sector Survey organized by the World Bank, we investigate the effect of monitoring activities and firm bargaining power on bribe payments and tax revenues. We also test for the relationship between corruption, tax levels and firm growth. We find that detection mechanisms have significant effect on bribe and tax payments. Also, we find that a myopic government that does not take into account the actual importance of bribe activities would underestimate the negative effect of corruption on firm growth.

The paper is organized as follows. In section 1, we develop the basic theoretical model with homogeneous bureaucrats. In section 2, heterogeneity in bureaucrat types is introduced. In section 3, we account for shared bargaining power between firms and

[1] For a discussion and examples of bureaucrats' discretionary power over the private sector, see for instance Tanzi (1998).

public employees. In section 4, the empirical strategy, data sources and empirical results are presented. Section 5 concludes.

1. The Basic Model

We consider the conflict between a government, a public agent (a bureaucrat) and a private firm in the framework of the tax collection process. The government seeks to maximize the revenues it derives from tax levied on private firms' benefits. The government has to hire bureaucrats to look at firms benefits, which are not observed directly by the government, and collect taxes based on these benefits. Bureaucrats, through red tape and other discretionary behavior, are able to impose costs on firms during the tax collection process. In order to reduce red tape costs and avoid their tax obligations, firms could bribe bureaucrats. A bureaucrat who is caught receiving a bribe with probability p loses all his income. If not caught with probability $1-p$, he receives his wage and the bribe.

In this environment, we focus on the government's use of one mechanism to reduce the occurrence of corruption within its bureaucracy: monitoring activities to detect corrupt bureaucrats.

The sequence of the game is as follows. In stage 1, the government announces the tax rate τ, the public wage w and the probability of detecting corrupt bureaucrats p. In the second stage, the bureaucrat and the firm look at the firm's benefits V as well as the red tape cost c that could be imposed on the firm by the bureaucrat and negotiate the tax amount T and bribe payment B, if any.

To begin, we assume that bureaucrats are homogenous and could all impose a red tape cost c on the firm. As the last mover, the firm will choose to pay a bribe and, in doing so, evade its tax obligations ($T=\tau V$) if its benefits net of the bribe are greater than its benefits net of its tax obligations and the red tape cost imposed by the bureaucrat, as:

(1a) $$(V - B) \geq (V - T - c)$$

That is, the firm will pay the bribe if the bribe amount is smaller than its tax obligations plus the red tape cost.[2]

(1b) $$B \leq T + c$$

The bureaucrat will be corrupt if his expected revenue from accepting a bribe is greater than his wage. Given that a corrupt official gets (*w* + *B*) with probability (1–*p*) or is caught with probability *p* and loses all his income, a typical tax collector will accept a bribe if:[3]

(2a) $$(1 - p)(w + B) + p(0) \geq w$$

or

(2b) $$B \geq \frac{p}{(1 - p)} w$$

For a bureaucrat to become corrupt, the expected bribe amount has to be greater than the expected loss of salary if the bureaucrat is caught. Taking into account the firm's incentive, the problem of the bureaucrat is then to maximize its bribe amount net of its opportunity cost, or more formally:

$$\max_B \left(B - \frac{p}{(1-p)} w \right)$$

Subject to: $B \leq T + c$

Given the incentives faced by bureaucrats and private firms, and combining (1b) and (2b), a government that wishes to avoid corruption faces the following constraint set:

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[2]In a situation where the firm can be audited by another public employee after its negotiation, we can include a fine, *A*, in our constraint without changing our main findings. In that case, that fine would reduce the amount of the bribe, *b*, paid so that $A + b \leq T + c$ could simply be $B \leq T + c$. We could also consider the case where a firm has to pay a fine plus its tax obligations when caught and thus weighs the benefits of being corrupt against those of being honest. In that case, the firm's constraint becomes: $(T+A)(p) + B(1-p) \leq T + c$. However, we focus on the simplest case where only the bureaucrat is penalized when evasion is discovered. We also note from firm's constraint (1a), that firms will accept to bear some red tape cost before choosing to pay a bribe.

[3] This constraint is very similar to constraint (1) in Acemoglu and Verdier (1998). However, the wage considered here is defined as the net wage, that is, gross wage minus taxes paid by the public employee.

(3) $$T + c \leq \frac{p}{(1 - p)} w$$

This indicates that a bureaucrat remains honest if the firm's tax payment plus red tape cost are smaller than the bureaucrat's opportunity cost. A government that does not want to see its tax revenues dissipated through corruption activities must set the tax rate τ, public sector wage *w* and probability of detection *p* so that equation (3) holds.

If we denote the government costs of monitoring corruption activities by $\psi(p)=\alpha p$, where $\alpha > 0$, we can more formally write the revenue-maximizing problem of the government as:

$$\max_{p} T - \psi(p)$$

Subject to: $$T \leq \frac{p}{(1 - p)} w - c$$

Solving for the government optimization problem, we consider the case where, for a given tax rate τ, public wage *w* and red tape cost c, the government maximizes its revenues by varying the probability of detection *p*.

While maintaining public wage constant, the government can maximize tax revenues and avoid corruption by adjusting its level of monitoring activities to detect corruption. The first-order condition of the government's problem in this case is:

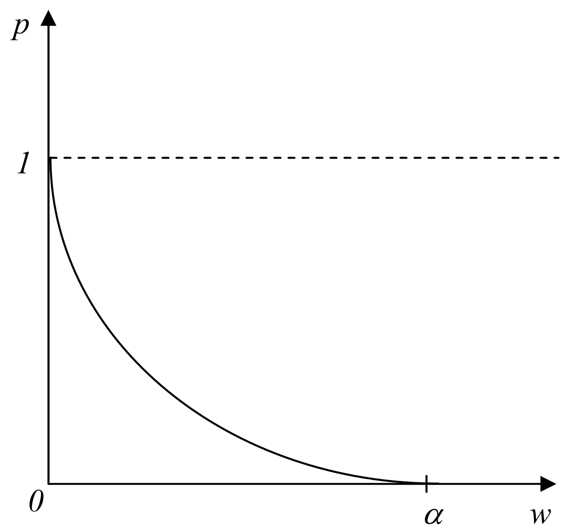
$$\frac{w(1-p) - w(-1)p}{(1 - p)^2} - \alpha = 0$$

$$\Leftrightarrow \quad \frac{w}{(1 - p)^2} - \alpha = 0$$

(4) $$\Leftrightarrow \quad p = 1 - \left(\frac{w}{\alpha}\right)^{1/2}$$

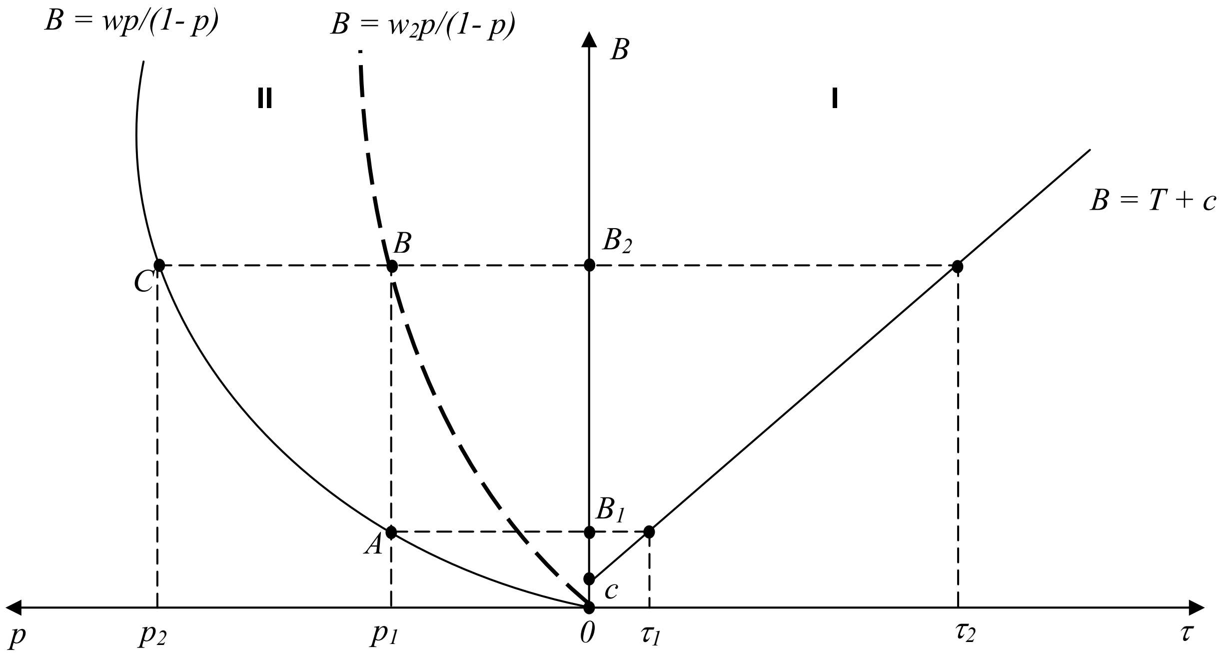
Equation (4) is represented diagrammatically in Figure 1. It shows that the optimal probability of detection decreases with an increase in public wages. Indeed, the opportunity cost of a bureaucrat losing his job if caught taking bribes increases with the wage level and/or the probability of detecting corrupt officials, each corruption control mechanism decreasing when the other increases.

Figure 1: Probability of Detection Versus Public Wages



These results could be interpreted in light of the corruption control theory through tax rates, incentive wages and monitoring activities (Basu et al., 1992; Besley and Mclaren, 1993). Equation (3), the government constraint set, allows us to represent schematically the relationship between the probability of detection of corruption bureaucrats control *p*, incentive wages w, tax rate τ and bribe amounts *B*. The first quadrant in Figure 2 shows the firm's constraint $B = T + c$, or the bribe's offer curve. This curve corresponds to the maximum amount of bribe a firm is willing to pay at different tax rates and given the discretionary costs imposed by the public official *c*. In the second quadrant, the bureaucrat's constraint is represented $B = wp/(1-p)$. It corresponds with the bureaucrat's opportunity cost and can also be seen as the minimum amount of bribe an employee will accept given the probability of detection *p* and wage *w*, that is, the bureaucrat's demand for bribes.

Figure 2: Bureaucrat Demand and Firm Offer of Bribes



Using Figure 2, we can examine schematically the effects of the variation of these parameters at equilibrium. We observe that for any tax rate, for instance τ_2, there is a corresponding equilibrium probability p_2 and a wage w which generate demand for a bribe amount B_2. All other things being equal, any detection probability p lower than p_2 does not maximize government revenues since the bribe amount that a firm is willing to offer is greater than the bureaucrat's opportunity cost. Such a situation is represented by tax rate τ_2, wage w and the probability of detection p_1 (instead of a p_2) in Figure 2. In such a case, corruption would take place in the segment AB. Note that in such a situation, the minimum bribe a bureaucrat is willing to accept is B_1, while a firm is willing to pay any amount up to B_2 to avoid its tax obligations and red tape cost c.

