From Corruption to Lobbying and Economic Growth*

Bård Harstad† and Jakob Svensson‡

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Abstract

Why do we often observe corruption in poor countries and lobbying in rich ones, and what are the consequences? We present a simple growth model where firms can either bribe bureaucrats to "bend the rules" or lobby the government to "change the rules". While changing the rules is more permanent, the bureaucrat cannot commit not to ask for bribes also in the future. Based on this assumption, we find that firms bribe when the level of development is low, but they switch to lobbying when the level of development is sufficiently high. However, bribing leads to hold-up problems which discourage firms to invest, and the economy might get stuck in a poverty trap with bribing forever. A poverty trap is more likely if penalties on corruption and the cost of compliance are large.

Keywords: Corruption, lobbying, development, poverty trap

JEL classification: O16, O17, D72, D92

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†MEDS, Kellogg School of Management. Email: harstad@northwestern.edu

‡IIES, Stockholm University, NHH, and CEPR. Email: jakob.svensson@iies.su.se

In India, as elsewhere in the developing world, the old business of corruption is meeting a new rival: the Washington-style business of persuasion [International Herald Tribune, May 31, 2006]

1. Introduction

Lobbying and corruption have been the subject of tremendous public interest and research. Somewhat surprisingly, however, these two means of influencing the regulatory environment have either been studied separately or viewed as basically being the same thing.[1] The question why firms choose to lobby or bribe, and the consequences of this choice, remains largely unanswered. In this paper we try to shed some light on the issue.

We define lobbying, taking the form of campaign contributions or influence-buying through other means, as an activity that aims at *changing* existing rules or policies. We view bribing, on the other hand, as an attempt to *get around* existing rules or policies.

While there is little comprehensive data on the extent of corruption and lobbying across countries, a common perception is that firms in developing countries are more likely to pay bribes to get around regulatory constraints while firms in developed countries are more prone to lobby the government to change rules that adversely affect them.[2] What can account for this difference between developed and developing countries? Should we expect an evolution from bribing to lobbying, as the quotation above suggests, or can countries get trapped in a bribing equilibrium forever?

Bribing and lobbying differ in important dimensions. First, lobbying is a legal and regulated activity in many countries, while bribing is not. Second, a change in the rule brought in place through lobbying often affects everyone,[3] while the return

[1] For example Coate and Morris (1999), building on Grossman and Helpman's (1994) lobbying model, interpret lobbying as a bribe.

[2] There is a fairly close (negative) correlation between various subjective measures of corruption and income (for a review of the literature, see Svensson 2005). There is also some preliminary evidence that the extent of lobbying increases with income. Using firm data from almost 4000 firms from 25 transition countries, Campos and Giovannoni (2005) find that the share of firms belonging to a lobby group increases with GDP per capita. They also find evidence suggesting that corruption and lobbying are substitutes; i.e., firms belonging to a lobby group are significantly less likely to pay bribes.

[3] Admitedly, the notion of "special interest groups" suggest that firms may lobby for special tax breaks or for increased public spending on items that primarily benefit the lobbying firms.

to bribing is more firm-specific. Third, a government that ponders a change in the rule might have quite different concerns than a bureaucrat considering a bribe. Our model captures all these differences. However, possibly the most important difference, and the driving assumption in the model, is that the effect of lobbying is more permanent than that of bribing. Bureaucrats can seldom commit not to ask for bribes in the future since corrupt deals are not enforceable in courts and since firms deal with different officials over time. Although policies and politicians also change over time, our key assumption is that government's ability to commit is *relatively* stronger than that of an individual bureaucrat.[4]

We study a simple growth model where firms initially are subject to a regulation. For example, a licence is required to import essential inputs or the inputs are subject to a tariff. Instead of complying to the regulation, a firm can either bribe the official to "bend the rules" and be exempt from the regulation, or the firms can collectively lobby the government to change or relax the requirements. In addition, each firm decides how much to invest in capital.

In this setting, we show that firms are most likely to bribe when their level of capital is small. The equilibrium bribe, however, increases in a firm's level of capital, partly because its willingness to pay increases. At some point, the bribes are so high that the bureaucrats price themselves out of the market. Thus, there might be an evolution from bribing to lobbying. On the other hand, there is a hold-up problem between the bureaucrats and the firms because the more a firm invests, the more it has to pay in bribes. This reduces the incentives to invest, and the economy may get stuck in a poverty-trap with extensive bribing forever. The conditions for when such poverty traps arise depend on a number of parameters, generating a rich set of empirical predictions.

The analysis provide new insight for how policies affect corruption. For example, tough penalties on corruption makes the firms more likely to lobby instead of bribe, conditional on the stage of development, but they also increase the bribes a firm has to pay, and the incentives to invest are accordingly reduced. Thus, tough penalties can make the poverty trap more likely. We show that equilibrium (and optimal) penalties increase in the level of development and that these, as

This distinction is not important for our argument.

[4]Empirical support for this assumption is discussed in section 6. Intuitively, a change of the rules may be governed by time-consuming procedural rules and it may also require the commission of reports to study impact and may need to be referred for consideration at various authorities and courts. Frequent changes in for example the tariff structure may also have an impact on a country's relation to its trading partners. All these factors suggest that it is costly to change the law frequently.

well as other political parameters, depend on whether the regulation is intended to internalize externalities or rather generate revenues for the <government.

Our key predictions receive broad support from existing data on corruption and lobbying across countries and sectors. The model predicts that corruption [lobbying] should be more prevalent in poorer [richer] countries - exactly the perception mentioned above.[5] Specifically, our model predicts an inverted U-shape relationship between capital and the amount of bribes, a finding that also matches the evidence (see further Section 6). More broadly, our theory suggests that the hold-up problem is less severe if governments or bureaucrats can commit. With a coordinated bureaucracy, therefore, high growth and bribery can coexist, as some suggest is the situation in current China.

Modern research on the economics of corruption began with Rose-Ackerman (1975, 1978). Following Becker and Stigler (1974), the early literature studied corruption primarily within a principal (government) agent (public official) framework. We follow Shleifer and Vishny (1993) and take the principal-agent problem as given and instead focus on the consequences of corruption for resource allocation. We study the effects of repeated extortion, as in Choi and Thum (2004), but our focus is primarily on the firms' behavior, rather than the bureaucrats'.[6]

The literature on lobbying is reviewed by Austen-Smith (1997) and Grossman and Helpman (2002). Starting with the issue of interest group formation (Olson, 1965), the recent literature looks at how lobbying influences policy choices in an environment with competing interests. Lobbying, often taking the form of strategic provision of information or campaign contributions, can either influence policy makers' positions and actions or help preferred candidates to win elections. As argued by Grossman and Helpman (2002), the degree to which an industry can influence policy depends on the strength of its political organization and various industry characteristics. We follow this framework, although our formalization may be considered a short-cut for various types of lobbying.[7]

[5]It is also possible to view our model as a formalization of the human capital theories of institutions. The human capital theories argue that growth in human capital and income cause institutional development (Lipset, 1960; and more recently Glaeser et al., 2004). Interpreting the rule as a composite measure of property rights protection, we provide a model with exactly this prediction. As income grow, the hold-up problem becomes so severe (too much must be paid in bribes) that firm owners have strong incentives to lobby for improved protection of property rights.

[6]The literature on corruption is reviewed in Bardhan (1997) and Svensson (2005).

