THE EFFECT OF FISCAL POLICY AND CORRUPTION CONTROL MECHANISMS ON FIRM GROWTH AND SOCIAL WELFARE: THEORY AND EVIDENCE

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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 negotiating 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 within the framework of a no-corruption equilibrium. However, when the public administration is composed of heterogeneous types of bureaucrats with the specific ability to impose red tape costs on firms, we show, like Acemoglu and Verdier (2000), that it might be best 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.

Keywords: Corruption, Tax evasion, Tax administration, Firm growth

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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; Tanzi, 2002). Corruption has even been seen as an integral part of government activities often specifically devised to extract higher bribes (Bardham, 1997; 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 of public resources to private agents, 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; Tanzi and Davoodi, 2002).

Various models have been proposed to examine the effect of bureaucratic corruption. In the context of tax collection activities, Basu, Bhattacharya and Mishra (1992) considered the effect of corruption control mechanisms such as penalties, and the probability of detection of corrupt agents within public hierarchies. Besley and McLaren (1993) studied the use of optimal remuneration schemes in reducing corruption. Based on general equilibrium models, Acemoglu and Verdier (1998, 2000) examined the appearance of corruption in government regulatory activities in the context of imperfect propriety right enforcement. They noted 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 on business activities and collect taxes. These bureaucrats are self-interested and, given their superior information, are difficult to monitor. In addition, they often possess discretionary power over firms. A bureaucrat could, for instance, choose to enforce tax rules or other regulations stringently, 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] In such situations, side payments are likely to take place between firms and bureaucrats.

We focus in this paper on one corruption control mechanism in particular, namely the detection of corrupt employees through monitoring activities. We first model a situation where bureaucrats are homogeneous and have complete negotiating 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 within the framework of a no-corruption equilibrium.

However, when the public administration is composed of heterogeneous types of bureaucrats with the specific ability to impose red tape costs on firms, we show, like Acemoglu and Verdier (2000), that it might be best 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.

Furthermore, we show that the government could be placed in a lose-lose situation where an overly high tax rate is conducive to high costs imposed on firms through bribery and overly low tax revenues. For a certain level of tax enforcement and monitoring activities, reducing tax rates could bring about a win-win situation in which net costs to firms are reduced and tax revenues increase.

Using firm-level data from the Ugandan enterprise 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 bribery activities tend to significantly reduce tax revenues and that detection mechanisms have significant effects on bribe and tax payments. We also find that a myopic government that does not take into account the actual importance of bribery activities would underestimate the negative impact of corruption on firm growth as bribe payments prove to have an even stronger negative effect on firms' growth than taxes.

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 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 within the framework of the tax collection process. The government seeks to maximize the revenues it derives from taxes levied on private firms' profits. The government has to hire bureaucrats to look at firms' profits, which are not observed directly by the government, and collect taxes based on those profits. Bureaucrats, through red tape and other discretionary behaviors, are able to impose costs on firms during the tax collection process. In order to

[1] For a discussion and examples of bureaucrats' discretionary power over the private sector,

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 in particular to reduce the occurrence of corruption within its bureaucracy, namely monitoring activities to detect corrupt bureaucrats.

The sequence of the game is as follows. In stage 1, the government announces tax rate τ, 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 profits *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 profits net of the bribe are greater than its profits net of its tax obligations and the red tape cost imposed by the bureaucrat, as in:

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

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

see for instance Tanzi (1998).

[2] In a situation where the firm can be audited by another public employee after the bribe and tax payment negotiation, we can include a fine, *A*, in our constraint without changing our main findings. In such a case, the 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 such a 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 constraint (1a) that firms will agree to bear some red tape cost before choosing to pay a bribe.

(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 the bribe amount net of 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:

(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

[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.

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*.

Keeping 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:

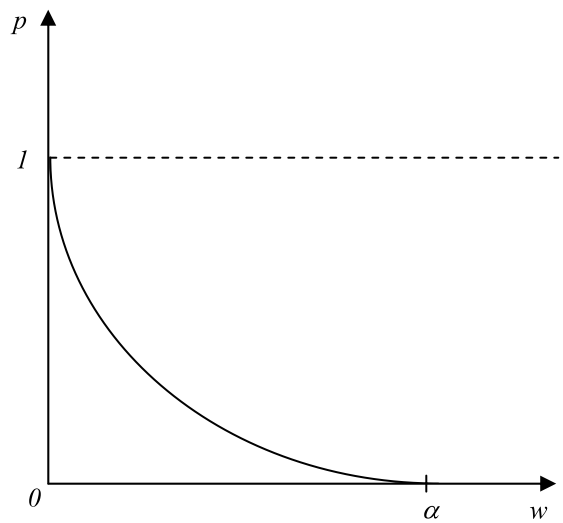
$$\frac{w(1-p) - w(-1)p}{(1-p)^2} - \alpha = 0$$