These results could help shed light on how a government should set its optimal tax rate with regard to the corruption control mechanism it puts forward through monitoring activities. Suppose the government wants to increase tax revenues by increasing the tax rate from τ_1 to τ_2, but does not adjust p optimally. This creates room for corruption. Indeed, before the tax increase (i.e. at the equilibrium defined by τ_1, p_1, w

and B_1), tax revenues are given by the area 0Ap_1 in Figure 2.[4] After the tax rate is increased from τ_1 to τ_2, while p_1 is left unchanged, government revenues are still equal to the area 0Ap_1. This is due to the fact that the increase in tax revenues the government is seeking (area p_1ACp_2) is captured in bribe payments by corrupt bureaucrats. To maximize tax revenues, the government would need to increase the probability of detection from p_1 to p_2 concurrently with the tax hike. This would allow re-establishment of a no-corruption equilibrium. For instance, in the case where probability of detection increases from p_1 to p_2, the government would maximize its tax revenues and firm tax payments would correspond to the area 0Cp_2.[5]

It can also be noted using Figure 2 that even with an infinite salary and an infinitesimally small probability of detection (i.e. when the bureaucrat's bribe demand curve $B=wp/(1-p)$ merges with the vertical axis), bribery at equilibrium will always exist. This corroborates the stylized fact of Besley and McLaren (1993) that extremely high wages are required to bring corruption down to a minimum level.

In this simple model, we have considered a situation where bureaucrats are seen as homogeneous. In the next section, we examine the situation where the public administration is composed of heterogeneous bureaucrats.

2. Model with Two Types of Public Officials

As in Acemoglu and Verdier (2000), we now account for heterogeneity among public officials. Some bureaucrats can be seen as having a better capacity than others to extract bribes, due for instance to their strategic position in the administration or their specific capacity to impose red tape. Some bureaucrats, for instance in the customs agency, are in a position to impose more delays and other costly impediments on a firm's import or other bureaucratic activities (licenses, permits, etc.). We assume that this difference in bribe-taking capacity among bureaucrats is exogenous.[6]

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[4] Area 0Ap_1 includes red tape cost. For simplicity, we assume that this cost is constant and that tax revenues and bribe amounts differ only by this constant.
[5] The same is true if we were to analyze the situation with incentive wages where let's say we increased w to w_2 which would make bureaucrats' constraint $B = pw/(1-p)$ go from the origin, by point B and on, doted line on figure 2. Transfers would then be all under the form of taxes and correspond to surface 0Bp_1. Both corrections are equivalent and yield the same revenues.
[6] This difference could be endogenized without changes in the results.

Let us assume that there are two types of bureaucrats and that a firm is matched with one type of bureaucrat. Type 1 bureaucrats are able to impose red tape cost c_1, while type 2 bureaucrats are able to impose cost c_2 on the firm. Also, the cost that type1 bureaucrats are able to impose is greater than that of type 2 (i.e. $c_1 > c_2$). Further, let's assume that the proportion of type1 bureaucrats in the administration is π_1, while that of type 2 is (1- π_1). We also assume that these costs and proportions are common knowledge among players.

In order to characterize the solution to the government problem, we first determine the optimal tax rate the government would choose faced with each type of bureaucrat. These tax rates are a function of the wage level *w*, the probability of detection *p* and the red tape cost imposed by the bureaucrat c_i, where $i = 1,2$. For each type of bureaucrat, the optimal tax rates are obtained from the government's constraint set (3) and are:

(3a) $$\tau_1 \le \frac{p}{(1-p)}\frac{w}{V} - \frac{c_1}{V}$$

(3b) $$\tau_2 \le \frac{p}{(1-p)}\frac{w}{V} - \frac{c_2}{V}$$

As before, assuming that the public wage *w* is identical for both types of bureaucrat but that the probability of detection *p* could vary, we can determine for each of these policies the optimal probability of detection associated with each bureaucrat's type:

(4a) $$p_1 = 1 - \left(\frac{w}{\alpha}\right)^{1/2}$$

(4b) $$p_2 = 1 - \left(\frac{(1-\pi_1)w}{\alpha}\right)^{1/2}$$

Given equations (3a), (3b), (4a) and (4b) and that $c_1 > c_2$, we have that $\tau_1 < \tau_2$. That is, we observe that the optimal tax rate needs to be set at a lower level in a public administration composed of type 1 bureaucrats than in an administration composed of type 2 bureaucrats.[7] Also, when a government is looking for identical gross revenues (without considering cost of detection) from either type 1 or type 2 bureaucrats, meaning $T_1=T_2$, type 1 bureaucrats in the administration have to be monitored with higher intensity than type 2 bureaucrats, thus having $p_1>p_2$. For this purpose, we assume that the government chooses between two fiscal policies (τ_1, p_1) or (τ_2, p_2), each characterized by a tax rate τ and its corresponding optimal level of detection of corrupt officials *p.*

Before determining the optimal policy in terms of *net* tax revenues, let us first compare these two policies in terms of government *gross* revenues (without considering the costs of detection) when the government sets a unique tax rate in the context of an administration composed of heterogeneous bureaucrats. If the government sets the tax rate at τ_1 (and $\tau_1 < \tau_2$), tax revenues are collected by both type 1 and type 2 bureaucrats and are equal to T_1. By setting such a tax rate where $\tau_1<\tau_2$, the government loses revenues $(T_2 - T_1)(1 - \pi_1)$ which could have been collected by type 2 bureaucrats if the tax rate had been set at τ_2 (see Table 1). In turn, if the government sets the tax rate at the higher level τ_2, tax revenues are T_2 $(1-\pi_1)$ but are only collected by type 2 bureaucrats. Indeed, all transfers collected by type 1 bureaucrats, $T_1\ \pi_1$, take the form of bribe payments. This could be understood as follows: under the higher tax rate τ_2, the opportunity cost (determined by p_2) is too small to provide incentives to type 1 bureaucrats to be honest. Furthermore, firms dealing with these bureaucrats will prefer to pay any bribe amounts smaller than $T_2 + c_1$ instead of paying their fiscal obligations and red tape costs.[8] Under a tax policy (τ_1, p_1) there would then be no corruption at

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[7] $\tau_1 < \tau_2$ if,

$$\frac{p}{1-p}\frac{w}{V} - \frac{c_1}{V} < \frac{p}{1-p}\frac{w}{V} - \frac{c_2}{V}$$

$$\Leftrightarrow \quad -c_1 < -c_2$$

$$\Leftrightarrow \quad c_1 > c_2$$

[8] Fiscal obligations and costs paid to type 1 bureaucrats under the regime with tax rate τ_2, equivalent to $T_2 + c_1$, are obviously greater than obligations paid to type 2 bureaucrats, which are equivalent to $T_2 + c_2$ since $c_1 > c_2$.

equilibrium, while corruption would be observed under policy (τ_2, p_2) at equilibrium. Based on this observation, from now on the fiscal policy (τ_1, p_1) will be referred to as the *no-corruption regime* whereas fiscal policy (τ_2, p_2) will be referred to as the *flexible regime.*

Note that, under the no-corruption regime with tax rate τ_1, the corresponding optimal detection level p_1 is such that the bureaucrats' opportunity costs are very high and they have no incentive to be corrupt. However, under such a no-corruption regime, the government's corruption control costs are higher and its tax revenues lower than under the flexible regime. Indeed, under the flexible regime, despite the fact that some revenues are lost through corruption, tax revenues are higher since $\tau_2 > \tau_1$ and detection costs lower since $p_2 < p_1$.

Table 1: Gross Tax Revenues Under the No-corruption and the Flexible Fiscal Regimes

	Policy 1 *No-corruption regime* Tax rate: τ_1	**Policy 2** *Flexible regime* Tax rate: τ_2
Revenues collected by type 1 bureaucrats	$T_1 \pi_1$	0
Revenues collected by type 2 bureaucrats	$T_1 (1 - \pi_1)$	$T_2 (1 - \pi_1)$
Revenues lost	$(T_2 - T_1)(1 - \pi_1)$	$T_1 \pi_1$
Gross tax revenues	T_1	$T_2 (1 - \pi_1)$

Let's now compare these two fiscal regimes in terms of government *net* tax revenues (net of detection costs) and in terms of social and firm costs. We define social costs as the sum of the costs imposed on firms by tax officials plus the government's costs to detect corrupt employees. Firm costs are defined as the sum of taxes paid by firms plus the red tape costs imposed by corrupt bureaucrats and the bribe amounts. To evaluate these costs, we first determine the proportion of type 1 bureaucrats, π_1^*, that will be corrupt at equilibrium. We then compare social costs and firm costs under each regime.

The net tax revenues (NR) under each fiscal regime are:

(5) $RN\tau_1 = T_1 - \alpha p_1 \qquad \Leftrightarrow \qquad RN\tau_1 = \frac{p_1}{(1-p_1)}w - c_1 - \alpha p_1$

(6) $RN\tau_2 = T_2 - \alpha p_2 \qquad \Leftrightarrow \qquad RN\tau_2 = (1-\pi_1)\left(\frac{p_2}{(1-p_2)}w - c_2\right) - \alpha p_2$

We need to determine the critical proportion π_1^* of type 1 bureaucrats within the administration for which we observe corruption at equilibrium. We solve for the case for which net tax revenues under the no-corruption regime are lower than under the flexible regime: [9]

$$RN\tau_1 \langle RN\tau_2$$

$$\Leftrightarrow \qquad \frac{p_1 w}{(1-p_1)} - c_1 - \alpha p_1 \quad \langle \quad (1-\pi_1)\left(\frac{p_2 w}{(1-p_2)} - c_2\right) - \alpha p_2$$

(7) $\Leftrightarrow \qquad (1-x_1^2) \rangle\ \pi_1 * \rangle\ (1-x_2^2)$

where:

$$x_1 = \frac{\sqrt{\alpha w} - \sqrt{\alpha w - 4(w+c_2)(2\sqrt{\alpha w} - w - c_1)}}{2(w+c_2)}$$

$$x_2 = \frac{\sqrt{\alpha w} + \sqrt{\alpha w - 4(w+c_2)(2\sqrt{\alpha w} - w - c_1)}}{2(w+c_2)}$$

When the proportion of type 1 bureaucrats is the critical range defined by equation (7), net revenues collected under a flexible policy (τ_2, p_2) are greater than those collected under a no-corruption policy (τ_1, p_1). [10]

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[9] Details are given in Annex B.

[10] Alternatively, it could be seen that:

$RN\tau_1 = T_1 - \alpha p_1$ and $RN\tau_2 = (1-\pi_1)T_2 - \alpha p_2$

Thus : $RN\tau_1 \langle RN\tau_2 \Leftrightarrow \pi_1^* < 1 - \frac{T_1 - \alpha(p_1 - p_2)}{T_2}$.