[7]This paper is also related to the political economy literature on policy reform and policy persistence. Fernandez and Rodrik (1991) and Alesina and Drazen (1991) argue that informa-

Given the large literature on both corruption and lobbying, it is surprising that the intersection is almost empty. Lambsdorff (2002) surveys the literature on rent seeking and argues that it, traditionally, takes corruption to be less wasteful than lobbying because bribes are pure transfers. Dal Bó *et al.* (2006) study alternative means of extortions (bribing vs. punishing), while other compare various types of lobbying: Bardhan and Mookherjee (1999) contrast lobbying to central vs. local governments, while Bennedsen and Feldmann (2006) compare campaign contributions to informational lobbying. To our knowledge, this is the first study comparing bribing and lobbying in a dynamic framework.

The paper is organized as follows. The next section presents a simple model of bribing, lobbying and growth. The model is solved in the following section. Section 3.1 solves for the bribes, Section 3.2 solves for the lobbying equilibrium, and Section 3.3 compares the two and determines when firms prefer one rather than the other. While Sections 2 and 3 take the cost of lobbying as given, Section 4 endogenizes this by introducing the government and its preferences. This also allows us to study the government's choice of policies under various commitment possibilities. Robustness and generalizations are discussed in Section 5, while Section 6 discusses the empirical predictions.

2. A Simple Model: Bribing, Lobbying and Growth

Each firm's production function is given by $f(k) = rk$, where r is a productivity parameter. To simplify, we let there be a large (infinite) number of firms, of measure one, such that k represents both the aggregate and the firm-specific capital stock.

Each firm faces some regulation which it has to overcome. If it complies with the regulation, it costs c per unit of capital. The cost of compliance, ck, is proportional to k because the regulation constrains the entire production, which

tional asymmetries between winners and losers of the reform can explain why reforms are not undertaken or are delayed. Brainard and Verdier (1997) and Coate and Morris (1999) instead stress the reaction of interest groups to the introduction of a policy. Our argument for policy persistence differ in important ways from these models. Specifically the policy in place is assumed to be costly for the firms. Thus, when firms lobby they do it to change the policy. As in Brainard and Verdier (1994) and Coate and Morris (1999), adjustment is a key variable in our analysis. However, if firms undertake less adjustment or invest too little, they may never build up a sufficiently large stock of capital to make lobbying worthwhile. The economy will then be stuck in an equilibrium with policy persistence and bribing.

is proportional to k. Thus, the rule could be interpreted as an industrial licensing requirement where either input or output are subject to administrative approval or a tariff.

Instead of complying, a firm can pay a bribe B to the bureaucrat for *bending* the rules and letting the firm proceed without complying to the regulation. The size of B is negotiated between the firm and the bureaucrat. We let the generalized Nash bargaining solution characterize the outcome of the negotiations, and the bureaucrat's relative bargaining power is β. Bribery is a crime and, by accepting the bribe, the bureaucrat faces an expected cost of $\theta x k$.[8] The expected penalty is proportional to k to reflect that either (i) the penalty is increasing in the size of the crime, or (ii) smaller firms are less frequently investigated or can hide its crime more easily. The parameter θ measures the bureaucrat's personal stigma of being penalized or, alternatively, it may capture the bureaucrat's individual probability of being investigated. The θs are uniformly distributed on $[0, 1]$ and they are *i.i.d.* across firms and time. There is no need for private information in the model, so we let θ be observed by the firm before it negotiates with the bureaucrat. Let $c < x$, such that at least some bureaucrats are too costly to bribe.

As another alternative to complying, the firms may lobby the government to *change* the rules. In contrast to the bending of the rules, changing the rules benefit all the firms. The cost of lobbying, L, captures both the firms' cost of collective action as well as the costs associated with influencing the government to reform. While we endogenize L in Section 4, we start out taking it as given. But even when the collective cost of lobbying is fixed at L, a firm's individual cost of lobbying is not fixed, since the firm-specific contributions are determined by negotiations between the firms. Again, we let the Nash bargaining solution characterize the outcome. The main difference between bribing and lobbying is, we assume, that while bending the rules has only a temporary effect, changing the rules is a more permanent action. There is no way the bureaucrat can commit to not ask for bribes again, since the firm may have to deal with a different bureaucrat the next period, and since bribing-contracts are illegal and thus not enforceable. Changing the rules, however, may be costly for the government and the rules are thus more sticky. Our argument only requires that the effect of lobbying is just slightly more permanent than the effect of bribing. To simplify, however, we assume that lobbying has a permanent effect, relaxing the rules once and for all (making $c = 0$).

In each period t, the timing is as follows. The firms collectively decide whether to lobby the government to change the rules. Since the firms are identical in

[8] The results would be similar if the firms were paying the penalty instead of the bureaucrats.

equilibrium, they all agree on whether (and when) to lobby. If the firms end up not lobbying, they proceed individually. Then, each firm observes the type of its bureaucrat and determines whether to negotiate a bribe B with him. If the negotiation breaks down or is never initiated, the firm complies. As already mentioned, the firm faces a new bureaucrat every period, such that this sequence repeats itself at each time t.

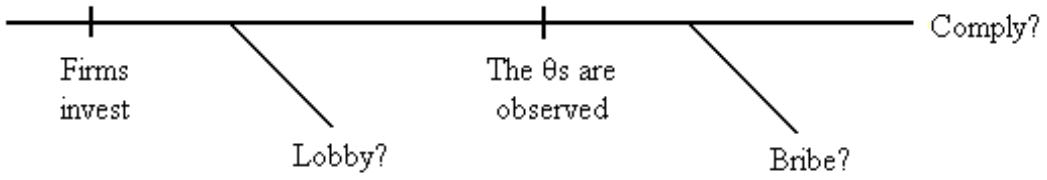

Figure 2.1: Timing of each period

Although it is convenient to refer to "period t", we let time be continuous in the model. This simplifies some of the calculations without affecting the results. The capital depreciates at the rate d, but each firm may increase its stock of capital by investing i_t at cost $zi_t^2/2$ in the beginning of each period:

$$\dot{k}_t = i_t - dk_t. \tag{2.1}$$

The parameter d may measure the fraction the government expropriates as well as the physical depreciation of capital. The discount rate, δ, captures the firms' valuation of the future and may be small in consolidated democracies but large in unstable environments. As is well known, δ can be interpreted as the sum of the pure time preference discount rate and the hazard rate for which a war or the government expropriates all the capital. The subscript t is frequently suppressed for convenience.

The model is solved in the next section. While simple, the model can be generalized in several ways. Section 4 introduces the government and endogenizes the cost of lobbying, L, and the political variables c, x and β. This generates predictions for how the policies change over time. Section 5 discusses other extensions,

such as introducing discrete time, temporary effects of lobbying, imperfect credit markets, a finite number of firms and externalities between the firms. In each case, we argue, the effects survive or are strengthened.

3. From Bribing to Lobbying

We solve the model in three steps. First, we solve for the bribes and the steady state investment levels. Second, we derive the individual cost of lobbying and the investment levels when lobbying is anticipated. Finally, we investigate when firms prefer to lobby instead of to bribe.