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

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

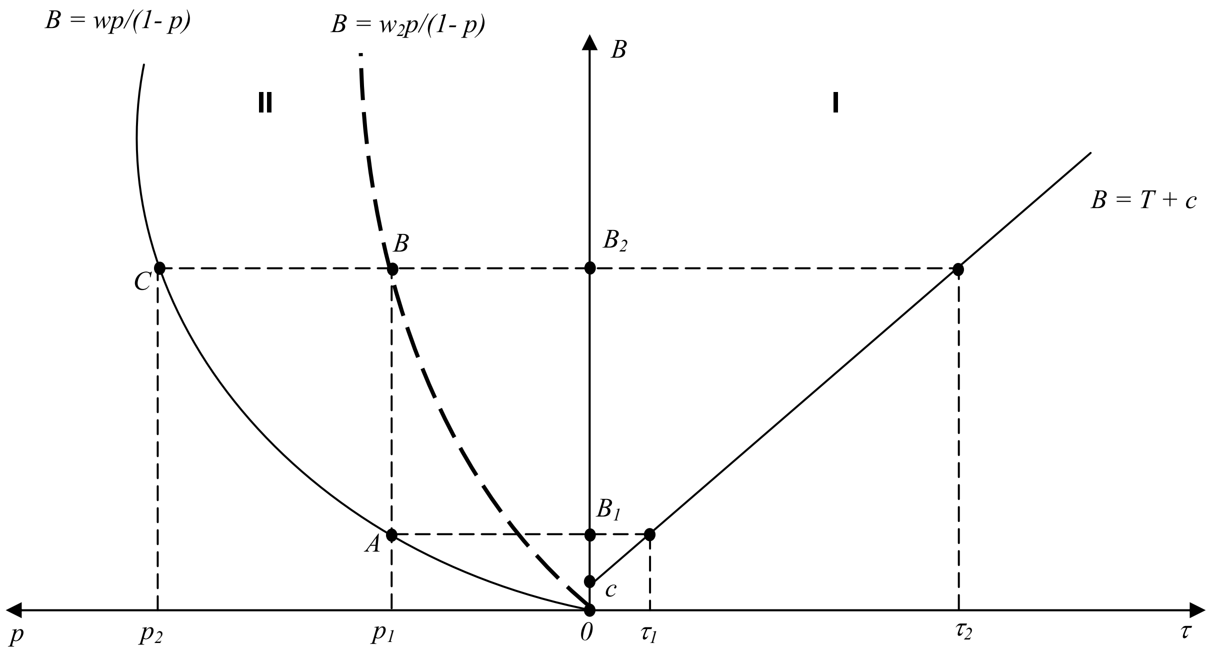
Equation (4) is represented diagrammatically in Figure 1. It shows that the optimal probability of detection decreases with an increase in public wages. Indeed, the opportunity cost of a bureaucrat losing his job if caught taking bribes increases with the wage level and/or the probability of detecting 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 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 diagrammatically the relationship between the probability of detection of corruption bureaucrat 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 to 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 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 that 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 because the increase in tax revenues sought by the government (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

Like Besley and McLaren (1993) and 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.

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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 would be true if we were to analyze the situation with incentive wages where, for example, we increased w to w_2 which would make bureaucrats' constraint $B = pw/(1-p)$ go from the origin, through point B and onwards (dotted line on Figure 2). Transfers would then be in the form of taxes and would correspond to area $0Bp_1$. Both corrections are equivalent and yield the same revenues.

Some bureaucrats, for example those in the customs agency, are in a position to impose more delays and other costly impediments on a firm's imports, or to engage in other bureaucratic activities (licences, permits, etc.). We assume that this difference in bribe-taking capacity among bureaucrats is exogenous.[6]

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. The cost that type1 bureaucrats are able to impose is therefore greater than that of type 2 (i.e. $c_1 > c_2$). Further, let us assume that the proportion of type1 bureaucrats in the administration is π_1, while that of type 2 is $(1- \pi_1)$. 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) $$\tau_1 \leq \frac{p}{(1-p)}\frac{w}{V} - \frac{c_1}{V}$$

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

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

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

[6] This difference could be endogenized without changes in the results.

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

Given equations (3a), (3b), (4a) and (4b) and that $c_1 > c_2$, then $\tau_1 < \tau_2$. That is, 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 seeking 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, then $p_1 > p_2$. 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 single 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 - π_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- π_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 can 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,

[7] $\tau_1 < \tau_2$ if, $$\frac{p}{1-p}\frac{w}{V} - \frac{c_1}{V} \langle \frac{p}{1-p}\frac{w}{V} - \frac{c_2}{V}$$
$$\Leftrightarrow \quad -c_1 \langle -c_2$$
$$\Leftrightarrow \quad c_1 \rangle c_2$$

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 equilibrium, while corruption would be observed under policy (τ_2, p_2) at equilibrium. Based on this observation, from now on 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 are lower since $p_2 < p_1$.

TABLE 1: GROSS TAX REVENUES UNDER THE NO-CORRUPTION AND 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	$T_2 (1 - \pi_1)$

Proceeding as we did for gross revenues, we compare these two fiscal regimes in terms of government *net* tax revenues (net of detection costs) to assess which regime yields higher 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

[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

the red tape costs imposed by corrupt bureaucrats and bribe amounts. To evaluate these costs, we first determine the proportion of type 1 bureaucrats, π_1^*, that will be corrupt at equilibrium. Comparing social costs and firm costs under each regime leads to the following two propositions (proof in the Appendix):

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:

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

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

PROPOSITION 2: Social costs are lower under a flexible regime with some corruption at equilibrium than under a no-corruption regime.

Proposition 2 suggests that the 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, the 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. $\tau_2 > \tau_1$).

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 the entire surplus arising from this interaction. In this section, we

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are equivalent to $T_{2} + c_2$ since $c_1 > c_2$.

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 that 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:

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

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

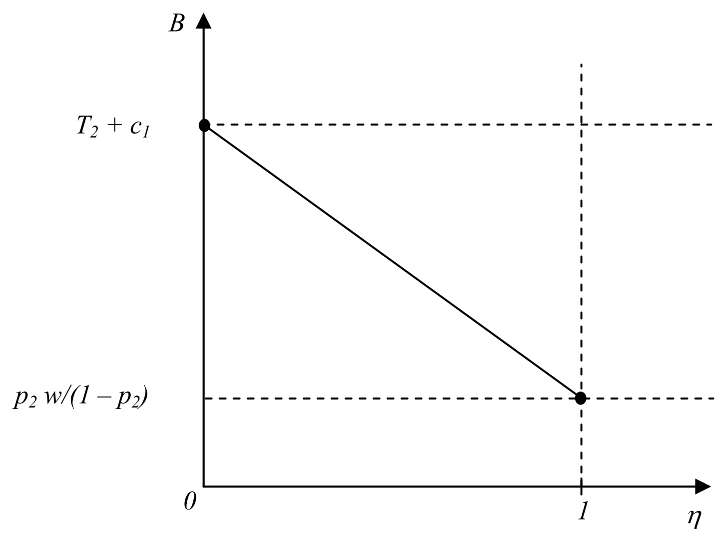
$$B \leq T_2 + c_1$$

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.[9] Using a generalized Nash solution, we obtain the following from the first-order conditions (proof in the Appendix):

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

[9] This is very similar to the maximization problem considered in part A, the only difference being that η = 0 and firms could not reduce their bribe amounts through negotiations.