This leads to the following proposition:

PROPOSITION 1: *Where there are heterogeneous types of bureaucrats with different discretionary powers, we find corruption at equilibrium if public wage is fixed, the probability of detection p varies and the proportion of type 1 bureaucrats satisfies:* $\left(1 - x_1^2\right) \rangle \; \pi_1 * \rangle \left(1 - x_2^2\right)$

where:

$$x_1 = \frac{\sqrt{\alpha w} - \sqrt{\alpha w - 4\left(w + c_2\right)\left(2\sqrt{\alpha w} - w - c_1\right)}}{2\left(w + c_2\right)}$$

$$x_2 = \frac{\sqrt{\alpha w} + \sqrt{\alpha w - 4\left(w + c_2\right)\left(2\sqrt{\alpha w} - w - c_1\right)}}{2\left(w + c_2\right)}$$

Looking now at social costs under these two fiscal regimes, it could be shown that the flexible regime is less socially detrimental than the no-corruption regime:

PROPOSITION 2: *Social costs are lower under a flexible regime where we find some corruption at equilibrium then under a no-corruption regime.*

Proof: Social costs under the no-corruption regime (SC_{sc}) are:[11]

$$SC_{sc} = \pi_1 c_1 + \left(1 - \pi_1\right)c_2 + \alpha p_1$$

While social costs under the flexible regime (SC_c) are:

$$SC_c = \left(1 - \pi_1\right)c_2 + \alpha p_2$$

Comparing these costs, we have:

$$SC_{sc} \; \rangle \; SC_c$$

$$\Leftrightarrow \quad \pi_1 c_1 + \left(1 - \pi_1\right)c_2 + \alpha p_1 > (1 - \pi_1)c_2 + \alpha p_2$$

$$\Leftrightarrow \quad \pi_1 c_1 + \alpha p_1 > \alpha p_2$$

[11] Net of tax transfers to the government and to corrupt bureaucrats.

This inequality always holds since $p_1 > p_2$. Social costs are thus lower under a policy that allows some level of corruption then under a fiscal regime that completely eliminates it.[12]

Let's turn now to the costs imposed on firms (FC_{sc}) under these two fiscal regimes. Under the no-corruption regime, firm costs are:

$$FC_{sc} = \pi_1(T_1 + c_1) + (1 - \pi_1)(T_1 + c_2)$$

Costs imposed on firms (FC_c) under the flexible regime are:

$$FC_c = \pi_1 B + (1 - \pi_1)(T_2 + c_2) \qquad \text{where } B = (T_2 + c_1)$$

Comparing these costs, we have:

$$FC_{sc} \rangle FC_c$$

If we compare the first term of each equation, we note that:

$$\pi_1(T_1 + c_1) \langle \pi_1(T_2 + c_1)$$

While for the second term, we have:

$$(1 - \pi_1)(T_1 + c_2) \langle (1 - \pi_1)(T_2 + c_2)$$

This implies that costs imposed on firms are higher under the flexible regime. Hence, while the flexible regime yields higher net tax revenues and lower social costs than the no-corruption regime, we see that costs imposed on firms are greater under the flexible regime than under the no-corruption regime. Under the flexible regime, corrupt firms pay bribes equal to T_2+c_1 to type 1 bureaucrats, while honest firms pay higher tax transfers (i.e. $\tau_2 > \tau_1$).

[12] In addition to this positive analysis, a normative analysis of these social costs is available upon request.

3. Model with Bargaining Power

Up to now, we have considered the case where firms have no bargaining power in their relationship with public officials. In such situations, bureaucrats are able to extract all the surplus arising from this interaction. In this section, we examine the effects of firms possessing some bargaining power in their dealings with public officials.

The sequence of events remains the same as before. The only difference is that we now assume the *sharing* of the bargaining power between firms and bureaucrats. We denote the bargaining power of firms by η and of bureaucrats by (1-η).

If we assume that in their negotiation process bureaucrats and firms act optimally given the other players' incentives, their joint optimization problem is:

$$\max_B \left(T_2 + c_1 - B\right)^{\eta}\left(B - \frac{p_2 w}{(1 - p_2)}\right)^{1-\eta}$$

Subject to: $B \geq \frac{p_2}{(1 - p_2)} w$

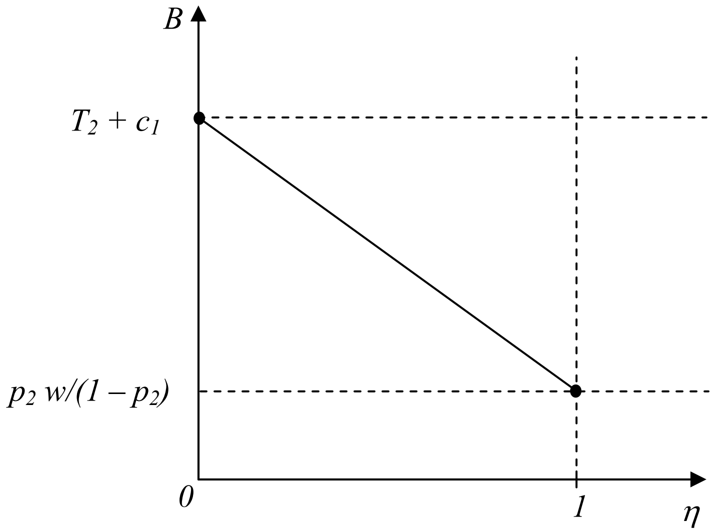
$$B \leq T_2 + c_1$$

The first term in this optimization problem corresponds to the firm's objective, which is to minimize its bribe payment relative to its fiscal obligations and red tape costs. The second term corresponds to the bureaucrat's objective, which is to maximize the bribe received relative to the opportunity cost.[13] Using a generalized Nash solution, we obtain from the first-order conditions the following:

(8) $$B = \eta \frac{p_2 w}{(1 - p_2)} + (1 - \eta)(T_2 + c_1)$$

[13] This is very similar to the maximization problem considered in part A. The only difference there was that $\eta = 0$ and firms could not reduce their bribe amounts through negotiations.

Figure 3: Bribe Amounts Versus Bargaining Power



Equation (8) is represented diagrammatically in Figure 3. The horizontal axis represents the firm bargaining power and the vertical axis represents bribe amounts. We see that when firms have no bargaining power (η = 0), they pay a bribe equivalent to their tax obligations T_2 plus the red tape costs c_1. When firms' bargaining powers increases, the amount of bribes decreases. When firms have complete negotiation power (η = 1) they pay a bribe equivalent to the bureaucrat's opportunity cost. This leads to the following proposition:

PROPOSITION 3: *Under a flexible fiscal regime allowing some corruption at equilibrium, firms with bargaining power are able to reduce their bribe payments*.

We can examine diagrammatically the effects of firms' bargaining power on the equilibrium between *w*, τ and *p* and on bribe amounts. Figure 2 shows the case where the government has set a tax rate τ_2, a probability of detection p_1 and a public wage *w,* which together determine the opportunity cost for bureaucrats given by B = *wp/(1- p)*) and firms' bribe offer curve, B=T+c. This policy choice creates the opportunity for corruption as the minimum bribe a bureaucrat would accept is equal to B_1, while firms are willing to pay any level of bribe up to B_2. Without bargaining power (as in section 1), a typical firm would pay a bribe amount B_2. When the firm has some bargaining power, the bribe amount will be in the range of AB and will tend toward the bureaucrat's opportunity cost A as the firm's negotiation power increases.

Note that as the probability of detection increases, the number of corrupt bureaucrats tends to decrease but, for the remaining corrupt bureaucrats, bribe amounts will increase as their opportunity cost increases. The aggregate bribe payments under low or high detection levels could then be equal. This corroborates the stylized fact of Basu, Bhattacharya and Mishra (1992): a rise in sanctions increases the opportunity cost of a corrupt employee, who will then ask for larger bribes.

If we now examine the effect of negotiation power on firm costs, we see that costs imposed on firms under the no-corruption regime (FC_{sc}) are:

$$FC_{sc} = \pi_1\left(T_1 + c_1\right) + \left(1 - \pi_1\right)\left(T_1 + c_2\right)$$

Under a flexible regime (FC_c), costs imposed on firms are :

$$FC_c = \pi_1\left[\left(1 - \eta\right)\left(T_2 + c_1\right) + \eta\left(\frac{p_2 w}{\left(1 - p_2\right)}\right)\right] + \left(1 - \pi_1\right)\left(T_2 + c_2\right)$$

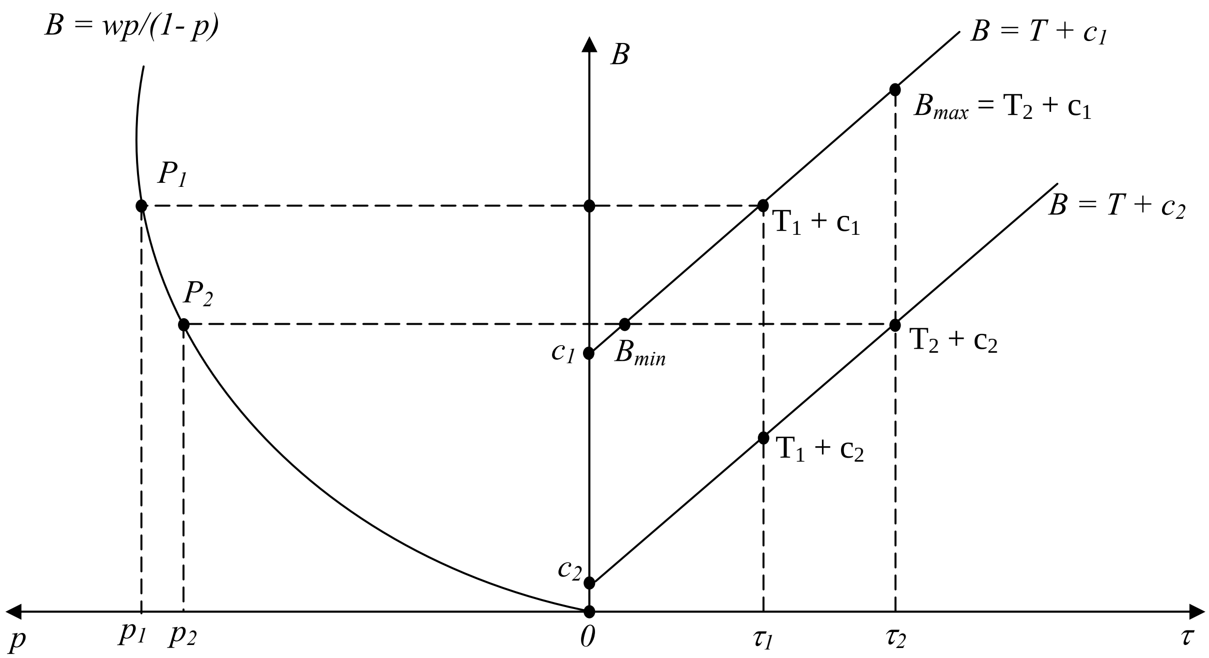
If we compare these costs, we can verify the assumption that costs imposed on firms under a flexible regime are smaller than under a no-corruption regime, that is:

$$FC_{sc} \rangle FC_c$$

We can see from the comparison of the first terms of both of these expressions that when η equals zero the first term of (FC_c) is always greater than that of (FC_{sc}) as in section 2. Comparing the second terms of these expressions also gives the same results as in part 2: firms dealing with type 2 bureaucrats pay their full tax obligations as well as discretionary cost c_2.