3.1. Bribes and Investments

Before deciding whether to comply, a firm learns the type θ of its current bureaucrat. If $ck > \theta xk$, the firm and the bureaucrat can both be better off if the firm pay a bribe $B \in (\theta xk, ck)$ to the bureaucrat in order to get around the regulation. The size of the bribe is determined by negotiations between the firm and the bureaucrat. Relying on the generalized Nash bargaining solution, where β represents the bureaucrat's bargaining power, we can determine the equilibrium bribe:

$$\max_B (B - \theta xk)^{\beta} (ck - B)^{1-\beta} \Rightarrow B = \beta ck + (1 - \beta) x\theta k. \tag{3.1}$$

The bribe increases in k for two reasons. First, a large k implies that the firm's cost of compliance is large, and it is thus willing to pay more to get around the rules. Second, the bureaucrat's cost of bending the rules is larger because it is more likely that a big firm will be investigated, or because the penalty of such a large crime is bigger. For both reasons, large firms pay more bribes. Clearly, B is also increasing in c, the cost of compliance, since a larger c reduces the firm's bargaining power and the bureaucrat can ask for accordingly higher bribes. This is particularly important if the bureaucrat's relative bargaining power is large. Thus, B increases in β as well. Finally, notice that if the penalty for corruption, x, is large, then B is large because the bureaucrat must be compensated for the large penalty he risks.

Since θ is uniformly distributed on $[0, 1]$, the probability that a firm bribes is c/x, while it complies with probability $(1 - c/x)$. This is quite intuitive: The

larger is the cost of compliance relative to the penalty of corruption, the more firms prefer to bribe instead of comply.

Proposition 1. *A fraction c/x of the firms bribe and the bribe B, given by (3.1), is increasing in k, c, x and β.*

Before learning the bureaucrat's type, a firm's current expected profit, if there is no lobbying, can be written as

$$\begin{aligned} rk - \mathrm{E}\min\{ck, B\} &= (r-b)k, \text{ where} \\ b &\equiv c\left(1-(1-\beta)c/2x\right). \end{aligned} \tag{3.2}$$

b increases in c, x and β. When a firm invests, it takes into account how investments affect profit, including the effect on the bribes. In order to solve for the equilibrium investments, consider, first, an equilibrium where bribing takes place forever. In such a steady state, each firm will at time t plan its investments in order to solve:

$$\max_{i_\tau} \int_t^\infty \left((r-b)k_\tau - \frac{z}{2}i_\tau^2\right) e^{-\delta(\tau-t)} d\tau \text{ s.t. } k_t \text{ and (2.1).} \tag{3.3}$$

Proposition 2. *In a bribing equilibrium investment i, given by (3.4), is decreasing in b and thus in c, x and β.*

$$i = \frac{r-b}{z\left(d+\delta\right)} = \frac{r - c\left(1-(1-\beta)c/2x\right)}{z\left(d+\delta\right)} \tag{3.4}$$

Proof: (3.3) is an optimal control theory problem, with the following current-value Hamilton function:

$$H = (r-b)k - \frac{z}{2}i^2 + p\left(i - dk\right),$$

where p is shadow value of capital. The first-order conditions are:

$$\begin{aligned} \dot{p} - \delta p &= -\frac{\partial H}{\partial k} = -(r-b) + dp \\ \frac{\partial H}{\partial i} &= -zi + p = 0. \end{aligned} \tag{3.5}$$

Together with (2.1), this gives two differential equations with only one stable solution, which can be found straightforwardly:

$$p = \frac{r-b}{d+\delta} \text{ and } i = \frac{p}{z}.$$

QED

The more capital the firm has, the higher the bribes will be. This discourages the firm from investing. Thus, bribing leads to a typical hold-up problem since the bureaucrat cannot commit to not ask for higher bribes in the future. Since the equilibrium size of the bribes increases in c, x and β, investments do the opposite. Naturally, powerful bureaucrats (β large) extract more bribes and this reduces incentives to invest. Harsh penalties on corruption (large x) reduces growth as well, because the bureaucrats then demand higher bribes, worsening the hold-up problem. If c increases, both the cost of compliance and the bribes are larger, and investments decrease for both reasons.

3.2. Lobbying and Investments

Having solved for the steady state investments above, it is easy to calculate a firm's present discounted value, $V(k,b)$, which depends on its current level of capital and, of course, b. If successful lobbying has taken place and the rules have been relaxed, the firm's investment decision is similar to (3.3) if just b is replaced with zero. Then, a firm's present discounted value is $V(k,0)$. Whether the firms benefit from lobbying thus depends on a consideration of $V(k,b)$, $V(k,0)$ and the cost of lobbying, L.

However, although the firms' collective cost of lobbying is fixed in this section, the cost of lobbying is not fixed for the individual firm. The firms negotiate the individual contributions under the constraint that the contributions must sum to L. If the negotiations fail, the default is to bribe or comply.[9] Since Proposition 1 states that larger firms must pay more bribes, it is more beneficial for firm j to lobby instead of to bribe if its level of capital, k_j, is large. Firm j's eagerness to lobby, however, can be exploited by the other firms which can force firm j to pay more of the costs.

[9] In the proof, we assume that the default is to continue to bribe forever if the negotiations fail. The result would be identical if the default were to lobby in the next period, instead, in a discrete time model. In continuous time, it is not obvious how to model such a situation.

Proposition 3. *Firm j's cost of lobbying is given by (3.6) and increases in k_j.*

$$L_j = \frac{b(k_j - k)}{d + \delta} + L \tag{3.6}$$

Proof: If bribing were to take place forever, the evolution of k follows from (2.1). Since i is constant, solving this differential equation gives:

$$k_\tau = \frac{i}{d}\left(1 - e^{-d(\tau - t)}\right) + k_t e^{-d(\tau - t)}. \tag{3.7}$$

The present discounted value of the firm, at time t, would be (after substituting for i):

$$V(k_t, b) = \int_t^\infty \left((r - b)k_\tau - \frac{z}{2}i^2\right) e^{-\delta(\tau - t)} d\tau = \frac{(r - b)k_t}{d + \delta} + \frac{(r - b)^2}{2z\delta\left(d + \delta\right)^2}. \tag{3.8}$$

If lobbying had taken place, however, the firm's present value would be $V(k_t, 0)$. If we let k_j represent firm j's capital level at the current time, j's benefit from lobbying is $V(k_j, 0) - V(k_j, b) - L_j$. Suppose, for a moment, that there are n firms. The Nash bargaining solution is given by

$$\max_{\{L_i\}_i} \prod_i \left(V(k_i, 0) - L_i - V(k_i, b)\right) \text{ s.t. } \textstyle\sum_i L_i/n = L \Rightarrow$$

$$\begin{aligned} V(k_j, 0) - V(k_j, b) - L_j &= \textstyle\sum_i \left(V(k_i, 0) - V(k_i, b) - L_i\right)/n \Rightarrow \\ \frac{bk_j}{d + \delta} - L_j &= \frac{b\sum_i k_i/n}{d + \delta} - L \Rightarrow L_j = \frac{b(k_j - k)}{d + \delta} + L, \end{aligned} \tag{3.9}$$

where k is the average k_i. Clearly, this holds also when $n \to \infty$. *QED*

If a firm anticipates that lobbying will take place at some time T in the future, it realizes that the more it has invested up to then, the more it will have to contribute to lobbying in equilibrium. This discourages firms to invest. Thus, lobbying generates a hold-up problem, just as with bribing. In fact, investment levels turn out to be the same at any time $t < T$, as they would be if bribing were to continue forever.[10] If lobbying has taken place, such that the rules are relaxed,

[10] The reason is that bribing is the default if the firms' negotiations break down. At the lobby stage, with the Nash bargaining solution, each firm ends up with a payoff equal to their default payoff $V(k_j, b)$ plus a fraction of the total surplus from lobbying. This fraction would be $1/n$ if there were n firms. When $n \to \infty$, therefore, firm j's payoff is simply $V(k_j, b)$, plus a constant which is independent of k_j. Thus, j invests as if it had to continue to bribe forever.

the firms approach a new steady state. Then, without hold-up problems every period, firms choose to invest more.