FIGURE 3: BRIBE AMOUNTS VERSUS BARGAINING POWER



Equation (5) is represented diagrammatically in Figure 3. On the horizontal axis lies firm bargaining power and on the vertical axis lies 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 power increases, the amount of bribe decreases. When firms have complete negotiating 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 for some corruption at equilibrium, firms with bargaining power are able to reduce their bribe payments*.

Proof: *We can examine in diagram form 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 negotiating 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 in line with their opportunity costs. 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 negotiating power on firm costs, we see that the costs imposed on firms under the no-corruption regime (*FC_{sc}*) are:

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

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

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

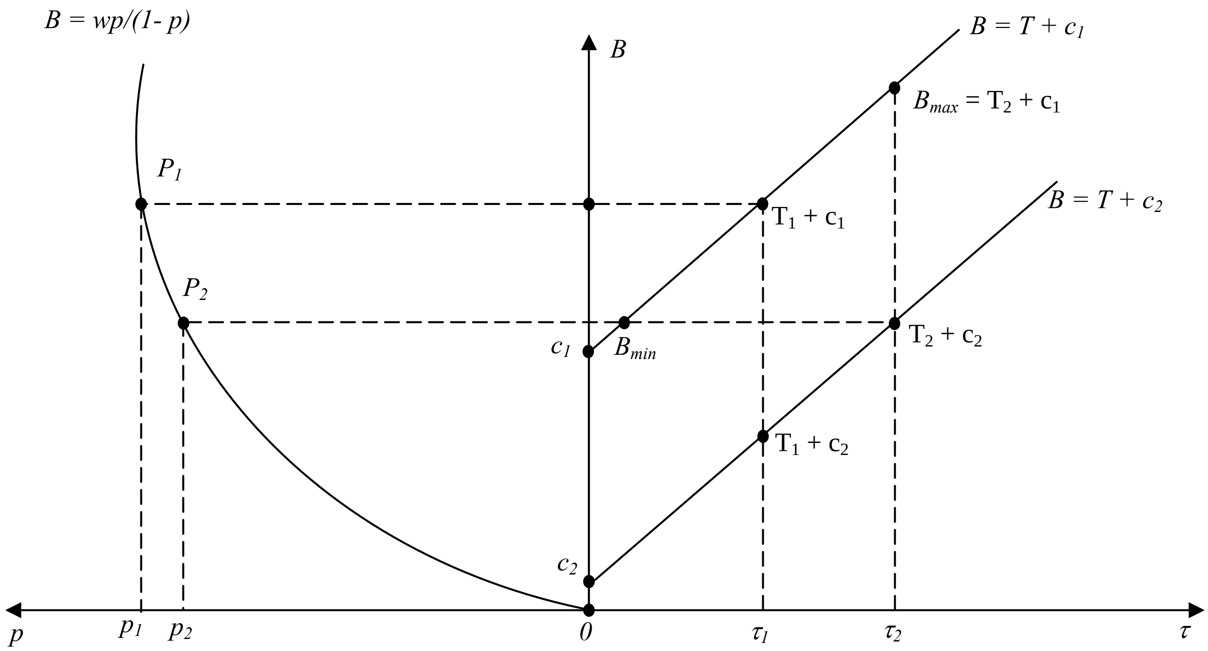
If we compare these costs, we can verify the assumption that the costs imposed on firms under a flexible regime are less than under a no-corruption regime, that is:

$$FC_{sc} \rangle FC_c$$

We can see from the comparison of the first terms of both 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 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[10] while B_{max} corresponds to the

[10] Note that B_{min} also corresponds to $p_2w/(1-p_2)$ in Figure 3.

maximum amount a firm is willing to pay[11]. 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 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. This corresponds to segment B_{min} to $T_1 + c_1$ in Figure 4 and leads to the following corollary (proof in the Appendix):

COROLLARY OF PROPOSITION 3: *Under a fiscal regime allowing for 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.*

Lose-lose versus Win-win Policy

It is often observed that governments in developing countries tend to establish very complex tax regimes, but only achieve 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 that 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 that is too high relative to its corruption detection policy and in which a very high level of corruption will be observed. In such a 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 refer to this policy regime as a *lose-lose* situation

[11] B_{max} also corresponds to T_2+c_1 in Figure 3.

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 wages 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, with firms facing a very high level of bribe payments and governments facing very low tax revenues, both will gain through a reduction in the tax rate. The first part of our next proposition establishes conditions for a lose-lose situation and the second part, conditions for a *win-win* situation.

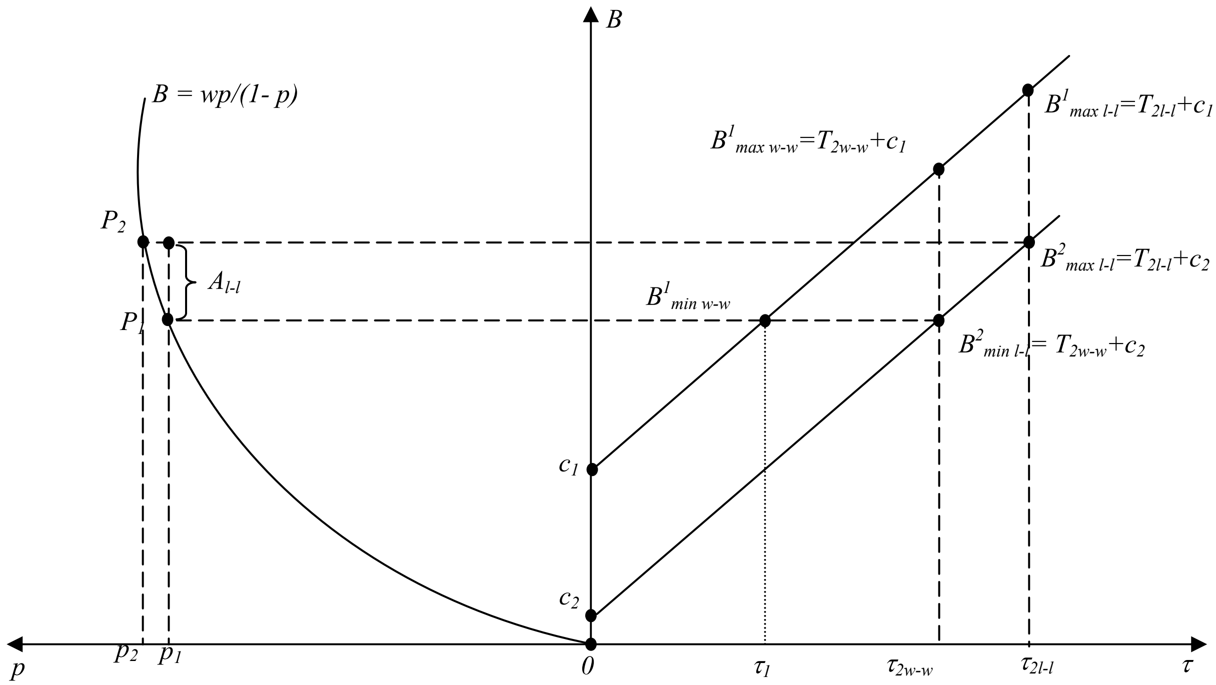
PROPOSITION 4a: *Given a fixed proportion of corrupt bureaucrats of type 1, π_1, there may be an inefficient (lose-lose) fiscal policy for which the government sets a fiscal policy (τ_{2l-l}, p_1) for which tax rate τ_2 commands a detection rate that is higher than p_1. We thus observe a situation in which both types 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, the firm bribe offer will be greater than the bureaucrat demand for bribes corresponding to their opportunity cost. Thus, the government loses all its tax revenues since both types of bureaucrats are corrupt.*