In Figure 4, we examine diagrammatically the effects of the firm bargaining power η on bribe amounts and tax revenues.

Figure 4: Bribe Demand and Offer Under the No-corruption and Flexible Regimes Where the Firm Has Bargaining Power



We note in Figure 4 that, under a no-corruption regime (τ_1, p_1), the opportunity cost for both employees is P_1 and no opportunity for corruption is created as neither type 1 nor type 2 bureaucrats have an incentive to be dishonest. Indeed, the opportunity cost for type 1 bureaucrats is at P1 while the firm's bribe offer is T1+c1. Hence, no corruption is created as the bribe offer by firms facing type 2 bureaucrats is even lower (i.e. T1+c2) and the minimum bribe that would be accepted by the type 2 bureaucrat is also at P1. When government chooses a flexible fiscal regime (τ_2, p_2), room for corruption is created since the bureaucrat's opportunity cost is at P_2. However, we can see that, in order to keep type 1 bureaucrats honest, the opportunity cost should have been set at a level corresponding to B_{max}. Indeed, it can be seen that along the firm's bribe offer curve (B= T + c_1), B_{min} corresponds to the minimum amount of bribe a type 1 bureaucrat is willing to receive given the opportunity cost[14] while B_{max} corresponds to the maximum amount a firm is willing to pay[15]. We also note that firms with full bargaining power matched with type 1 bureaucrats pay B_{min}, which is smaller than T_1 + c_1 (the amount of tax plus red

[14] Note that B_{min} also corresponds to $p_2w/(1-p_2)$ in Figure 3.
[15] B_{max} also corresponds to T_2+c_1 in Figure 3.

tape cost a firm would have to pay under a no-corruption regime). This means that under a flexible fiscal regime (τ_2, p_2), firms that deal with type 1 bureaucrats and have sufficient bargaining power can potentially reduce their tax obligations by paying a bribe smaller than the level of their fiscal obligations (T1+c1) under the no-corruption regime.

We can determine the critical bargaining power η^* for which firms facing type 1 bureaucrats transfer exactly the same amount of money under both policies (i.e. T_1+c_1)[16]:

(9) $$\eta^* = \frac{\left(T_2 - T_1\right)}{\pi_1\left[T_2 + c_1 - \frac{p_2 w}{\left(1-p_2\right)}\right]}$$

This critical bargaining power (η^*) depends on the government tax level τ and public wage *w* as on probability of detection *p* and on cost *c* imposed by bureaucrats. We see that the larger the tax differential between the two regimes, the higher the firm's bargaining power to reduce bribe payments. On the other hand, the firm's bargaining power increases with the probability of detection and public wages[17], whereas the proportion of type 1 employees are inversely related to the critical bargaining power. This last observation could seem counterintuitive. However, as Schleifer and Vishny (1993) observed, this could be explained by the fact that the presence of a greater proportion of type 1 bureaucrats in the administration would increase competition among them, therefore reducing the equilibrium amount of bribe they receive.

Finally, we note that firms are better off under a flexible regime if their bargaining power is such that $\eta>\eta^*$. This corresponds to segment B_{min} to $T_1 + c_1$ in Figure 4 and leads to the following corollary:

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[16] See appendix for details.

[17] $$\frac{\partial \eta^*}{\partial p_2} = \frac{(T_2 - T_1)w}{\pi_1\left(T_2 + c_1 - \frac{p_2 w}{(1-p_2)}\right)^2 (1-p_2)}$$ and $$\frac{\partial \eta^*}{\partial w} = \frac{(T_2 - T_1)p_2}{\pi_1\left(T_2 + c_1 - \frac{p_2 w}{(1-p_2)}\right)^2 (1-p_2)}$$

COROLLARY OF PROPOSITION 3: *Under a fiscal regime allowing some level of corruption, the amount of bribe paid by firms with bargaining power greater than η* is lower than the amount of taxes and red tape costs under a no-corruption regime.*

The optimal tax rate for the government under the flexible fiscal regime is represented in Figure 4. We can see that if the government seeks only to maximize its net revenues, τ_2 is such that :

$$(1-\pi_1)T_2 - \alpha p_2 - \theta w > T_1 - \alpha p_1 - \theta w$$

$$\Leftrightarrow \quad (1-\pi_1)T_2 > T_1 - \alpha p_1 + \alpha p_2$$

(10) $$\Leftrightarrow \quad T_2 > \frac{T_1 - \alpha(p_1 - p_2)}{(1-\pi_1)}$$

and $T_2 * = \frac{T_1 - \alpha(p_1 - p_2)}{(1-\pi_1)}$

Equation (10) demonstrates that the higher the proportion of type 1 bureaucrats, π_1, the higher the tax rate τ_2 required to collect greater tax revenues under the flexible regime than under τ_1. Furthermore, the greater the difference between the probability of detection of employees 1 and 2 (p_1-p_2), the lower the tax rate τ_2 necessary to yield higher revenues under the flexible regime than under the no-corruption regime with τ_1.

Also, when τ_2 is greater than a critical tax rate τ_2^{**}, the flexible regime yields higher tax revenues (net of detection costs) than the no-corruption regime. In such a case, bureaucrats' opportunity cost is above P_1 so that firms with full bargaining power facing bureaucrats of type 1 will pay a bribe equal to their tax obligations under the no corruption equilibrium. Firms then derive no advantage and the flexible regime is only in the interest of the government. As mentioned earlier, there is an optimal range of values of τ_2 where corruption can be beneficial to firms with bargaining power $\eta > \eta^*$. For this to be the case, τ_2 has to lead to an opportunity cost lower than P1 which represents the upper limit of this beneficial range, while the lower limit of this beneficial range τ_2 has a corresponding opportunity cost P_2 (see Figure 4). However, at P_2 the flexible regime is only in the interest of firms facing type 1 bureaucrats since the government levies taxes equivalent to the no-corruption revenues. Finally, if $\tau_2 = \tau_2^{**}$, the flexible fiscal regime is both in the interest of the government and firms facing type 1 bureaucrats. This situation also corresponds to the case where a firm facing a type 1 bureaucrat has bargaining power $\eta=\eta^*$.

Lose-Lose versus win-win policy

It is often observed that governments in developing countries tend to establish very complex tax regimes, but are faced with very low tax collection levels. This occurs despite high tax rates due to tax evasion and exemptions (Gauthier and Gersovitz, 1997; Gauthier and Reinikka, 2001). The constraint on government activities caused by low tax revenues could be explained by a combination of low probability of detection, low wage levels and high tax rates which encourage corruption activities. Our simple framework allows us to illustrate such a situation.

Imagine a situation in which the government has set a tax rate which is too high relative to its policy to detect corruption and in which a very high level of corruption will be observed. In such case, firms have an incentive to pay bribes and evade taxation while bureaucrats facing a low probability of being caught accepting bribes will tend to be corrupt. We could call this policy regime a lose-lose situation

The rationale for observing such a policy regime in a developing country could relate to a situation where government wants to save on monitoring expenses while forcing its employees to raise supplementary wage through corruption. Gang and al. (1988) noted the issue by asking: “If public workers suffer discrimination by wage, why is it then that demand for such jobs stays high?” Lindauer and al. (1988) also noted in the case of Uganda that “civil workers either survived by diminishing their ethical standards or perished in uprightness.”

It could be argued that in such a lose-lose situation, firms facing a very high level of bribe payment and government facing very low tax revenues, both will gain through a reduction in tax rate.

The first part of next proposition establishes conditions for a lose-lose situation and the second part, conditions for a win-win situation.

PROPOSITION 4a *: Given a fixed proportion of corrupt bureaucrats of type 1,* π_1 *, we could observe an inefficient (lose-lose) fiscal policy for which the government sets a fiscal policy (*τ_{2l-l}*,* p_1*) for which tax rate* τ_2 *commands a detection rate that is higher than* p_1*. We thus observe a situation in which both type of bureaucrats are corrupt. Under such circumstances:*

$$\tau_{2l-l} \rangle \frac{p_1 w}{V(1-p_1)} - \frac{c_2}{V}$$

Proof: Figure (5) illustrates the situation. As observed, when p_1 is lower than p_2, firms' bribe offer will be greater than bureaucrats demand for bribe corresponding to their opportunity cost. Thus, the government loses all its tax revenues since both type of bureaucrats are corrupt.

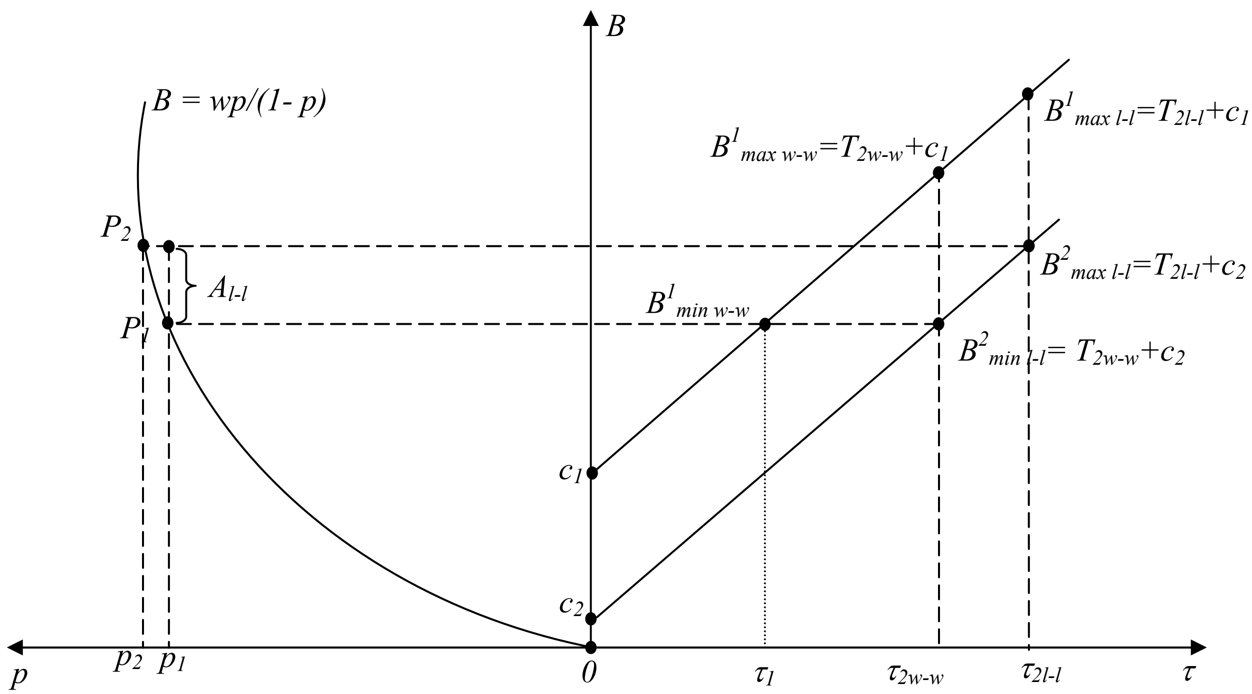
A firm with no bargaining power dealing with bureaucrat of type 2 will offer a bribe up to $B^2_{max\ l-l}= T_{2\ l-l}+c_2$ while the bureaucrat of type 2 dealing with a firm that has full bargaining power will accept to lower a bribe's amount down to P_1 which is equivalent to $B^2_{min\ l-l}$. The logic is the same for a firm dealing with a bureaucrat of type 1: the offer of the firm goes up to $B^1_{max\ l-l}= T_{2\ l-l}+c_1$ while demand for bribe by the bureaucrat stops at P_1 which is equivalent to $B^1_{min\ l-l}$. Note that both types of bureaucrats dealing with firms having full bargaining power receive the same bribe amount since they have the same opportunity cost. Firms with full bargaining power will transfer $B^1_{min\ l-l} =B^2_{minl-l}= T_{2\ w-w}+c_2$ to bureaucrat 1 or 2.