Proposition 4. *Suppose that, in equilibrium, lobbying replaces bribing at time T.* (i) *At any time $t < T$, each firm invests according to (3.4).* (ii) *At any time $t > T$, the investments are given by:*

$$i = \frac{r}{z\left(d+\delta\right)}.$$

Proof: (i) Anticipating lobbying at time T, a firm's problem is:

$$\max_{i_\tau} \int_t^T \left((r-b)k_\tau - \frac{z}{2}i^2\right) e^{-\delta(\tau-t)}d\tau + \left[V(k_{j|\tau=T},0) - L_j\right] e^{-\delta(T-t)} \text{ s.t. } (2.1).$$

The first-order conditions are (3.5), as before. The terminal condition, however becomes $p_T = \partial\left(V(k_{j|\tau=T},0) - L_j\right)/\partial k_{j|\tau=T} = (r-b)/\left(d+\delta\right)$ when substituting for L_j from (3.9). This is clearly satisfied when $p = zi$ and i is given by (3.4). (ii) follows from Proposition 2. *QED*

3.3. From Bribing To Lobbying

Having derived the costs of bribing and lobbying, we can compare the two to determine what the firms do. In equilibrium, all firms invest equally much and they will thus agree on when to lobby and when to bribe.

Proposition 5. *The firms prefer lobbying instead of bribing if and only if (3.10) holds, which is the case if k and b (and thus c, x and β) are large.*

$$k \geq \overline{k} \equiv \frac{\delta L}{b} - \frac{b}{2z\left(d+\delta\right)^2} \tag{3.10}$$

Proof: Investments and the evolution of k follows from (2.1). If lobbying is going to take place at time $T > t$, the firms' present value at time t is

$$\int_t^T \left((r-b)k_\tau - \frac{z}{2}i^2\right) e^{-\delta(\tau-t)}d\tau + \left[V(k_T,0) - L\right] e^{-\delta(T-t)}.$$

The derivative w.r.t. T equals zero when

$$\left((r-b)k_T - \frac{z}{2}i^2\right)e^{-\delta(T-t)} + \left[\frac{\partial V(k_T,0)}{\partial k_T}\frac{\partial k_T}{\partial T} - \frac{\partial L}{\partial T}\right]e^{-\delta(T-t)} + \left[V(k_T,0) - L\right]\left(-\delta e^{-\delta(T-t)}\right) = 0. \tag{3.11}$$

Eliminating the term $e^{-\delta(T-t)}$, substituting for i and setting $\partial k_T/\partial T = i - dk_T$ and $\partial L/\partial T = 0$, this becomes:

$$\left((r-b)k_T - \frac{z}{2}\left(\frac{r-b}{z\left(d+\delta\right)}\right)^2\right) + \left[\frac{r}{d+\delta}\left(\frac{r-b}{z\left(d+\delta\right)} - dk_T\right)\right]$$

$$-\delta\left[\frac{rk_T}{d+\delta} + \frac{r^2}{2z\delta\left(d+\delta\right)^2} - L\right] = 0 \Rightarrow \tag{3.12}$$

$$-bk_T + \frac{-(r-b)^2 + 2r(r-b) - r^2}{2z\left(d+\delta\right)^2} + \delta L = 0 \Rightarrow \tag{3.13}$$

$$bk_T + \frac{b^2}{2z\left(d+\delta\right)^2} = \delta L. \tag{3.14}$$

The second-order condition (see (3.13)) is trivially satisfied. Thus, firms prefer bribing for smaller ks and lobbying for larger ks. *QED*

If k is small, the equilibrium bribes are small and cheaper than lobbying. But as k grows, the bureaucrat continues to ask for larger and larger bribes. Since the bureaucrats cannot commit to not ask for higher bribes in the future, they eventually "price themselves out of the market". At that point, firms turn to politicians and lobby instead. For a given k, lobbying is more attractive if the bribes are large, which is the case if c, x and β are large. Moreover, since the bribes are fractions of all future profits, lobbying is more attractive if the present discounted value of future profit is large. That is the case when the cost of investments, z, the rate of capital depreciation, d, and the discount rate, δ, are all small.

Combining Proposition 4 and 5 leads to the main result of this section: While Proposition 5 says that the firms are more inclined to lobby instead of bribing when k is large, Proposition 4 states that the growth rate of k depends on whether the firms actually bribe or lobby. Thus, there may be an evolution where the firms

bribe for low k, but when time passes and k increases, the firms eventually reaches a stage where they rather lobby. However, the hold-up problem between the bureaucrat and the firm implies that investments are lower when firms bribe. If these investments are sufficiently low, the capital level never reaches the threshold $\overline{k}$ for when the firms switch from bribing to lobbying. Then, the economy is stuck in a "poverty trap": High bribes lead to low investments which, in turn, never makes it beneficial to switch from bribing to lobbying.

Proposition 6. (i) *The firms will eventually switch from bribing to lobbying if and only if (3.15) holds.* (ii) *If (3.15) holds, the time T of the switch is given by (3.16).*

$$\frac{b(r-b)}{dz\left(d+\delta\right)}+\frac{b^2}{2z\left(d+\delta\right)^2}>\delta L \tag{3.15}$$

$$\frac{b(r-b)}{dz\left(d+\delta\right)}\left(1-e^{-dT}\right)+bk_0e^{-dT}+\frac{b^2}{2z\left(d+\delta\right)^2}=\delta L \tag{3.16}$$

Proof: In order to find the time of lobbying, substitute (3.7) in (3.14) at $\tau = T$ and set $k_t = k_0$ at $t = 0$. (3.14) becomes:

$$\begin{aligned} b\frac{i}{d}\left(1-e^{-dT}\right)+bk_0e^{-dT}+\frac{b^2}{2z\left(d+\delta\right)^2} &= \delta L \Rightarrow \\ \frac{b(r-b)}{dz\left(d+\delta\right)}\left(1-e^{-dT}\right)+bk_0e^{-dT}+\frac{b^2}{2z\left(d+\delta\right)^2} &= \delta L. \end{aligned}$$

The left-hand side is increasing in T for k_0 small. For lobbying eventually to take place, it is necessary that this expression holds for some positive T, implying that the left-hand side must be larger than the right-hand side for $T \to \infty$. This requires (3.15). *QED*

The result follows from Propositions 4 and 5. Investments are larger if r is large while d, δ and z are small, and the level of development will then sooner reach the critical $\overline{k}$ where the firms switch to lobbying. Moreover, $\overline{k}$ is lower for r large and d, δ and z small, since then lobbying is more attractive for any given k. Thus, these parameters have a multiplicative effect - they affect capital accumulation directly and they make a switch from bribing to lobbying more likely. Countries where firms face low investment costs (e.g., an efficient transportation system), a low depreciation rate (e.g., a favorable physical environment), and patient investors

(e.g., due to a stable political environment) are more likely to switch from bribing to lobbying in the long run. Countries with exogenous or self-imposed constraints on capital accumulation, however, discourage investments and, as a result, may be stuck in an equilibrium with low income and continued bribing.