A firm with no bargaining power dealing with type 2 bureaucrats will offer a bribe up to $B^2_{max\ l\text{-}l} = T_{2\ l\text{-}l} + c_2$ while a type 2 bureaucrat dealing with a firm that has full bargaining power will accept to lower a bribe down to P_1 which is equivalent to $B^2_{min\ l\text{-}l}$. The logic is the same for a firm dealing with a type 1 bureaucrat: the firm's offer goes up to $B^1_{max\ l\text{-}l} = T_{2\ l\text{-}l} + c_1$ while bribe demand by the bureaucrat remains at P_1 which is equivalent to $B^1_{min\ l\text{-}l}$. 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* $B^1_{min\ l\text{-}l} = B^2_{min l\text{-}l} = T_{2\ w\text{-}w} + c_2$ *to bureaucrat 1 or 2.*

FIGURE 5: WIN-WIN VERSUS LOSE-LOSE SITUATION



PROPOSITION 4b: *Under a fixed proportion of corrupt type 1 bureaucrats,* π_1*, there may be an efficient (win-win) fiscal policy (*$\tau_{2w\text{-}w}$*,* p_1*) where government tax revenues increase and firm transfers decrease by reducing tax rate* τ_2*, such that the opportunity cost of the type 2 bureaucrat 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 the type 2 bureaucrat,* P_1*, matches the opportunity cost commanded by* $\tau_{2w\text{-}w}$*. The government now earns tax revenues collected by the type 2 bureaucrat, and firms dealing with* *the bureaucrat now pay 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* P_1*.*

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

In the next section, we test some of our propositions using firm-level data from Uganda.

4. Empirical Analysis

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

Our empirical investigation is divided into two parts. We first 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. We then investigate the effect of corruption and fiscal policy on firm growth.

The Data

Data are taken from the Ugandan Enterprise survey initiated by the World Bank and the Uganda Private Sector Foundation in 1998. In all, 243 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, namely Kampala, Jinja–Iganga, Mbale–Tororo, Mukono and Mbarara. The survey focused on constraints to private investments in Uganda. The data include information on investments, exports, infrastructure services, taxation, regulation, and corruption. See Reinikka and Svensson (2001) and Svensson (2003) for details.

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.[12] 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 in the general Tax Code, one of the main sources of tax exemptions is the 1991 Investment Code, which provides exemptions to large investors. The Minister of Finance also grants tax exemptions on a case-by-case basis from CIT, import duties, and domestic sales taxes. There are no specific rules or criteria for the granting of privileged status. (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 respondents 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, regulations, etc.[13]

Table 2 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.[14]

TABLE 2: BASIC BUSINESS STATISTICS (1997)

[12] Other taxes include import duties, the withholding tax, the presumptive tax on small businesses; the local property tax, etc. (see Chen and others 2001).
[13] 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).
[14] 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 > 0.25 and bribe/sales > 0.25.

Variable	Number of observations	Mean	Std Deviation	Minimum	Maximum
Age	242	13.9	12.5	1	74
Number of workers	243	124	259	0	2000
Sales	225	2 486	9 499	0.8	89100
Tax obligations	153	266	584	0	4 223
Tax	153	78	228	0	1 691
Tax/sales	153	0.058	0.063	0	0.242
Tax/worker	153	1000	3000	0	34 000
Bribe	153	7	18	0	164
Bribe/sales	153	0.014	0.025	0	0.2
Bribe/worker	153	69	126	0	909
Foreign–owned	243	24.1	39.5	0	100

Note: Age is in years in 1997. Workers include permanent and temporary workers. Sales, tax obligations, taxes and bribes are in thousands of USD. Tax/sales includes company income tax/sales, sales tax VAT/sales and NSSF/sales, and are fractions. Taxes and bribes per worker are in USD. Bribes/sales and foreign owned are fractions.

Roughly 72% of the sample firms reported paying bribes. Of these, 40% said they did so to reduce tax obligations, and 63% to accelerate services. In the tourism sector, close to 82% of businesses reported paying bribes, compared with only 39% in the agriculture sector. Average bribe amounts were US $6720. The highest average bribe amounts were observed in the agro processing sector (US $13443) and the lowest in agriculture (US $1047). In addition to the nature of government services, these differences reflect differences in firm size and ownership structure among sectors. The bribes represent 2.4% of sales value. Firms in the agro processing sector reported the highest bribe ratio with 6% of sales value, while the lowest ratio was reported in the agriculture sector (0.6%).

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 pay more, at 3.0% of sales for the 6–30 employee category.

This is three times more per unit of sales than larger firms, and 10 times more than smaller firms.