PROPOSITION 4b: *Under a fixed proportion of corrupt bureaucrats of type 1,* π_1*, we could observe an efficient (win-win) fiscal policy (*τ_{2w-w}*,* p_1*) where the government tax revenues increase and firms transfers decrease through reducing tax rate,* τ_2*, such that the opportunity cost of bureaucrat of type 2 is set at* P_1*. In such circumstances the tax rate is:*

$$\tau_{2w-w} = \frac{p_1 w}{V(1-p_1)} - \frac{c_2}{V}$$

Proof: With the lowering of the tax rate, the opportunity cost of a bureaucrat of type 2, P_1, matches the opportunity cost commanded by $\tau_{2w\text{-}w}$. The government now earns tax revenue collected by bureaucrat of type 2, and firms dealing with the bureaucrat of type 2 are now paying a tax amount equal to $T_{2\,w\text{-}w}+c_2$ which is equivalent to the lowest bribe under the lose-lose situation. Firms dealing with type 1 bureaucrats and with no bargaining power see their bribe reduced from $B^1_{max\ l\text{-}l}=T_{2\,l\text{-}l}+c_1$ to $B^1_{max\ w\text{-}w}$ since above that amount firms prefer to be honest; those with full bargaining power see no change in their situation and pay $B^1_{min\ w\text{-}w}= T_{2\,w\text{-}w}+c_2$ since the opportunity cost of all bureaucrats is still at P_1.

Figure (5): Win-win versus lose-lose situation



The conditions for which the optimal negotiation power leads to optimal tax rate are established in Proposition 4 c in the Appendix.

In the next section we examine the case of Cameroon and Uganda and test some of our propositions.

4. EMPIRICAL ANALYSIS

The purpose of our empirical analysis is to assess the effects of corruption and fiscal policy on tax revenues and economic growth, and test some of the main predictions of our theoretical model using firm-level data from Uganda.

Our empirical investigation is divided in two parts. In the first part, we assess the effect of monitoring activities and firm bargaining power on bribe and tax revenues using a simple simultaneous model of bribe and tax payments. In the second part, we investigate the effect of corruption and fiscal policy on economic growth. As stated in Proposition 4, a fiscal regime could be such that tax levels and bribe payments are high, leading to low tax revenues. In such a situation, firms and government are negatively affected and both could gain from a reduction in tax levels and bribe payments. We will compare the effect of observed corruption on firm growth with that of anticipated corruption by a myopic government.

The Data

Data are taken from a survey of 243 firms conducted in Uganda by the World Bank and the Private Sector Foundation in 1998. Firms from five economic sectors: commercial agriculture, agro processing, manufacturing, tourism and construction, were interviewed on their activities in 1995–1997. The sample covers businesses in five geographical areas: Kampala, Jinja–Iganga, Mbale–Tororo, Mukono and Mbarara. Data include information on investments, exports, infrastructure services, taxation, regulation, and corruption.

Taxation data were collected on the main taxes paid by Ugandan businesses, in particular the corporate income tax (CIT), the sales tax/value added tax (VAT), and the National Social Security Fund (NSSF) levy.[18] Information was obtained on the range of special tax reduction and exemption programs available to firms within the Ugandan tax system. In addition to special provisions of the general Tax Code, one of the main

[18] Other taxes include import duties, the withholding tax, the presumptive tax on small businesses; the local property tax, etc. (see Chen and others 2001).

sources of tax exemptions is the 1991 Investment Code which provides exemptions to large investments. The Minister of Finance also grants tax exemptions on an ad hoc basis. These case–by–case exemptions have included exemptions from CIT, import duties, and domestic sales taxes. Furthermore, there are no specific rules or criteria for the granting of these privileged statuses. (See Gauthier and Reinikka, 2001)

Data on corruption were collected in several parts of the questionnaire. Businesses were asked if they usually paid special amounts or bribes to tax and customs officers. Information on bribe amounts was obtained indirectly as respondent were asked to estimate the typical bribe payments a firm in their line of business would pay each year to deal with public officials, in customs, taxes, licences, regulation, etc.[19]

Table 1 presents some basic characteristics of the sample, including age, sales, taxes, bribes and ownership using 1997 data. We note the relatively large size of firms in the sample, as well as the prevalence of domestic ownership.

TABLE 1. BASIC BUSINESS STATISTICS (1997)

Variable	Number of observations	Mean	Std Deviation	Minimum	Maximum
Age	242	13.9	12.5	1	74
Number of workers	242	124	259	2	2000
Sales	225	2.486	9.499	0.0008	89.1
Tax	164	0.373	3.141	0	39.3
Tax/sales	164	0.076	0.092	0	0.476
Tax/worker	164	1355	4262	0	33815
Bribe	164	0.007	0.018	0	0.164
Bribe/sales	164	0.013	0.024	0	0.2
Bribe/worker	164	69	126	0	909
Foreign–owned	243	0.161	0.368	0	1

Note: Age is in years in 1997. Workers include permanent and temporary workers. Sales, tax and bribe are in millions of USD. Tax/sales includes Company income tax/sales, sales tax VAT/sales and NSSF/sales, and are fractions. Tax and bribe per worker are in USD. Bribe/sales and Foreign owned are fractions.

[19] The question was as follows "Many business people have told us that firms are often required to make informal payments to public officials to deal with customs, taxes, licenses, regulations, services, etc. Can you estimate what a firm in your line of business and of similar size and characteristics typically pays each year?" (Svensson, 2003).

Table 2 reports tax ratios, frequency of exemptions and evasion by sector categories.[20] Tax rate is measured as the ratio of payments of the three main groups of taxes to sales. Exemption is the frequency of firms that report benefiting from at least one of the main tax exemption program. Evasion is the frequency of firms evading taxes. A business is considered evading if it reports not paying a tax or group of taxes and reported no full exemption. Evasion estimates are based on Gauthier and Reinikka (2001).

TABLE 2. VARIATION IN EROSION BY SECTOR (1997)					
VARIABLE	**SECTOR**				
	Agriculture	**Agro processing**	**Other Manufacturing**	**Construction**	**Tourism**
Tax/ sales ratio	0.034	0.040	0.093	0.039	0.067
<u>Exemption</u>					
At least one exemption	0.571	0.640	0.442	0.333	0.500
<u>Evasion</u>					
Evader	0.571	0.560	0.481	0.444	0.563
Evade all	0.048	0	0	0	0
Sample size	21	25	52	9	16

We observe in Table 2 some variations among sectors. The highest tax ratios are observed in the manufacturing sector (9.3%) and the lowest in agriculture (3.4%). We also note the pervasiveness of evasion as well as exemptions. 56% of firms report benefiting from a tax exemption regime. The highest rate of tax exemption is observed in the agro processing sector (64%) and lowest in construction (33%). Tax revenues are further decreased through high rates of tax evasion. Frequency of tax evasion is very high at around 60%.

With respect to bribe payments, close to 81% of firms in the sample report paying bribes. In the construction sector, close to 90% of businesses report paying bribes but only 56% in the agriculture sector. Average bribe amounts are 6720 US$. The highest

[20] Restricting the sample to those firms with a complete series on all variables of interest reduces the original sample of 243 businesses by about one-third. Of the remaining businesses, those which reported any of the following were eliminated as either data entry errors or extreme outliers: tax/sales >0.5 and bribe/sales >0.5.

average bribe amounts is observed in the agriculture sector (13443US$) and the lowest in agriculture (1047US$) (not shown). In addition to the nature of government services, these differences reflect in part differences in firm size and ownership structure among sectors. In percentage of sales, bribes represent 1.3% of sales value. Firms in the agro processing sector report the highest bribe ratio with 6% of sales value and the lowest is in the Agriculture (0.6%).

With respect to corruption, 176 firms reported bribe data out of a sample of 243 firms. Overall, 77% of firms declared paying bribes overall. Of these, 40% declared paying for reducing tax obligations, 63% for accelerating services. The average amount of bribes paid to public officials was Ush 7.4 million (6723 Usd) or 1.3 percent of annual sales (see also Svensson, 2003).

In terms of firm size, it is interesting to note that the burden of bribe extraction by public officials, which falls in absolute terms on larger firms, is in fact heavier for medium–sized firms, which pay larger bribes Indeed, in terms of the ratio of bribe payments to sales value and the ratio of bribe payments per worker, medium–sized firms again pay more, at 3.5 percent of sales for the 26–75 employee category. This is 29 times more per unit of sales than larger firms, and 9 times more than smaller firms.

Econometric specification

A. Monitoring activities

We first investigate the effect of monitoring activities and firm negotiation power on bribe payments and tax revenues. We make use of a simple empirical model of firm determination of bribe and tax payments. Bribe payments (BRIBE) can be postulated as a function of official tax obligations (TAXOBL), actual tax payment (TAX), monitoring activities by the tax administration (VERIF), resale value of the firm (RESALE), sunk cost (SUNK) and a vector of other factors affecting bribe payments ($\mathbf{X_B}$). Simultaneously, actual tax payment (TAX) is function of official tax obligations (TAXOBL), bribe payments (BRIBE), profit level (PROFIT) and a vector of other factors affecting tax payments ($\mathbf{X_T}$). More specifically, the model can be written as a system of two equations:

(11) $BRIBE = \beta_0 + \beta_1 TAXOBL + \beta_2 TAX + \beta_3 VERIF + \beta_4 RESALE + \beta_5 SUNK + \beta_x \mathbf{X_B} + \varepsilon_1$

(12) $TAX = \delta_0 + \delta_1 TAXOBL + \delta_2 BRIBE + \delta_3 PROFIT + \delta_x \mathbf{X_T} + \varepsilon_2$

The variable bribe (BRIBE) is the reported bribe payments per employee. The variable official tax obligation (TAXOBL) is the amount of tax obligation per employee. Our definition of tax obligation is based on the sample firms' own declaration of exemptions and characteristics, and the Uganda tax code.[21] The variable tax (TAX) is the ratio of tax payment per employee. The dummy variable VERIF takes the value of one if firms report at least one of the two tax verifications by the tax administration (Corporate tax and VAT) during the year. The variable resale (RESALE) represents the ratio of the firm resale value of plant and equipments per employee. It serves as a proxy of firm mobility and hence capacity to avoid paying bribes. The variable SUNK is the ratio of firm replacement value of plant and equipment per employee. It denotes the importance of sunk cost for the firm. The variable profit (PROFIT) is the ratio of profits per employee. The vector of covariates $\mathbf{X_B}$ is composed of four variables : a dummy variable of tax evasion activities (EVA) which take the value of one if a firm evades both corporate tax and VAT taxes; an index (GVT) which varies from one to five, accounting for a firm's use of government services (water, electricity, waste disposal, telephone and roads); the variable age (AGE) which is the log of the age of the firm; and an index of exchange activities (EXC) which denotes the importance of trading activities by the firm, specifically import and export activities. The vector $\mathbf{X_T}$ includes two variables: the index of exchange activities (EXC); and an index of tax payments (TAXINDEX) which accounts for which taxes a firm pays. Tables B1 and B2 in the Appendix present a detailed description of variables and summary statistics.