There is an ambiguous effect of b, and thus of c, x and β. On the one hand, a larger b makes lobbying more attractive, whatever is k. Thus, the threshold $\overline{k}$ for which the firms switch from bribing to lobbying decreases in b. On the other hand, a larger b discourages investments at all stages, making the firms less likely to reach any fixed threshold $\overline{k}$. Since (3.15) and (3.16) are inverted U-shaped in b, it is clear that a *moderate* b makes lobbying more likely. The left-hand side of (3.15) reaches its maximum at $b = \overline{b}$, where

$$\overline{b} \equiv r(d+\delta)/(d+2\delta).$$

If, for example, compliance is costly (c large) and bureaucrats powerful (β large), then $b > \overline{b}$ and an increase in x makes it less likely that the firms eventually switch to lobbying. If c and β are instead small, then $b < \overline{b}$ and increasing x makes such a switch more likely. In each case, a larger x, and thus a larger b, discourages investments. But a larger b also makes the cost of complying/bribing, bk, larger. The latter argument dominates if and only if k is large. A large k, in turn, is likely if b is small. Thus, increasing b makes lobbying more likely if b is already small, while it makes lobbying less likely if b is already large.

4. Governments and Politics

The model above compared bribing and corruption in a simple model where the cost of lobbying were fixed and the government absent. In this section, we introduce the government and its preferences. We do this to endogenize the cost of lobbying and make positive predictions for equilibrium policies. One can also, however, let the government's utility function below define the social welfare function. With that interpretation, the results below are normative statements describing optimal policies.

4.1. Governments and Lobbying

There are several reasons for why the government may care about regulation. A public interest view is that it is beneficial for the society that the firms comply

to the rules.[11] Take environmental regulation, for example. Unregulated firms or firms that do not comply may pollute and cause some externality on the rest of the society. For each unit that is not produced according to the rules, we let the negative externality be measured by the constant $e > 0$. One may say that if $e > c$, the regulation appears to be good since the benefit of compliance is larger than the cost. If $e < c$, on the other hand, the regulation appears more like "red tape" since the cost of compliance exceeds the actual benefit.

An alternative view, the public choice theory or "tollbooth view", is that regulation is in place to extract rents from the firms.[12] The bribes collected by the bureaucrat may benefit the government indirectly because, with high expected bribes, the bureaucrats' wages can be reduced accordingly. Or, the bribes may directly benefit the government if it can control the bureaucrats and thereby collect a fraction of the bribes. We let the constant $f \in (0, 1)$ represent this fraction or, more generally, the extent to which the government benefit from the collected bribes.[13]

The government may also care about the level of development, k, by itself. After all, k measures the amount of taxable output and the activity in the economy, with positive effects on both consumption and employment. To capture the concerns for development and growth, we let g measure the government's benefit of a larger k. The government's objective function can thus be written as

$$u_G = -e(c/x)k + f(c/x)c(1+\beta)k/2 + gk. \tag{4.1}$$

The first term captures the negative externality by those (c/x) firms that do not

[11] Pigou's (1938) public interest theory of regulation holds that unregulated markets exhibit frequent market failures and that a government that pursues social efficiency counters these failures and protects the public through regulation (see Djankov et al., 2002).

[12] De Soto (1989), Shleifer and Vishny (1993) and Djankov *et al.* (2002) argue that regulations are partly instituted to provide public officials the power, or the property rights, to demand and collect bribes. Evidence is provided in Wade's (1982) account of corruption in the canal irrigation department in a South Indian state. Wade describes how some irrigation engineers raise vast amounts in bribes from the distribution of water and contracts, and redistribute parts to superior officers and politicians. Corruption is institutionalized and there is even a second-hand market for posts that provide the holder an opportunity to extract bribes. The existence of entry fees for positions in the bureaucracy is documented in many developing and transition countries (see World Bank, 1998).

[13] The bureaucrats suffer from the expected penalties, θxk. But since these may be interpreted as a pure transfer from the bureaucrat to the government, we let only the bribe itself enter the government's utility function. For example, the government may collect θxk directly and the bureaucrat's utility $B - \theta xk$ indirectly (by reducing his salary). The sum of these two terms is simply B.

comply. The second term captures the benefit of the bribes. The fraction of firms that bribe is c/x and, conditional on bribing, the expected (and average) bribe is $c(1+\beta)k/2$. If the regulation has been relaxed, no bribes are paid and no firms comply. Then, the government's payoff reduces to

$$u_G = (g-e)k.$$

We normalize the government's value of lobby contributions to one, ensuring transferable utility between the government and the firms. For lobbying to be successful, the firms need to compensate the government for the losses it faces when relaxing the rules. If f is large, these losses are due to less bribes being collected. If e is large, instead, the losses come from the externality that arise without regulation. In addition, there might be some fixed cost associated with lobbying, $\underline{l}$, just as argued in the previous section.[14] To simplify, we assume that the firms make a take-it-or-leave-it offer to the government when they lobby.[15] With these modifications, the cost of lobbying is endogenous. Propositions 1-4 continue to hold, but Proposition 5 should be replaced by:

Proposition 7. *Lobbying replaces bribing if (4.2) holds.* (i) *Given k, (4.2) is more likely to hold if e and f are small while g is large.* (ii) *(4.2) is more likely to hold for large k if $h > 0$.*

$$hk \geq \delta\underline{l} + \frac{b(2(e-g)-b)}{2z\left(d+\delta\right)^2}, \text{ where} \tag{4.2}$$

$$h \equiv (1-f)(1+\beta)c^2/2x + (c-e)(1-c/x) \tag{4.3}$$

Proof: In a bribing equilibrium, the present discounted value of the government's welfare function is found by simply integrating (4.1). This gives:

$$\left[(f(1+\beta)c/2 - e)(c/x) + g\right] K(k,b), \text{ where} \tag{4.4}$$

$$K(k,b) \equiv \int_t^\infty k_\tau e^{-\delta(\tau-t)} d\tau = \frac{r-b}{zd\delta\left(d+\delta\right)} + \frac{1}{\left(d+\delta\right)}\left(k_t - \frac{r-b}{zd\left(d+\delta\right)}\right)$$

$$= \frac{r-b}{z\delta\left(d+\delta\right)^2} + \frac{k_t}{\left(d+\delta\right)}.$$

[14] As will become clear below, it is not the fixed cost $\underline{l}$ that is driving the results in this section.

[15] However, *any* allocation of bargaining power (and thus the surplus) between the firms and the government would give exactly the same results in this subsection, since whether and when to lobby is determined by maximizing the joint surplus between the firms and the government.

If the government relaxes the rules, c and b become 0, and the government's welfare simply $(g-e)\,K(k,0)$. The cost of lobbying is the difference in the government's utility, plus the fixed cost:

$$\begin{aligned} L(k) &= (f(1+\beta)c/2-e)\,(c/x)\,K(k,b)+eK(k,0)-g\,[K(k,0)-K(k,b)]+\underline{l} \\ &= \frac{\eta k}{d+\delta}+\frac{(r-b)\,[(f(1+\beta)c/2-e)c/x]+re-gb}{z\delta\,(d+\delta)^2}+\underline{l} \\ &= \frac{\eta k}{d+\delta}+\frac{(r-b)\eta+b(e-g)}{z\delta\,(d+\delta)^2}+\underline{l}, \text{ where} \qquad (4.5) \\ \eta &\equiv f(c/x)(1+\beta)c/2+e(1-c/x). \qquad (4.6) \end{aligned}$$