Econometric Specification

A. Monitoring Activities

We first investigate the effect of monitoring activities and firm negotiating 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), sunk cost (SUNK), the firm's use of government services (GVT), and the firm's age (AGE), sectors (SEC) and location (LOC). Simultaneously, actual tax payment (TAX) is a function of official tax obligations (TAXOBL), bribe payments (BRIBE), profit level (PROFIT), sunk cost (SUNK), monitoring activities by the tax administration (VERIF), ownership (OWN) and location (LOC). More specifically, the model can be written as a system of two equations:

$$(6)\ BRIBE = \beta_0 + \beta_1 TAXOBL + \beta_2 TAX + \beta_3 VERIF + \beta_4 SUNK + \beta_5 GVT + \beta_6 AGE + \beta_7 SEC + \beta_8 LOC + \varepsilon_1$$

$$(7)\ TAX = \delta_0 + \delta_1 TAXOBL + \delta_2\ BRIBE + \delta_4 VERIF + \delta_5 SUNK + \delta_3 PROFIT + \delta_6 OWN + \beta_7 SEC + \beta_8 LOC + \varepsilon_2$$

The bribe variable (BRIBE) is the reported bribe payments per employee. The official tax obligation variable (TAXOBL) is the amount of tax obligation per employee. Our definition of tax obligation is based on the sample firms' own declaration of tax exemptions and characteristics, and the Uganda tax code.[15] The

[15] 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. (See Gauthier and Reinikka, 2001 for further details).

tax variable (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 two tax audits by the tax administration (corporate tax and VAT) during the year. The SUNK variable is the ratio of firm replacement value and resale value of plant and equipment per employee. It denotes the importance of sunk cost for the firm and is a proxy for the firm's capital immobility. The variable profit (PROFIT) is the ratio of profits per employee. The variable (GVT) is an index which varies from one to five, accounting for a firm's use of government services (water, electricity, waste disposal, telephone and roads). The age variable (AGE) is the log of the age of the firm. TAXINDEX is an index of tax payments that accounts for which taxes a firm pays. Tables A1 and Table A2 in the Appendix present a detailed description of the variables along with 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.

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.[16]

Results

The three-stage least-squares regression results from the simultaneous estimation of equations (6) and (7) are presented in Table 3. The first column presents the estimated coefficients for bribe payments, while the second lists the estimated coefficients for tax payments.[17]

[16] The procedure iterates over the estimated disturbance covariance matrix and parameter estimates until the parameter estimates converge. Under seemingly unrelated regression, the procedure converges to the maximum likelihood estimates. For more details about the 3SLS procedure, see Greene (2003), pp. 405-407.

[17] 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, σ =

We observe that the coefficient for the official tax obligations variable in equation (6) 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, graft payments 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), suggesting that bribe payments decrease with increased monitoring. This result supports proposition 4 and is consistent with the stylized facts presented in Basu and Mishra (1992), namely that it is useful for the government to increase monitoring activities as it reduces corruption activities.

The SUNK variable accounting for firm sunk costs and a proxy of firm bargaining power has, as expected, a positive coefficient (significant at the 5 percent level). This suggest that, 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 to public officials than firms with lower sunk costs. The AGE variable shows a negative and significant coefficient, suggesting that older firms might be better established than younger ones and are thus able to reduce their bribe payments to public officials. Finally, the coefficient of the variable accounting for the use of public services (GVT) is positive (significant at the 1 percent level), indicating that graft payments increase with the use of public infrastructure and thus increased contacts with government officials.

TABLE 3: DETERMINANTS OF BRIBE AND TAX PAYMENTS
3SLS ESTIMATION

VARIABLES	SPECIFICATION (1)		SPECIFICATION (2)	
	BRIBE	TAX	BRIBE	TAX
BRIBE		–9.1327*		–10.0444**

3.651; t = -1.85, P>t: 0.067), indicating that the hypothesis of simultaneity could not be rejected.

		(–1.81)		(–2.17)
TAX	–.0077** (–1.95)		–.0073* (–1.80)	
TAX EXP	.0122*** (5.77)	.9254*** (16.03)	.0125*** (5.90)	.9436*** (15.53)
MOBILITY			4.6394** (2.32)	57.7237 (1.58)
VERIF	–39.3520** (–1.98)	–189.1819* (–0.46)	–43.8918** (–2.10)	–300.1831 (–0.70)
GVT	18.7839** (2.18)		17.8328** (2.09)	
AGE	–20.6162** (–2.22)		–28.3411*** (–2.81)	
OWN		6.5109* (1.67)		6.4611 (1.61)
PROFITS		–.2647*** (–12.64)		–.2669*** (–12.31)
SECTOR	10.8482 (1.25)	171.3445 (1.15)	14.8839 (1.61)	148.208 (0.90)
LOCATION	–7.0513 (–0.94)	89.0086 (0.68)	–5.6711 (–0.74)	122.9067 (0.93)
Constant	–64.0720 (1.05)	–513.6864 –(0.52)	61.6876 (0.98)	–508.477 (–0.52)
R^2	0.3132	0.7300	0.3460	0.7124
X^2	59.18	393.81	65.30	343.13
p-value	0.0000	0.0000	0.0000	0.0000
Number of observations	141	141	131	131

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.

The second column in Table 3 shows the determinants of tax payment. We observe that the coefficient for the official tax obligations variable in equation (7) 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) 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 fiscal 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 and more government contacts.

B. Effects of Tax and Bribery Rates on Firm Growth

We now investigate the effect of tax and corruption activities on firm 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. Following Fisman and Svensson (2002), we utilize the following basic formulation:

$$(8)\ \mathrm{GROWTH} = \beta_0 + \beta_1\ \mathrm{BRIBE} + \beta_2\ \mathrm{TAX} + \beta_3\ \mathrm{TAXOBL} + \beta_4 \mathrm{SALES}_0 + \beta_5\ \mathrm{AGE} + \beta_6 \mathrm{OWN} + \beta_7 \mathrm{TAXINDEX} + \beta_8 \mathrm{SEC} + \beta_9 \mathrm{LOC} + \varepsilon_1$$

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, TAXOBL is the amount of tax obligation per employee. SALES_0 represents initial sales, AGE is the log of the firm's age, OWN is a dummy to account for the effect of foreign ownership, and TAXINDEX is an index of tax payments that accounts for which taxes a firm pays. Tables A1 and A2 in the Appendix present a detailed description of the variables along with summary statistics.