The system of equations contains endogenous variables among the explanatory variables violating the standard assumptions of OLS. Furthermore, the error terms across equations are likely to be correlated. Such correlation represents the effects of unmeasured factors on bribe and tax payments.

[21] Specifically, for 1997 data, we examined specific exemptions under the general tax code and special tax exemptions. We took into account the specific exemptions of the general tax code concerning the three main tax collected (CIT, VAT and NSSF), as well as the exemptions granted under the various regimes of the 1991 Investment Code.

In order to deal with these issues, we use a three-stage least squares approach (3SLS) to produce consistent estimates, which makes use of generalized least squares (GLS) to account for the correlation structure in the disturbances across the equations.[22]

Results

The three-stage least squares regression results from the simultaneous estimation of equations (11) and (12) are presented in Table 3 for two different specifications. For each specification, the first column presents the estimated coefficients for bribe payments, while the second lists the estimated coefficients for tax payments.[23]

We observe that in both specifications the coefficient for the official tax obligations variable in equation (11) is positive (significant at the 1 percent level). This result suggests that, as expected, higher tax obligations increase bribe payments. Furthermore, the coefficient for actual tax payment is negative (significant at the 10 percent level), indicating that, as hypothesized, bribes decrease with tax payments. We also note that the coefficient of the variable accounting for monitoring activities (VERIF) is negative as expected (significant at the 5 percent level in specification 1 and the10 percent level in specification 2), suggesting that bribe payments decrease with increased monitoring.

These results support proposition 4 and are consistent with the stylized facts presented in Basu and Mishra (1992), that it is useful for the government to increase monitoring activities as it reduces corruption activities. We also observe that the coefficient of the variable age is negative (significant at the10 percent level), indicating that older and more established firms pay smaller bribes than younger and less established ones. Finally, the coefficient of the variable (GVT) is positive (significant at the 5 percent level in specification 1 and the 1 percent level in specification 2), indicating that bribes increase with the use of public infrastructure and thus greater contacts with government officials.

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[22] For more details about the 3SLS procedure, see Greene (2003), pp. 405-407

[23] An endogeneity test was conducted using a Hausman test, as described in Gujarati (1995). The test yields a significant coefficient for the predicted residuals ($b = -6.743$, $\sigma = 3.651$; $t = -1.85$, $P>t: 0.067$), indicating that the hypothesis of simultaneity could not be rejected.

TABLE 3. Determinants of Bribe and Tax Payments : 3SLS Estimation

VARIABLES	SPECIFICATION (1)		SPECIFICATION (2)	
	BRIBE	TAX	BRIBE	TAX
TAXOBL	.013*** (5.12)	.946*** (10.99)	.013*** (5.18)	.941*** (10.46)
TAX	–.009* (–1.95)		–.008* (–1.68)	
BRIBE		–12.872** (–2.21)		–8.762* (–1.66)
VERIF	–36.53** (–2.00)		–34.11* (–1.72)	
RESALE			–.005** (–2.08)	
SUNK			.002* (1.91)	
GVT	20.93** (2.45)		25.05* (2.77)	
AGE	–15.76* (–1.72)		–19.20* (–1.90)	
EXC	2.54 (0.13)	49.92 (0.09)	–0.357 (–0.02)	26.65 (0.05)
SEC	8.34 (0.98)	–18.47 (–0.08)	10.89 (1.19)	–134.87 (–0.53)
LOC	–5.569 (–0.75)	–67.92 (–0.33)	–3.78 (–0.49)	–20.95 (–0.10)
PROFIT		–.207*** (–6.51)		–.220*** (–6.57)
TAXINDEX		727.87 (1.30)		615.97 (1.01)
EVA	29.91 (0.41)		27.07 (0.35)	
Constant	–15.61 (–0.10)	–540.52 (–0.49)	–31.47 (–0.19)	–347.20 (–0.30)
R^2	0.312	0.523	0.345	0.534
X^2	57.27	166.81	63.36	149.63
p-value	.000	.000	.000	.000
N	147	147	137	137

Note: N is the number of observations. The figures in parentheses are z-statistics. * Statistically significant at the 10 percent level, ** Statistically significant at the 5 percent level. ** *Statistically significant at the 1 percent level. X^2 test and corresponding p-value that the coefficients in the equation are jointly equal to zero.

In specification 2 in which two variables are introduced to account for firms bargaining power (resale value and sunk cost), we observe that the coefficient of the variable RESALE is negative (significant at the 5 percent level). This result suggests that, as hypothesised in proposition 3, as resale value increases, firms become more mobile and acquire more bargaining power, leading to lower bribe payments. Furthermore, the coefficient of the variable sunk cost (SUNK) is positive (significant at the10 percent level), indicating that, again as hypothesised in proposition 3, firms with important sunk costs in plant and equipment have less bargaining power and are more inclined to pay higher bribes.

The second column in both specifications shows the determinants of tax payment. We observe that the coefficient for the official tax obligations variable in equation (12) is positive (significant at the 1 percent level). This suggests that, as expected, higher official tax obligations are associated with higher tax payments. Furthermore, we also note that the coefficient for bribe payments is negative (significant at the 5 percent level in specification 1 and at the 10 percent level in specification 2) indicating that, as hypothesized, higher bribes are associated with lower tax payments. We also note that the coefficient of the variable profit ratio is negative (significant at the 1 percent level), suggesting that a higher profit rate leads to higher tax evasion.

These results support propositions 3 and 4, that bribe and tax payments are responsive to tax policies and detection mechanisms. In particular, our results suggest that monitoring activities are useful in the sense that they increase government tax revenues and reduce bribery activities. Furthermore, these results indicate that bureaucrats' capacity to extract bribes decreases with firms' bargaining power associated with increased mobility.

B. Effects of Tax and bribery rates on firm's growth

We now investigate the effect of tax and corruption activities on firm growth. We utilize the following basic formulation which follows Fisman and Svensson (2002):

(13) $GROWTH = \beta_0 + \beta_1\ BRIBE + \beta_2\ TAX + \beta_3\ SALES_0 + \beta_4\ OWN + \beta_5\ EXC + \beta_6\ EVA + \varepsilon$

where GROWTH is the rate of growth of employment during the 1995-97 period, BRIBE is the ratio of the bribe amount per employee, TAX is the ratio of tax per employee, SALES represents initial sales, OWN is a dummy of foreign ownership, EXC is an index of firm exchanges, and EVA is a dummy of evasion.

Initial sales are introduced to control for initial firm size. Origin of capital ownership could be linked with access to technology and financial resources. However, access to bureaucrats could vary with ownership as foreign owned firms might be subject to more harassment from government officials. The importance of trading activities (export and import) also influences a firm growth potential. Tax evasion could slow down or increase growth. In addition to these variables, following Fisman and Svensson (2002), we also control for specific effects of location and industry as there could be a difference in technology and demand shocks among sectors and local markets.

Our theoretical framework suggests that the process that drives bribe payments is a function of factors associated with contacts between firms and bureaucrats and respective negotiation power. Bribe amounts in this model are then endogenous and are seen as determined by a negotiation process taking place between firms and bureaucrats, as examined in the previous section. Bribe payments could be seen as influenced by the degree of contacts between firms and bureaucrats and the leverage bureaucrats are able to exercise over firms.

Given the truncated nature of the bribe variable, we make use of a Tobit model to estimate bribe payments. The model takes the form:

(14a) $BRIBE^* = \alpha_0 + \alpha_1\ TAXOBL + \alpha_2\ TAX + \alpha_3\ RESALE + \alpha_4\ SUNK + \alpha_5\ AGE + \alpha_6 GVT + \alpha_7\ VERIF + \alpha_8\ SEC + \alpha_9\ LOC + \mu$

(14b) $BRIBE = \max(0, BRIBE^*)$

where, BRIBE*****, the latent variable, is the ratio of reported bribe per employee, TAXOBL the ratio of official tax obligations per employee, TAX the ratio of tax payments per employee. Following Svensson (2003), RESALE and the sunk cost of capital (SUNK) are introduced to account for a firm's bargaining power towards government officials. The variable AGE is the log of the firm's age, GVT measures the extent to which a firms is in contact with government services, VERIF denotes if their has been a tax verification for the two main taxes (CIT and VAT), and finally, sector and location are introduced to take account of differences in technology and demand shocks among sectors and local markets. Tables B1 to B2 in the Appendix present a detailed description of variables and summary statistics.

In the first stage, we estimate bribe rates using (14a–b). In the second stage, these estimates are used as instruments in equation (13). The instrumental variable used in the growth regression is generated with a tobit model for truncated variables by regressing the bribe rate on tax rate, expected tax rate, the mobility of capital, sunk cost, firm's age, the extent of verification of taxes and of contact with government's agents, firm's sector and location.

Models of such types with a truncated dependant variable mixed with continuous variables were first studied by Nelson and Olson (1978). Amemiya (1978) develops a simultaneous equation model with a Tobit and a continuous variable. Maddala (1983) proposes a Maximum likelihood model to estimate such system of equation. The advantage of these methods is that they obtain unbiased estimators. The use of these models will be investigated further in the future stages of our research program.

This two stage model will be compared to the effects of corruption anticipated by a myopic government. Such a myopic government could be seen as simply estimating the effect of bribes on firm growth without taking into account the endogenous relationship between bribes and growth. Comparing these estimates could say something about the potential gains associated with policy reforms with respect to fiscal and corruption control policies.

Results

Table 4 presents the simple OLS regression results of firm growth using three different specifications. Regressions are run using a Huber-White correction for heteroskedasticity. Furthermore, following Fisman and Svensson (2002), clusters for industry and location are also used.

In the three specifications in Table 4, we observe that the coefficients on bribe and tax ratios are negative as expected, but that the coefficient of bribe ratio is not significant at a 10% level.

The growth regression (13) is then estimated in which bribes are instrumented using equations (14a-b) for three different specifications. Tobit estimates of bribes are presented in Table 6.

We observe in the three specifications in Table 5 that the coefficients on bribe and taxes have the expected negative sign and are significant (both at the 5 percent in specification 1 and both at 1 percent in specifications 2-3).

We also note that the coefficient for initial sales is positive and significant (at the 5 percent and at the 10 percent level), indicating that growth of employment is associated with larger initial sales level. Also, tax evasion has a positive and significant effect (at the 5 percent level) on growth. We thus observe that once we account for endogeneity in the growth regression, the negative effect of bribe and tax ratios on growth are both significant.