Unlike before, L is now a function of k. This should obviously be recognized when the firms are choosing the optimal time for lobbying. Substituting for $L(k)$ into (3.11) gives our new first-order condition:

$$\left((r-b)k_T-\frac{z}{2}i^2\right)e^{-\delta(T-t)}+\left[\frac{\partial V(k_T,0)}{\partial k_T}\frac{\partial k_T}{\partial T}-\frac{\partial L(k_T)}{\partial k_T}\frac{\partial k_T}{\partial T}\right]e^{-\delta(T-t)}$$

$$-\left[V(k_T,0)-L(k_T)\right]\delta e^{-\delta(T-t)}=0.$$

Eliminating the term $e^{-\delta(T-t)}$, substituting for investments i and setting $\partial k_T/\partial T = i-dk_T$ and $\partial L/\partial k_T = \eta/(d+\delta)$, this becomes:

$$\left((r-b)k_T-\frac{z}{2}\left(\frac{r-b}{z\,(d+\delta)}\right)^2\right)+\left[\left(\frac{r}{d+\delta}-\frac{\eta}{d+\delta}\right)\left(\frac{r-b}{z\,(d+\delta)}-dk_T\right)\right]$$

$$-\delta\left[\frac{rk_T}{d+\delta}+\frac{r^2}{2z\delta\,(d+\delta)^2}-L(k_T)\right]=0.$$

Substituting for $L(k_T)$ from (4.5) and collecting the terms give:

$$-k_T\,(b-\eta)+\frac{-(r-b)^2+r^2-2rb+2b(e-g)}{2z\,(d+\delta)^2}+\delta\underline{l}=0\Rightarrow$$

$$k_T\,(b-\eta)=\delta\underline{l}+\frac{b(2(e-g)-b)}{2z\,(d+\delta)^2}. \qquad (4.7)$$

Defining $h\equiv b-\eta$ and substituting for b and η gives Proposition 7. *QED*

Part (i) is quite intuitive. If the government benefits from compliance (e) or bribes (f), it is naturally reluctant to relax the rules that generate these benefits. In these circumstances, it is expensive to persuade the government to relax the rules, lobbying is costly and takes place only for a very large k. If g is large, however, the government cares a lot about economic growth, which is hampered by the bribes, and it then needs less compensation to change the rules.

Part (ii) states that firms lobby for large k if and only if $h > 0$. Unlike in the previous section, the cost of lobbying is a function of k. This function is increasing for two reasons: First, when k is large, so is the amount of production that ought to be regulated. Second, when k is large, so are the bribes that benefit the government. Thus, when k grows, the rules are getting more important to the government and it becomes more costly to lobby and persuade the government to relax them. Nevertheless, the firms do switch from bribing to lobbying for large k if the bribes increase faster than does the cost of lobbying. This requires $h > 0$.

Studying the definition of h reveals two reasons for why it may be positive. The tollbooth view of regulation presumes that the government is mostly interested in the bribes which the rules generate. This corresponds to the case where f is large and e small. In this case, the firms' cost of the rules is likely to increase faster than the government's revenues from the bribes. First, the government is not able to benefit from all the bribes when $f < 1$. Second, some firms actually choose to comply, and this generates another deadweight loss when $c > e$. Both these losses increase in k, making it optimal to relax the rules for k large. Thus, even in a situation where the government is a pure rent-maximizer and can collect all bribes from bureaucrats ($f = 1$, $e = 0$), the regulation is likely to be relaxed as k increases.

The public interest view of regulation presumes that $e > c$. Then, the second term of h is negative, and it is more likely that $h < 0$, such that the firms do not lobby for a change when k is large. On the other hand, not all firms comply. Some firms bribe instead and this generates a deadweight loss, particularly if f is small. Thus, even if $e > c$, it is still possible that $h > 0$ when $f < 1$. But sufficiently good rules (with a sufficiently large e) are never relaxed by lobbying. Bad rules or red tape (where $e < c$), however, are relaxed by lobbying for sufficiently large k.

Of course, it is not sufficient that $h > 0$ for lobbying to eventually replace bribing. In addition, k must reach the critical level, defined by (4.2). Thus, we can substitute for k in (4.2) to find the time of the switch from bribing to lobbying, and whether this will ever happen. This gives us the following result, replacing

Proposition 6.

Proposition 8. (i) *The firms will eventually switch from bribing to lobbying if and only if (4.8) holds.* (ii) *If (4.8) holds, the time T of the switch is given by (4.9).*

$$\frac{h(r-b)}{dz\left(d+\delta\right)} > \delta\underline{l} + \frac{b(2(e-g)-b)}{2z\left(d+\delta\right)^2} \tag{4.8}$$

$$\frac{h(r-b)}{dz\left(d+\delta\right)}\left(1-e^{-dT}\right) + hk_0e^{-dT} = \delta\underline{l} + \frac{b(2(e-g)-b)}{2z\left(d+\delta\right)^2} \tag{4.9}$$

Proof: The proof is completely analogous to that of Proposition 6, and thus omitted. *QED*

Condition (4.8) is more likely to hold if e and f are small while g is large. Rules that are valuable, whatever is the reason, are less likely to be relaxed by lobbying. One can also show that (4.8) is more likely to hold if z and d are small, while the effect of b is ambiguous, just as before.[16]

4.2. Short-term Policies

So far, we have treated the parameters c, x, and β as fixed. To some extent, however, these may be the outcome of a deliberate choice by the government. Since we have defined the government's utility function, we can easily study its optimal choice of these variables.

Setting policies in a dynamic framework brings us to the question of whether the government can commit to its choices. One extreme view is that the government is totally unable to commit, and that it sets policies in each period with no promises for what comes next. The other extreme view is that the government can perfectly well commit to policies in the future, for example by setting policies now that are protected by constitutional rules forever. We will analyze both these cases, recognizing that the reality is probably somewhere in between.

[16] The conditions for both Proposition 7 and 8 are different from those of Proposition 5 and 6, and the comparative static is also different for some of the parameters. Comparing the two cases could thus lead to interesting results. We abstain from discussing these to save space for our main results.

We start with the no-commitment case, assuming that every period t starts with the government setting its policy for that period.[17] Since investment decisions depend on the expected *future* policies, the actual policy at time t will not affect any investments. However, by changing c or x, the government affects the fraction of firms (c/x) that bribe instead of comply. As noticed in the subsection above, the government may benefit from both compliance and corruption, but these two concerns are clearly in conflict when the government can influence c/x. >From the government's utility function (4.1), we immediately find:

Proposition 9. *With short-term policies, the government prefers to set* (i) *c high if and only if f is large and e is small,* (ii) *x high if and only if e is large and f is small, and (iii) β high in any case.*

Proof: When taking the derivatives of (4.1), we can ignore the effects on i and k (since these depend on *future* policies, not current policies):

$$\begin{aligned} \frac{\partial u_G}{\partial c} &= f(1+\beta)ck/x - ek/x \\ \frac{\partial u_G}{\partial(-1/x)} &= -f(1+\beta)c^2k/2 + eck \\ \frac{\partial u_G}{\partial \beta} &= fkc^2/2x \end{aligned} \tag{4.10}$$

The derivative is taken with respect to $(-1/x)$ instead of x for convenience only (the two derivatives are obviously of the same sign). Although these derivatives do not pin down the optimal policies (the proposition refers to the sign of the derivatives), there are two alternative ways of pinning these down. Either these derivatives could be set equal to some marginal cost of adjusting these policies,[18] or the derivatives could be set equal to zero given some boundaries on $c \in [\underline{c}, \overline{c}]$, $x \in [\underline{x}, \overline{x}]$ and $\beta \in [\underline{\beta}, \overline{\beta}]$. In any case, Proposition 9 follows. *QED*

[17] Technically, we assume the government can only use Markov strategies.