Initial sales are introduced to control for initial firm size. Age could be linked to growth of employment, in that younger firms may tend to grow more quickly than older and more established firm. Origin of capital ownership could be linked to 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. We also control for the specific effects of location and industry, since there may be a difference in technology and demand shocks among sectors and local markets.

Our theoretical framework suggests that the process driving bribe and tax payments is a function of factors associated with contacts between firms and bureaucrats and respective negotiating power. Bribe and tax amounts in our model are therefore endogenous and are seen as determined by a negotiation process taking place between firms and bureaucrats, as examined in section 4A. Bribe and tax payments could be seen as being influenced by the degree of contacts between firms and bureaucrats and the leverage bureaucrats are able to exercise over firms. The model can then be written as a system of three equations (6), (7) and (8), as described above.

Given that the system of simultaneous equations contains endogenous variables among the explanatory variables, we use a three-stage least-squares approach (3SLS) to produce consistent estimates that account for the correlation structure in the disturbances across equations.

The simultaneous equation model will be compared to the effects of corruption of firm growth anticipated by a myopic government. Such a myopic government could be seen as simply estimating the effect of bribes and taxes on firm growth without taking into account the endogenous relationship between bribes, tax levels and growth. Comparing these estimates between a non-myopic and myopic government could be revelatory of the potential gains associated with reforms of fiscal and corruption control policies.

Results

As a starting point, the growth regression (8) is estimated using a simple OLS. The regression results for two different specifications are presented in Table 4. All regressions are run using a Huber-White correction for heteroskedasticity.

In both Table 4 specifications, we observe that the coefficients on bribe and tax ratios are not significant at a 10 percent level. This suggests that a myopic government would not be able to infer the potential negative effects of corruption activities on firm growth.

The growth regression (8) is then estimated using a 3SLS in which bribes and taxes are instrumented using equations (6) and (7). The results are presented in Table 5. The first column sets out the estimated coefficients for firm growth (Equation 8), while the second and third columns list the estimated coefficient for bribes (Equation 6) and taxes (Equation 7).

Controlling for profit rates, sector and location, we observe that the bribe and tax level coefficients in equation (8) are negative as expected and significant (at the 1 percent and 5 percent level). Furthermore, the tax obligation coefficient is positive as expected (significant at the 5 percent level), since a higher tax obligation is associated with better performing firms.

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. 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, being twice as great as that of taxes.

We also note that the coefficient for firm age is negative and significant (at the 1 percent level), indicating as expected that that growth of employment is associated with younger firms. We also note that firm growth is significantly greater among foreign-owned firms compared to domestic-owned firms. Furthermore, firms located in the capital, Kampala, tend to grow significantly more than firms located in other regions.

TABLE 4: DETERMINANTS OF FIRM GROWTH: OLS ESTIMATION

VARIABLES	SPECIFICATION (1)	SPECIFICATION (2)
BRIBE	–.00001 (–0.07)	–.00001 (–0.71)
TAX	–3.57e–06 (–0.70)	–5.98e–06 (–1.27)
TAX EXP	–1.67e–06 (–0.46)	–1.45e–06 (–0.45)
$SALES_{95}$	.0115 (1.09)	.0052 (0.49)
AGE	-.0482* (-1.72)	-.0370 (-1.45)
OWN	.0006 (0.95)	.0011 (1.57)
PAYTAX	.0255 (0.59)	.0456 (1.10)
SECTOR		-.0335** (-1.96)
LOCATION		.0542*** (3.30)
Constant	.0050 (0.04)	.0161 (0.12)
R^2	0.073	0.190
N	128	128

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: DETERMINANT OF FIRM GROWTH, BRIBE AND TAX PAYMENTS 3SLS ESTIMATION

VARIABLES	GROWTH	BRIBE	TAX
BRIBE	–.0008** (–2.03)		–8.8824*** (–2.47)
TAX	–.00002***	–.0075*	

	(–2.47)	(–1.83)	
TAX EXP	.00001*	.0129***	.9349***
	(1.84)	(5.97)	(15.53)
AGE	–.0649**	–42.8749***	
	(–2.34)	(–3.29)	
$SALES_{95}$	.0130		
	(1.12)		
OWN	.0011*		7.9389*
	(1.83)		(1.66)
TAX INDEX	.0928**		
	(2.09)		
MOBILITY		5.8220***	66.7941**
		(3.11)	(2.01)
VERIF		–48.4994**	–251.989
		(–2.31)	(–0.62)
GVT		23.1036***	
		(2.58)	
PROFITS			–.2676***
			(–12.16)
SECTOR	–.0059	17.979*	167.8878
	(–0.26)	(1.80)	(0.96)
LOCATION	.0460***	–3.0901	172.3531
	(2.61)	(–0.37)	(1.25)
Constant	–.0977	65.9116	–857.4466
	(–0.63)	(0.98)	(–0.91)
R^2	–0.0999	0.3737	0.7344
X^2	38.62	69.76	332.32
p-value	0.0000	0.0000	0.0000
Number of observations	116	116	116

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.

The estimated coefficients for the bribe equation (6) and tax equation (7) presented in the second and third columns of Table 5 are consistent with the results presented in Table 3. Firms face the trade-off of paying taxes and bribes, as increased graft payments decrease tax payments and vice-versa. In the bargaining process between firms and public officials, less mobile firms and those requiring more government services for their activities have a lower bargaining power and pay higher bribes. Ultimately, they grow more slowly.

These results support Proposition 4 that the fiscal policy of a myopic government would underestimate the negative effects of bribery on growth (as modelled by a standard OLS) and would set too low a 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.