TABLE 4: Determinants of Firm Growth: OLS Estimation

VARIABLES	SPECIFICATION (1)	SPECIFICATION (2)	SPECIFICATION (3)
BRIBE	–.000035 (–0.37)	–.000035 (–0.36)	–.00004 (–0.42)
TAX	–5.47e–06*** (–3.04)	–5.54e–06*** (–3.28)	–5.40e–06*** (–3.22)
$SALES_0$	.012* (1.69)	.0131 (1.30)	.012 (1.17)
OWN	.001 (0.89)	.001 (1.08)	.001 (1.07)
EXC		–.014 (–0.24)	–.017 (–0.30)
EVA			.063 (2.30)
Constant	–.0.74 (–.90)	–.081 (–.81)	–.187 (–1.59)
R^2	0.026	0.027	0.024
N	138	138	136

Note: N is the number of observations. The figures in parentheses are t-statistics. all regressions allow for clustering by industry–location and use Hubert-White correction for heteroskedasticity * Statistically significant at the 10 percent level, ** Statistically significant at the 5 percent level. ** *Statistically significant at the 1 percent level.

TABLE 5: Determinants of Firm Growth: OLS Estimation with Bribe as an instrumental variable

Variables	Specification (1)	Specification (2)	Specification (3)
BRIBE1	–0.0003**	–0.0003***	–0.0003***
	(–2.50)	(–2.60)	(–2.78)
TAX	–6.07e–06**	–6.11e–06***	–5.99e–06***
	(–2.64)	(–2.89)	(–2.82)
$SALES_0$	.016**	.017*	.015*
	(2.52)	(1.99)	(1.83)
OWN	.0003	.0004	.0003
	(0.51)	(0.55)	(0.55)
EXC		–.007	–.010
		(–0.13)	(–0.19)
EVA			.073**
			(2.33)
Constant	–.104	–.108	–.230**
	(–1.53)	(–1.34)	(–2.25)
R^2	0.029	0.029	0.028
N	126	126	124

Note: N is the number of observations. The figures in parentheses are t-statistics. all regressions allow for clustering by industry–location and use Hubert-White correction for heteroskedasticity * Statistically significant at the 10 percent level, ** Statistically significant at the 5 percent level. ** *Statistically significant at the 1 percent level.

TABLE 6: Determinants of Bribe Payments: Tobit estimates – Dependent variable : Bribes per employee

VARIABLES	SPECIFICATION
TAXOBL	.014*** (6.43)
TAX	–.011*** (–3.68)
SUNK	.002* (1.84)
RESALE	–.006** (–2.23)
AGE	–15.54 (–1.34)
GVT	31.51*** (2.98)
VERIF	–40.46* (–1.78)
SEC	12.30 (1.18)
LOC	–6.40 (–0.73)
Constant	–7.0 (–0.10)
LR Chi-2	58.68
P-value	.000
Number of observations	142

a. T–values in parentheses.* significant at 10% level, ** significant at 5% level and *** significant at 1% level.

b. 28 observations are left–censored (bribemp<=0), 114 observations are uncensored.

It is also interesting to note the magnitude of the negative effect of bribes and taxes on growth. The negative effect of bribes on growth is much larger than that of taxes, as noticed by Fisman and Svensson (2002).

As a robustness check, we also used rate of growth of output instead of employment to measure firm growth. Regressions yield the same qualitative results (See Tables 4A, 5A and 6A in Appendix C). The impact of bribes and taxes are significant and negative in the growth regression with bribe as an instrumental variable (Table 5A).

These results support proposition 4 that the fiscal policy of a myopic government would underestimate the negative effects of bribery on growth (as modeled by a standard OLS) and would set a too low detection rate with respect to official tax rates. On the other hand, the fiscal policy of a non-myopic government would take into account the real negative effects of bribery on firm growth (by accounting for the endogeneity of bribery on growth) and would increase the detection rate in accordance with the official tax rates.

5. CONCLUSION

The purpose of this paper is to examine the relationship between tax levels and corruption activities. We develop a simple model to analyze the conflict between a government, bureaucrats and private firms in the context of the tax collection process.

We first model a situation where bureaucrats are homogeneous and have complete negotiation power over the firms with which they interact. We show that in such a situation the government can set an optimal tax rate and put in place corruption control mechanisms involving incentive wages and detection in the framework of a no-corruption equilibrium. However, when the public administration is composed of heterogeneous types of bureaucrats with the specific capacity to impose red tape costs on firms, we show, in line with Acemoglu and Verdier (2000), that it might be optimal for the government to allow a certain level of corruption given the cost of monitoring activities.

We show in particular that net government revenues are maximized under a fiscal regime with some level of corruption activity. We also show that the government could face lose-lose as well as win-win situations in the conduct of its fiscal policies.

We test the predictions of the model using firm-level data from Uganda. In particular, we examine the effect of monitoring activities and firm bargaining power on bribe payments and tax revenues. We also test the effect of bribe and tax rates on firm growth. We compare the effect of actual corruption (as measured by bribe payments) with the effect of government corruption expectation on firms' growth. Our results indicate that detection mechanisms have significant effect on bribe and tax payments. Also, our results indicate that a myopic government that does not take into account the actual importance of bribe activities would underestimate the negative effect of corruption on firm growth.

We intend in the next stages of the research to estimate the firm growth model using better econometric specifications, in particular using the Maddala (1983) procedure. We also expect to endogenise tax rates to account for the bargaining process between firms and bureaucrats and its effects on firms' growth.

Appendix A: Theory

Critical proportion of type 1 bureaucrats

Net revenues are as follows:

$$RN\tau_1 = \frac{p_1}{(1 - p_1)} w - c_1 - \alpha p_1$$

$$RN\tau_2 = (1 - \pi_1)\left(\frac{p_2}{(1 - p_2)} w - c_2 \right) - \alpha p_2$$

We calculate the critical proportion of type 1 bureaucrats that yield higher net revenues under a flexible regime than a no-corruption regime:

$$RN\tau_1 \ \langle\ RN\tau_2$$

$$\Leftrightarrow \qquad \frac{p_1 w}{(1 - p_1)} - c_1 - \alpha p_1 \quad \langle \quad (1 - \pi_1)\left(\frac{p_2 w}{(1 - p_2)} - c_2 \right) - \alpha p_2$$

where: $p_1 = 1 - \left(\frac{w}{\alpha}\right)^{1/2}$; $\qquad p_2 = 1 - \left(\frac{(1 - \pi_1) w}{\alpha} \right)^{1/2}$;

$$\frac{p_1 w}{(1 - p_1)} = (\alpha w)^{1/2} - w; \qquad \frac{p_2 w}{(1 - p_2)} = \left(\frac{\alpha w}{1 - \pi_1} \right)^{1/2} - w$$

Thus, $(\alpha w)^{1/2} - w - c_1 - \alpha + (\alpha w)^{1/2} \ \langle\ (1-\pi_1)\left[\left(\frac{\alpha w}{1-\pi_1} \right)^{1/2} - w - c_2 \right] - \alpha + ((1-\pi_1)\alpha w)^{1/2}$

$$\Leftrightarrow \qquad 2(\alpha w)^{1/2} - w - c_1 \ \langle\ 2((1-\pi_1)\alpha w)^{1/2} - (1-\pi_1) w - (1-\pi_1) c_2$$

$$\Leftrightarrow \qquad (1-\pi_1)(w + c_2) - 2(1-\pi_1)^{1/2}(\alpha w)^{1/2} + 2(\alpha w)^{1/2} - w - c_1 \ \langle\ 0$$

Subsituting, $x = (1-\pi_1)^{1/2}$ et $x^2 = (1-\pi_1)$

We have: $x^2(w+c_2) - 2x(\alpha w)^{1/2} + 2(\alpha w)^{1/2} - w - c_1 \ \langle\ 0$

Solutions to this inequality are :

$$x_1 = \frac{\sqrt{\alpha w} - \sqrt{\alpha w - 4(w + c_2)(2\sqrt{\alpha w} - w - c_1)}}{2(w + c_2)}$$

$$x_2 = \frac{\sqrt{\alpha w} + \sqrt{\alpha w - 4(w + c_2)(2\sqrt{\alpha w} - w - c_1)}}{2(w + c_2)}$$

Hence, $(1 - x_1^2) \rangle\ \pi_1 \ \rangle\ (1 - x_2^2)$

Nash solution to bureaucrat and firm's negotiation

We have:

$$\max_B \ (T + c - B)^{\eta}\left(B - \frac{pw}{(1-p)}\right)^{1-\eta}$$

$$\text{s.t}: \quad B \geq \frac{p}{(1-p)}w$$

$$B \leq T + c$$

From first order conditions, we get:

$$-\eta(T+c-B)^{\eta-1}\left(B - \left(\frac{pw}{(1-p)}\right)\right)^{1-\eta} + (T+c-B)^{\eta}(1-\eta)\left(B - \left(\frac{pw}{(1-p)}\right)\right)^{-\eta} = 0$$

$$\Leftrightarrow \quad \eta(T+c-B)^{\eta-1}\left(B - \left(\frac{pw}{(1-p)}\right)\right)^{1-\eta} = (T+c-B)^{\eta}(1-\eta)\left(B - \left(\frac{pw}{(1-p)}\right)\right)^{-\eta}$$

$$\Leftrightarrow \quad \eta\left(B - \frac{pw}{(1-p)}\right) = (1-\eta)(T+c-B)$$

Which yields the following relationship:

(9) $$B = \eta\frac{pw}{(1-p)} + (1-\eta)(T + c)$$

Critical bargaining power

To obtain firms' costs that are lower when a governement chooses a flexible fiscal regime, we need :

$$FC_{sc} \rangle FC_{c}$$

$$\Leftrightarrow (1-\pi_1)(T_1 + c_2) + \pi_1 (T_1 + c_1) > (1-\pi_1)(T_2 + c_2) + \pi_1 \left[(1-\eta)(T_2 + c_1) + \eta \left(\frac{p_2 w}{(1-p_2)} \right) \right]$$

$$\Leftrightarrow (1-\pi_1)(T_1 - T_2) > \pi_1 \left[T_2 + c_1 - \eta (T_2 + c_1 - \frac{p_2 w}{(1-p_2)}) - (T_1 + c_1) \right]$$

$$\Leftrightarrow (1-\pi_1)(T_1 - T_2) + \pi_1 (T_1 - T_2) > -\eta \pi_1 \left[T_2 + c_1 - \frac{p_2 w}{(1-p_2)} \right]$$

$$\Leftrightarrow \qquad -\eta \langle \frac{(T_1 - T_2)}{\pi_1 \left[T_2 + c_1 - \frac{p_2 w}{(1-p_2)} \right]}$$

$$\Leftrightarrow \qquad \eta^* = \frac{(T_2 - T_1)}{\pi_1 \left[T_2 + c_1 - \frac{p_2 w}{(1-p_2)} \right]}$$