[18] If κ represented U-shaped cost functions proportional to k, the first-order conditions would be:

$$\begin{aligned} f(1+\beta)c/x - e/x &= \kappa_c'(c) \\ -f(1+\beta)c^2/2 + ec &= \kappa_x'(x) \\ fkc^2/2x &= \kappa_\beta'(\beta) \end{aligned}$$

For interior solutions to exist, κ_c must be sufficiently convex and $\kappa_\beta'(\beta) > 0$.

These results are quite intuitive. According to the tollbooth view on regulation (f large), the government prefers bribing instead of compliance. By decreasing x and increasing c, more firms choose to bribe, increasing the revenues for the government. According to the public interest view (e large), the government prefers firms to comply. Then, it prefers x to be large while making c small. In either case, the government prefers to give most bargaining power to the bureaucrats (large β), because this increases the bribes without affecting anything else.

4.3. Long-term Policies and Development

Above, the government had only short-term concerns since its current policies did not affect the firms' investment decision. The investments depend instead on the expected future policies. If the firms anticipate that, in the future, c, x and β are going to be high, incentives to invest are low. Thus, the government may be better off if it somehow can commit to its future policies. The government is able to commit, indeed, if policies are costly to change and thus sticky. Suppose, therefore, that the government at time t can set its policies which thereafter will be in place forever.[19] This is in line with our assumption that lobbying induces the government to relax the rules permanently.

Taking into account the long-term consequences of its policies, the government realizes that c, x and β affect the investment levels of the firms. To the extent that the government benefits from economic growth or a higher level of development, it may want to reduce these parameters to boost the incentives to invest.

Proposition 10. *With long-term policies, the government prefers to set* (i) c, x *and* β *lower than in the short-term case, but* (ii) *higher* c, x *and* β *for large* k.

Proof: With commitment to policies, the government's intertemporal utility is

$$[f(1+\beta)c/2 - e)(c/x) + g]\, K(k,b),$$

just as if bribing were to continue forever, since this is the utility it will receive when firms can make a take-it-or-leave-it offer. The derivatives w.r.t. c, $(-1/x)$

[19] Ideally, the government would prefer time-dependent policies, but these are probably even harder to commit to, as they will hinge on future parameters that may not be verifiable.

and β becomes:

$$\begin{aligned}
&\left[f(1+\beta)c/x - e/x\right] K(k,b) + \left(\frac{u_G}{k}\right)\frac{\partial K(k,b)}{\partial c} \\
&\left[ec - f(1+\beta)c^2/2\right] K(k,b) + \left(\frac{u_G}{k}\right)\frac{\partial K(k,b)}{\partial(-1/x)} \qquad (4.11) \\
&\left[fc^2/2x\right] K(k,b) + \left(\frac{u_G}{k}\right)\frac{\partial K(k,b)}{\partial \beta}, \text{ where}
\end{aligned}$$

$$\begin{aligned}
\frac{\partial K(k,b)}{\partial c} &= \frac{-1+(1-\beta)c/x}{z\delta\left(d+\delta\right)^2} < 0 \\
\frac{\partial K(k,b)}{\partial(-1/x)} &= -\frac{(1-\beta)c^2/2}{z\delta\left(d+\delta\right)^2} < 0 \\
\frac{\partial K(k,b)}{\partial \beta} &= -\frac{c^2/2x}{z\delta\left(d+\delta\right)^2} < 0.
\end{aligned}$$

For each of the first-order conditions (4.11), the first bracket is simply the derivative in the short-term case (4.10). These are multiplied by $K(k,b)$, increasing in k. The second terms take into account the long-run effects on investment and growth, and their signs dictate the difference to the previous subsection. As we noticed there, to pin down policies, the derivatives could be equalized to marginal costs of adjusting the policies, or they could be set equal to zero given some boundaries on $c \in [\underline{c}, \overline{c}]$, $x \in [\underline{x}, \overline{x}]$ and $\beta \in [\underline{\beta}, \overline{\beta}]$. *QED*

If k is small, such that the economy is not yet developed, the dynamic effects are very important. In order to encourage growth, it is optimal with low regulation costs c, small penalties x on corruption, and less power to the bureaucrat, β, since lowering any of these parameters reduces the bribes and boosts investments. For k large, however, the dynamic effects are relatively less important than the static, or short-sighted, concerns. Then, c, x and β should be larger. Therefore, Proposition 10 suggests that as the economy is developing, the extent of regulation and the penalties on corruption should both increase.[20]

[20] Since we assume that firms have all bargaining power when lobbying, the government maximizes its welfare as if bribing were to continue forever. If the government had more bargaining power, it would pay more attention to increasing the firms' payoff from lobbying, implying somewhat larger c, x and β.

In contrast to the short-term case, where k is given, long-term policies depend on the government's value of growth, g. A larger g results in lower c, x and β, since the effects on growth are then more important.[21]

5. Robustness and Extensions

The analysis above is a first attempt of comparing corruption and lobbying and the transition from the former to the latter. Much more research needs to be done, however, as we have relied on a number of simplifying assumptions. This section discusses some of these assumptions and suggests how they might be relaxed.

5.1. Continuous vs. Discrete Time

Some assumptions are more technical of nature. For example, while we occasionally talk about "period t", time is assumed to be continuous. A discrete time model may be easier to interpret. Fortunately, all our results survive in a discrete-time version of the model. Assuming continuous time is only due to convenience, since it simplifies the analysis.

5.2. Changing the Rules Forever

The assumed difference between bribing and lobbying is extreme in that while bribing has a temporary effect, lobbying is assumed to relax the rules forever. A more general model would allow the rules to stay in place only a certain number of periods, or let the rules change back to the original form with some positive probability every period. As long as this probability were less than one, the results above would continue to hold. Once the capital level is sufficiently large, firms would lobby instead of bribe. New results would emerge, however: The more stable the rules were, the larger the investments would be, and the more likely

[21] The discussion above has presumed that $u_G > 0$, implying that the government likes economic growth, all effects taken into account. If e is very large, however, it might be that the government prefers k to be low if the benefits from income and the revenues for bribes do not compensate for the externality of all firms that do not comply. If this were the case, the government would prefer high x and β to discourage economic growth. With enough discretion over the policies, however, the government should be able to select x and β so high that, eventually, $u_G > 0$. Then, the results above continue to hold.

it would be that the firms eventually would start to lobby. It is straightforward to introduce some stability-parameter (or number of periods before the rules can change again), but we find doing so ad hoc. In a more general model the degree of instability should be related to politicians' possibilities to commit and thus the institutional details. This deserves a careful study, beyond the scope of this paper. As a first exploration, however, we find it useful to assume that the government is able to relax the rules forever.

5.3. Imperfect Credit Markets

Lobbying may require a substantial amount of resources by the firms, particularly when they compensates the government once and for all. In our analysis, this caused no problems since the firms maximized their intertemporal profit unconstrained. In reality, firms may face credit constraints making them unable to overcome the cost of lobbying. How would this change the analysis?

One way of modelling credit constraints is to let the firms borrow an amount sk, proportional to their size or production, for "free" (to an interest rate of zero), while additional loans must be repaid by the factor $R > 1$. Such a high interest rate makes lobbying less attractive, particularly when k is small and a lot of expensive borrowing is necessary. As k grows, however, the effective cost of lobbying, $L + R(L - sk)$, decreases since less money needs to be borrowed at the high interest rate. When k is sufficiently large, firms can afford to lobby. Thus, imperfect credit constraints strengthen our results since it then becomes more likely that the cost of lobbying, as a function of k, increases less than the cost of bribing.