Robustness

As a robustness check, given the truncated nature of the bribe variable, we use a Tobit model to estimate bribe payments. The model takes the form:

(6a) $$BRIBE^* = \beta_0 + \beta_1 TAXOBL + \beta_2 TAX + \beta_3 VERIF + \beta_4 SUNK + \beta_5 GVT + \beta_6 AGE + \beta_7 SEC + \beta_8 LOC + \varepsilon_1$$

(6b) $$BRIBE = \max(0, BRIBE^*)$$

where BRIBE*, the latent variable, is the ratio of reported bribes per employee and the other variables are as defined above. In the first stage, we estimate bribe rates using (6a–b) while tax rates are estimated with an OLS using (7). The results are presented in Tables 7 and 8. In the second stage, these estimates are used as instruments in the growth equation (5). As shown in Table 6, this approach yields the same qualitative results. The impact of bribes and taxes are significant and negative in the growth regression.

TABLE 6: ROBUSTNESS: DETERMINANTS OF FIRM GROWTH: OLS ESTIMATION WITH BRIBES AND TAXES AS AN INSTRUMENTAL VARIABLES

VARIABLES	SPECIFICATION
BRIBE	–.0008*

	(–1.93)
TAX	–.00003***
	(–2.63)
TAX EXP	.00001*
	(1.79)
AGE	–.0533**
	(–2.13)
$SALES_{95}$	.0139
	(1.22)
OWN	.0011
	(1.48)
TAX INDEX	.0936**
	(2.17)
SECTOR	–.0073
	(–0.38)
LOCATION	.0431***
	(2.56)
Constant	–.1416
	(–0.93)
R^2	0.2289
Number of observations	116

Note: N is the number of observations. The figures in parentheses are t-statistics. * Statistically significant at the 10 percent level, ** Statistically significant at the 5 percent level. *** Statistically significant at the 1 percent level.

TABLE 7: ROBUSTNESS: DETERMINANTS OF BRIBE PAYMENTS: TOBIT ESTIMATES – DEPENDENT VARIABLE: BRIBES PER EMPLOYEE

VARIABLES	SPECIFICATION
TAX	–.0100***
	(–2.65)
TAX EXP	.0137***
	(6.02)
AGE	–25.5472**
	(–2.06)
MOBILITY	4.7679**
	(2.11)
VERIF	–52.7652**
	(–2.19)
GVT	29.6765***
	(2.75)
SECTOR	15.7659
	(1.45)
LOCATION	–5.3237
	(–0.58)
Constant	5.2061
	(0.07)
R^2	0.0384
Number of observations	132

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.

TABLE 8: ROBUSTNESS: DETERMINANTS OF TAX PAYMENTS

VARIABLES	SPECIFICATION
BRIBE	–3.7881** (–2.33)
TAX EXP	.9153*** (4.37)
PROFIT	–.2813*** (–4.12)
MOBILITY	33.3480 (1.41)
VERIF	28.8559 (0.10)
GVT	21.7364 (0.18)
OWN	4.7537 (1.20)
SECTOR	52.5284 (0.46)
LOCATION	177.3695* (1.86)
Constant	–1133.498 (–1.25)
R^2	0.7608
Number of observations	135

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.

As a further robustness check, we also used rate of sales growth instead of employment growth to measure firm growth. We use bribe and tax amounts and control for size. Regressions yield the same qualitative results as shown in Table 8. The impact of bribes and taxes are negative and significant in the growth regression. Even so, the negative effect of bribes on growth is much greater than that of taxes.

TABLE 9: ROBUSTNESS: DETERMINANT OF FIRM GROWTH (SALES), BRIBE AND TAX PAYMENTS: 3SLS ESTIMATION

VARIABLES	GROWTH	BRIBE	TAX
UBRIBE	–.0001** (–2.03)		–7.7426** (–2.16)
UTAX	–6.43e-06*** (–2.45)	–.0581*** (–2.76)	
UTAXEXP	1.26e-06*** (3.78)	.0134*** (3.27)	.1652*** (3.99)
MOBILITY		181.5369 (0.69)	
VERIF		67.8930 (0.02)	15644.65 (0.48)
GVT		488.8299 (0.36)	
AGE	.0609 (0.65)		
OWN	.0209*** (2.82)	222.3189*** (3.17)	2959.662*** (4.93)
TAXINDEX			6662.961 (0.25)
EMPLOYMENT	–.0006 (–1.38)	1.2993 (0.15)	–37.4199 (–0.43)
$SALES_0$	.0714 (0.63)		
SECTOR	–.0634 (–0.95)	–908.6861 (–0.55)	–4857.922 (–0.29)
LOCATION	.1763** (2.12)	1173.578 (0.80)	19617.13 (1.45)
Constant	–.8341 (–0.57)	1388.386 (0.13)	–28712.58 (–0.28)
R^2	–16.1612	0.0067	–0.0624
X^2	69.39	27.36	45.01
p-value	0.0000	0.0012	0.0000
Number of observations	117	117	117

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.

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 negotiating 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, like Acemoglu and Verdier (2000), that it might be best 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. Our results are robust and indicate that bribe payments tend to significantly reduce tax payments by firms. We also show that bribery activities increase with firm immobility but that monitoring activities seem to be effective in reducing bribe payments. Also, our results indicate that a myopic government that does not take into account the actual importance of bribery activities would underestimate the negative effect of corruption on firm growth. Graft activity has a negative effect on growth at the firm level, both in terms of employment and sales. This effect is much greater than that of tax (ten times greater).

Appendix

PROOF OF PROPOSITION 1:

Net tax revenues to the government 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 yielding higher net revenues under a flexible regime than under a no-corruption regime:

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

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

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

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

Thus,

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

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

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

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

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

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

PROOF OF PROPOSITION 2:

Social costs under the no-corruption regime (SC_{sc}) are:[18]

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

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

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

Comparing these costs, we have:

$$SC_{sc} > SC_c$$

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

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

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.[19]

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

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

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

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 the 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 the 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. $\tau_2 > \tau_1$).

PROOF OF EQUATION (5)

We have:

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

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

$$B \leq T + c$$

[19] A normative analysis of social costs is also available upon request.