Hence, $\eta > \eta^*$ to have $FC_{sc} \rangle FC_{c}$

Proposition 4c

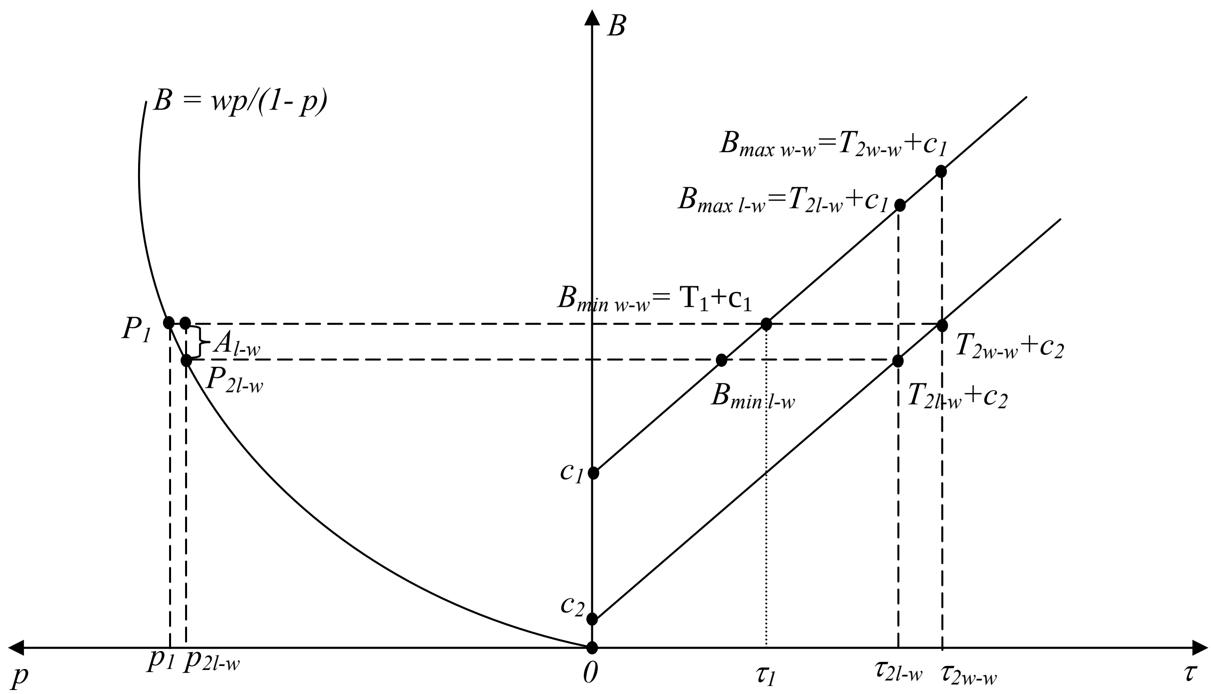
Under a fixed proportion π_1 of corrupt bureaucrats of type 1, we could observe an efficient fiscal policy ($\tau_{2l\text{-}w}$, p_1) that we call lose-win where the government sees its tax revenues decrease and firms see their transfers decrease by reducing the tax rate, τ_2, in order to set all bureaucrats opportunity cost under P_1. In such circumstances the tax rate is:

$$\tau_{2l-w} \langle \frac{p_1 w}{V(1-p_1)} - \frac{c_2}{V}$$

Proof:

Given ($\tau_{2l\text{-}w}$, p_1), the opportunity cost of both types of bureaucrats is now at $P_{2\ l\text{-}w}$ on figure (5a). Government sees a lowering in its tax revenues from bureaucrat 2 from $T_{2w\text{-}w}+c_2$ to $T_{2l\text{-}w}+c_2$. However, the situation is to the advantage of firms dealing with bureaucrats of type 1 since the lowering of the opportunity cost of the bureaucrats has the effect of lowering the minimal bribe a bureaucrat is willing to accept. On figure (5a), appears a range (brace $A_{l\text{-}w}$) where firms with sufficient bargaining power can lower their bribe to an amount smaller than what they would have paid in fiscal obligations under a no-corruption policy T_1+c_1. We also note that $B_{min\ l\text{-}w}$ is effectively smaller than $B_{min\ w\text{-}w}$= T_1+c_1.

Figure (5a): Win-win versus lose-win situation



Corollary to proposition 4c

There is an optimal tax rate τ_2^{**} *set accordingly to* η^* *(eq.9) for which gains made by firms dealing with corrupt bureaucrats of type 1 overcome government's losses due to tax revenues reduction. This optimal tax rate is such that:*

$$\tau_2^* = \frac{\left(\tau_1 + \frac{\eta^* \pi_1 c_1}{V} - \frac{\eta^* \pi_1 p_2 w}{V(1-p_2)}\right)}{(1-\eta^* \pi_1)}$$

Proof:

From the comparison of the effect of the flexible policy and the no-corruption policy on firms cost we obtained a critical bargaining power η^* (eq.9). Transforming this equation and isolating τ_2^{**} yields the optimal tax rate under which firms dealing with corrupt bureaucrats minimize their bribes while the government still collects higher tax revenues with a flexible policy than with a no-corruption policy.

Appendix B1: Summary Statistics of Variables

Variable	Obs	Mean	Std. Dev.
Age	242	12.9	12.5
Employment 1997	243	124	259
Employment 1995	213	103	251
Sales 97	225	2.486	9.499
Sales 95	197	1.669	6.180
Growth (of sales)	189	0.111	0.347
Growth(of employment)	208	0.054	0.257
Tax obligations/sales	164	0.163	0.116
Tax/sales	164	0.076	0.092
Bribe/sales	164	0.013	0.024
Tax obligations/worker	164	2882	5422
Tax/worker	164	1355	4262
Bribe/worker	164	69	126
Profit	219	590364	5028967
Profit / worker	219	3455	12821
Resale value	219	6359	12375
Sunk cost	220	15997	33321
Foreign Ownership	243	24.1	39.5
Exchange	241	0.510	.501
Taxindex	233	1.183	.574
Servgvt	243	3.474	1.292
Exemption	217	0.465	0.663
Evasion	231	1.939	0.239
Verification	229	1.677	0.469

Means and standard errors are given in Usd.

Appendix B2: Variables description

Age : firm's age in 1997;

Bribe: bribe's amount divided by number of employees in 1997;

Cluster: index taking value 1-25 depending on location and industry of the firm;

Emp97 : total employment in firm in1997;

Emp95 : total employment in firm in1995;

EVA: Binary variable taking value of 1 if a firm has evaded both taxes (corporate tax and VAT) and 0 if a firm has not;

EXC: Binary variable taking value 1 if firm exports and/or imports, taking value of 0 if firm does not export nor import;

Exemption: index from 0 to 2 indicating exemptions from corporate tax and import duties (exemption=0 if no exemptions, 1 if partial exemptions, and 2 if full exemptions);

GROWTH : growth of employment calculated as follows: (ln(emp97) – ln(emp95))/2 ;

GVT: Index from 0 to 5 for availability of public services. The index is the sum of five dummy variables that are indicating whether electricity, water, waste services, roads and telephones are available. The dummy variables take value 1 if service is available, 0 otherwise;

Gvtcontact: First principal component of a principal component analysis of variables *Exc, taxindex* and *Gvt*;

AGE: ln(firm's age);

LOC: index taking value 1- 5 depending on the sector of activity of the firm which are Kampala, Jinja–Iganga, Mbale–Tororo, Mukono and Mbarara;

$SALES_0$: log(sales95);

RESALE: Capital's mobility measured as the ratio of the firm's resale value over total employment;

OWN: Percentage of firm's foreign ownership;

PROFIT: Profit per employees in 1997;

Sales97 : gross sales in 1997;

SEC: index taking value 1- 5 depending on the sector of activity of the firm which are commercial agriculture, agro processing, manufacturing, tourism and construction;

SUNK: Capital's immobility measured as the ratio of the firm's replacement value of plant and equipment over total employment;

TAXINDEX : Log of (1+ Tax index);

Tax index: Index for types of taxes paid by a firm. The index is the sum of six dummy variables indicating which taxes a firm pays. A dummy is equal to 1 if firm pay the tax, 0 otherwise. Taxes for Uganda are import duty, import commission, withholding tax, excise tax, VAT, corporate tax;

TAX: taxes per employees in 1997;

TAX obligations: Tax obligations per employees in 1997;

VERIF: Binary variable taking value of 1 if a firm was verified for both taxes (corporate tax and VAT) and 0 if a firm was not verified.

Appendix C: Robustness Check

TABLE 4A: Determinant of Firm Growth: OLS estimates – Dependent variable: Growth of sales

Variables	Specification (1)	Specification (2)
Bribe/sales	–1.249	–1.099
	(0.852)	(0.874)
	[0.159]	[0.223]
Taxes/sales	–0.285	–0.478
	(0.303)	(0.292)
	[0.357]	[0.118]
$Sales_0$	0.002	–0.007
	(0.008)	(0.009)
	[0.766]	[0.456]
AGE	–0.052	–0.039
	(0.043)	(0.039)
	[0.242]	[0.333]
OWN		0.002
		(0.001)
		[0.159]
Cst	0.239*	0.306*
	(0.130)	(0.139)
	[0.081]	[0.041]
R^2	0.02	0.05
Number of observations	126	126

Note: Standard errors in parentheses and P–values in brackets. * Significant at 5% level.

TABLE 5A: Determinant of Firm Growth: OLS estimates with Bribe as an instrumental variable -- Dependent variable : Growth of sales

Variables	Specification (1)	Specification (2)
Bribe1/sales	–4.752*	–4.688*
	(2.426)	(2.377)
	[0.065]	[0.063]
Tax/sales	–0.430	–0.551*
	(0.346)	(0.313)
	[0.228]	[0.094]
$SALES_0$	–0.009	–0.016
	(0.008)	(0.010)
	[0.264]	[0.133]
AGE	–0.004	0.005
	(0.061)	(0.059)
	[0.943]	[0.927]
OWN		0.001*
		(0.001)
		[0.096]
Cst	0.307*	0.351*
	(0.130)	(0.134)
	[0.029]	[0.017]
R^2	0.03	0.05
Number of observations	106	106

Note: Standard errors in parentheses and P–values in brackets. * Significant at 5% level.

TABLE 6A: Determinants of bribe payments: Tobit estimates – Dependent variable : Bribes per sales

Variables	Uganda
Emploi	–5.08e–07
	(0.00001)
	[0.963]
PROFIT	2.89e–10
	(1.25e–09)
	[0.818]
resale/replace	–6.60e–09
	(5.10e–09)
	[0.198]
Sunk	–3.20e–08
	(2.11e–07)
	[0.880]
Gvtcontact	0.003
	(0.002)
	[0.118]
Exemption	0.012*
	(0.004)
	[0.002]
Cst	–0.009
	(0.010)
	[0.346]
Number of observations	124

Note: Standard errors in parentheses and P–values in brackets. * Significant at 5% level.

In tobit specification for Uganda, 24 observations are left–censored at Bribe=0, and 100 observations are left uncensored.

Note: The instrumental variable is generated with a tobit model for truncated variables by regressing the bribe rate on employment, profit, resale value of plant and equipment, sunk cost, and all variables accounting for contacts with government.

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