5.4. The Number of Firms

Another simplifying assumption is to let there be an infinite number of firms. With a finite number of firms, Proposition 4 would need to be modified since the firms would invest more as they approach T, the time when they switch from bribing to lobbying (shown in an earlier version of this paper). Specifically, with n firms, each firm would receive $1/n$ of the total surplus of lobbying at time T. Approaching the time of lobbying, T, firm j's investment would increase since the long-run return of investments increases (of which firm j captures $1/n$ at time T). As n increases, however, the $1/n$-effect decreases, and so do the investments prior

to T. This implies that investments at $t < T$ is smaller if n is larger. Thus, a large number of firms makes lobbying less likely to eventually replace bribes, and if it does, it does so at a later point in time. A greater n makes lobbying less likely because of the larger hold-up problem reduces the incentives to invest, not because of any assumed "collective action" problem. If $n \to \infty$, the $1/n$ effect vanishes and investments do not increase at all when t approaches T. This simplifies the analysis and is our reason for assuming an infinite number of firms.[22]

5.5. Competition and the Market Structure

We have assumed firms to be identical and ignored the market structure; there is no competition between the firms. This allowed us to isolate the difference between a temporary bending and a more permanent changing of the rules. In reality, the market structure may also be an important aspect when firms decide whether to lobby or bribe. If, for example, the firms' capital stocks generate a negative externality on the other firms (since more output reduces the price), firms anticipate that this negative externality would be even larger if they were to lobby, since relaxing the rules would increase aggregate investments. Thus, they may prefer to continue in a bribing equilibrium simply because this limits competition between them. Hence, the bribing equilibrium may remain in place since it functions as a barrier to invest.[23] Later in the development process, however, the firms may already be large and the threat of further investments might be relatively smaller. Then, the firms find it more attractive to lobby for a permanent change of the rules, and a switch from bribing to lobbying may occur. Again, this would strengthen our results.

[22] There might be multiple equilibria when $n < \infty$ because, if the firms anticipate lobbying at T, they invest more and it is likely that lobbying actually becomes worthwhile. If lobbying is not expected, investments are low and the expectation is thus self-fulfilling.

[23] This reasoning might be particularly important if the market is open to entry. If relatively few firms have entered the market, they might rationally anticipate that many more firms would enter if they lobbied the government. Relaxing the rules permanently would intensify the competition and reduce the firms' profit. Thus, the firms currently in place may choose to not lobby, and instead bribe, just to keep potential firms out of the market.

6. Discussion

Corruption and lobbying are to some extent substitutes. Through lobbying a firm may be able to change existing rules to the firm's advantage. Through bribery a firm may get the bureaucrat to bend the rules and thus avoid the full cost of compliance. There are differences, however, and in this paper we have primarily focused on one: The effect of lobbying is more permanent than bribing. Promises by individual bureaucrats not to ask (or extort) for bribes in the future are not credible since such contracts cannot be written when corruption is illegal and because firms deal with different officials over time. While policy also changes over time, we have in mind larger structural reforms, such as a trade reform, that shift property rights from bureaucrats to firm owners. Such policy reforms are typically more permanent.[24]

The analysis has yielded a number of empirical predictions. While it is beyond the scope of this paper to thoroughly look at them all, it is worth noting that many of the predictions are consistent with existing evidence. For example, our main result is that firms prefer bribing to lobbying early in the development process but that at later stages, when firms have invested more, they are more likely to lobby the government. However, since corruption discourages investments, the economy may be trapped in a bribing equilibrium with so little investments that the firms never switch from bribing to lobbying. The steady-state prediction for the cross-country relationship between income (or capital) and corruption is thus a decomposition of countries into two groups: One with high corruption but low investment and income and another with low corruption but high investment and income. As discussed in the Introduction, this is broadly consistent with the available evidence on corruption and income. Moreover, there is some preliminary evidence, based on firm data from transition countries, that the extent of lobbying increases with income and that firms belonging to a lobby group are significantly less likely to pay bribes (Campos and Giovannoni, 2005). Campos and Giovannoni also find that in politically less stable countries, firms are more likely to bribe and less likely to join a lobby group. All these facts are consistent with our theory.[25]

[24] As an example, of the 111 countries classified as either open or closed (to trade) by Sach and Warner (1995), *no* country that had reformed and thus was classified as open in the early period (1970-1989) was classified as closed in the 1990-1999 period (Wacziarg and Welch, 2003).

[25] The analysis also highlights the role of commitment. In reality, the degree to which governments and/or bureaucrats can commit to the future differs across countries for various institutional and historical reasons. According to the model, this variation will affect firms' incentives to lobby and bribe. For example, the hold-up problem will be much less severe if the bureau-

While our model does not address why firms are regulated in the first place, it has predictions on the evolution (or liberalization) of the regulatory framework over time. Specifically, it suggests that the regulatory framework tends to be more "efficient" over time. To exemplify, consider two types of regulations: one put in place out of public interest, for example out of health or environmental concerns, and another instituted to provide bureaucrats with the power to demand bribes. Proposition 8 then states that firms are more likely to eventually, or at an earlier point in time, lobby for the removal of the "bad" regulations while the "good" regulations are less likely to be relaxed. This prediction is consistent with the regulation of trade, for example.[26]

As just illustrated, the theory has cross-sectional implications. In particular, the model suggests that an industry's size is a predictor of when and whether firms switch from bribing to lobbying. The bribes increase in the firms' capital up to the point at which they switch to lobbying. Thus, the analysis predicts an inverted U-shape relationship between capital and bribes. This prediction is consistent with evidence from Uganda, for which firm survey data are available on both measures (Svensson, 2003).[27,28]

Our analysis of policy instruments provides both normative and positive predictions. Tough penalties on corruption, for example, may not be a good thing since they lead to larger bribes and thus lower investments.[29] This is particular the case if the cost of compliance is large and in early phases of development. To the extent that poor countries regulate business more than rich countries, as

cracy is coordinated and can commit to not ask for higher bribes in the future. In this case, high growth and bribery can go hand-in-hand as some suggest is the situation in China, for example.

[26] In the period 1970-1989, 70 percent of the countries classified by Sach and Warner (1995) were closed. In the 1990-1999 period, this number has fallen to below 30 percent (Wacziarg and Welch, 2003).

[27] Results and graphs available upon request.

[28] Of course, k is endogenous in the model, so simple cross-sectional estimates of the size of an industry and the extent of bribing cannot be interpreted causally. Fortunately, our model identifies a set of variables that only affects equilibrium bribes through their effect on k; i.e., the model identifies a set of instrument variables that can be used to test this and other predictions of the model. We leave this for future work.

[29] There is plenty of anecdotal evidence supporting this mechanism. For example, Fjelstad (2003, 2006) study the impact of the reforms of the tax administrations in Tanzania and Uganda. He argues that the reforms (increased salaries for tax officials and more relaxed rules for firing) did not result in less, but if anything more corruption. He also reports evidence from a Price-WaterhouseCoopers' survey of firms in Dar es Salaam that indicates that the price per bribe rose following the reform.

suggested in Djankov et al. (2002), both these results suggest that the penalty of corruption should be lower in poor countries.

This paper is only a first attempt of comparing bribing and lobbying as alternative influence-seeking activities. Future research should explore how this choice depends on the market structure and the environment more generally. This is necessary not only to understand large cross-country variations in corruption and lobbying activities, but also to derive policies that mitigate costly rent-seeking activities.

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