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

PROOF OF COROLLARY 3: DERIVATION OF CRITICAL BARGAINNING POWER η*

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

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

$$\Leftrightarrow\quad (1-\pi_1)(T_1+c_2)+\pi_1(T_1+c_1)$$
$$>(1-\pi_1)(T_2+c_2)+\pi_1\left[(1-\eta)(T_2+c_1)+\eta\left(\frac{p_2w}{(1-p_2)}\right)\right]$$

$$\Leftrightarrow\quad (1-\pi_1)(T_1-T_2)>\pi_1\left[T_2+c_1-\eta(T_2+c_1-\frac{p_2w}{(1-p_2)})-(T_1+c_1)\right]$$

$$\Leftrightarrow\quad (1-\pi_1)(T_1-T_2)+\pi_1(T_1-T_2)>-\eta\pi_1\left[T_2+c_1-\frac{p_2w}{(1-p_2)}\right]$$

$$\Leftrightarrow\quad -\eta\langle\frac{(T_1-T_2)}{\pi_1\left[T_2+c_1-\frac{p_2w}{(1-p_2)}\right]}$$

$$\Leftrightarrow\quad \eta^*=\frac{(T_2-T_1)}{\pi_1\left[T_2+c_1-\frac{p_2w}{(1-p_2)}\right]}$$

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

PROPOSITION 4C:

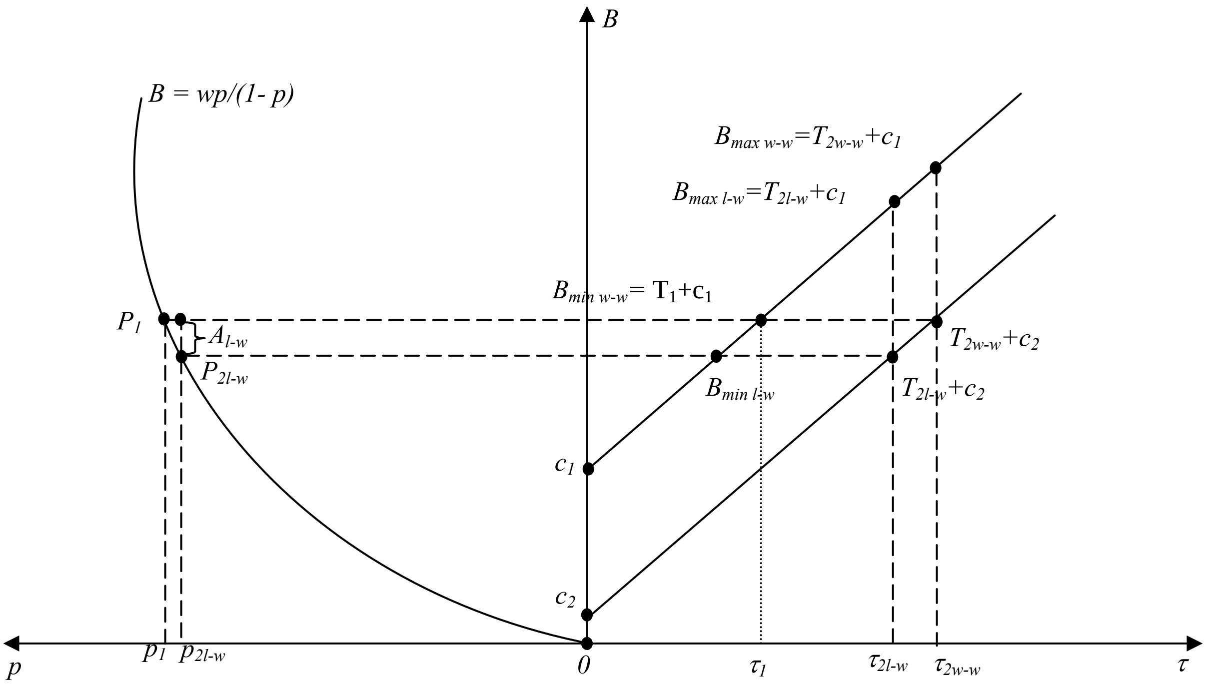
Under a fixed proportion π_1 of corrupt type 1 bureaucrats, there may be an efficient fiscal policy ($\tau_{2l\text{-}w}$, p_1) that we call lose-win where the government sees its tax revenues decrease and firms see their transfers decrease by reducing the tax rate, τ_2, in order to keep all bureaucrats 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 $P_{2\ l\text{-}w}$ in Figure (5a). The Government's tax revenues from bureaucrat 2 decline 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 type 1 bureaucrats since the lowering of the bureaucrats' opportunity cost has the effect of lowering the minimal bribe a bureaucrat is willing to accept. In Figure (5a), there is 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 type 1 bureaucrats make up for the government's losses due to the reduction of tax revenues. 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: *By comparing the effect of the flexible policy and the no-corruption policy on firm 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.*

TABLE A1: 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 1997	225	2.486	9.499
Sales 1995	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
Verification	229	1.677	0.469

Note: Means and standard errors are given in USD.

TABLE A2: VARIABLE DESCRIPTION

AGE: ln(firm's age);

BRIBE: Bribe amount divided by number of employees in 1997;

EMPLOYMENT97: Total employment in firm in1997;

EMPLOYMENT95: 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;

EXEMP: 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;

GROWTH (SALES): growth of sales calculated as follows: (ln(sales97) – ln(sales95))/2;

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

LOC: Index taking a value of 1- 5 depending on the firm's sector of activity (Kampala, Jinja–Iganga, Mbale–Tororo, Mukono or Mbarara);

OWN: Percentage of foreign ownership of the firm;

PROFIT: Profit per employees in 1997;

$SALES_{95}$: log(sales95);

SALES97: Amount of sales in 1997;

SEC: Index taking a value of 1- 5 depending on the sector of activity of the firm (commercial agriculture, agro processing, manufacturing, tourism or construction);

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

TAXINDEX: Log of (1+ Tax index);

Tax index: Index of 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 the firm pays the tax, 0 otherwise. Taxes in Uganda are import duty, import commission, withholding tax, excise tax, VAT and corporate tax;

TAX: Taxes per employees in 1997;

TAXOBL: Expected tax obligations per employees in 1997;

UBRIBE: Amounts of bribe payments in $US in 1997;

UTAX: Amount of tax payments in $US in 1997;

UTAXOBL: Amount of anticipated tax obligations in $US in 1997;

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

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