

Decentralized Bribery: The Costs, The Benefits and The Taming¹

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I propose a bribery model in which bureaucratic decisionmaking is decentralized. I establish that bribe extortion is economically nonneutral, and that capital markets in corrupt economies exhibit higher returns. There are multiple stable equilibria: high levels of bribery reduce the economy's productivity due to suppression of small businesses. Competition among bureaucrats might improve the outcome, but does not necessarily decrease the total graft. The choice of corruption fighting tactics and the choice of whom to blame provide nontrivial outcomes.

Keywords: corruption, bribery, decentralization.

JEL: D73.

No man is an Iland, intire of it selfe;
every man is a peece of the Continent.

John Donne

THE RUSSIAN LANGUAGE distinguishes between two different classes of bribery: *likhoimstvo* is bribery for doing things that an official should be preventing; and *mzdoinstvo* is bribery for doing things that an official should be doing for free². Both are corruption, using public office for personal gain. An example of the first kind of bribery can be taking a bribe to overlook hazardous working conditions in a factory. An example of the second kind of bribery can be gouging the bribe by threatening to close a factory due to nonexistent violations. The first kind of bribery can be prosecuted ex-post, and it's clearly detrimental to the welfare of the economy. The second kind of bribery is simply a transfer, and is therefore perceived as innocuous. I concentrate on the second kind of bribery in this study, and I show that this "transfer bribery"³ has significant economic consequences.

THIS PAPER proposes a model of bribery that does not require the influence of centralized government⁴. Decentralized corruption is relevant when many decisions are made simultaneously by different people. Most people face corruption *everywhere*: it is never the case, for example, that the police are corrupt, but educators are not. Moreover, a corrupt policeman will eventually interact as a client with a possibly corrupt educator, who in turn will be a client of a potentially corrupt doctor. Most of the time, corrupt officials would rather pay smaller bribes themselves. But individual changes in bribe-taking behavior will not change the bribe amount that bribe-givers expect to give, and this critical issue is not captured by a single-bureaucrat

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² Prahlab Bardhan. Corruption and development: a review of issues. *Journal of Economic Literature*, 35(3):1320–1346, 1997; Toke S. Aidt. Economic analysis of corruption: a survey. *The Economic Journal*, 113(491):F632–F652, 2003; and Jakob Svensson. Eight questions about corruption. *The Journal of Economic Perspectives*, 19(3):19–42, 2005

³ Shleifer and Vishny [1993], calls this *corruption without theft*, Bliss and Di Tella [1997] calls this *surplus-shifting*, and Drugov [2010] calls this *extortion*.

⁴ The Independent. Bungs and bribes football can't kick this habit, March 15 1995. URL <http://www.independent.co.uk/news/uk/1611274.html>; The Register. Apple accused of extortion by rival tablet biz, January 11 2012. URL http://www.theregister.co.uk/2012/01/11/apple_extortion/; and The St. Petersburg Times. U.S. travel agency accuses Aeroflot of extortion, February 9 2012. URL http://www.sptimes.ru/index.php?action_id=2&story_id=35138

approach. Decentralization of decisionmaking does not solve the corruption problem: one needs *competition* of inspectors for each particular corruption opportunity to lower or remove the bribe.

There are both benefits and costs of bribery. Corruption destroys less lucrative projects, but frees up resources that can be used in other more productive projects, or abroad. Corruption serves as a redistributive mechanism: governmental officials are notoriously underpaid for the services they provide. But, most importantly, corruption destroys incentives for investment: smaller projects might not be able to feed both the investor and the bribe. In this case, small project investors do not enter the market, and inspectors expect larger projects, and react by further increase of the expected bribe. Introducing competition among inspectors can allow smaller projects to start up, but does not necessarily lower the total graft, simultaneously adding the red tape costs.

THE LITERATURE has reached an empirical consensus that corruption is detrimental to welfare, and significantly reduces both long-term growth and near-term investment. Corrupt economies are mostly closed and heavily regulated. Corruption is enforced by a lack of education, low income levels and ethnic heterogeneity, and ex-colonies are more prone to corruption⁵.

There is a vast theoretical literature. Pioneered by the rent-seeking literature of Tullock [1967] and Krueger [1974], it includes the queue model of Lui [1985], where bribes are taken for advancing customers in a queue and actually improve allocations; Alesina and Angeletos [2005] models theft from government coffers, arguing that more redistribution does not necessarily bring more equality because of corruption; Aghion et al. [2009] builds a model of endogenous regulation, arguing that societies with little social conscience invite more regulation; and many others. The closest model to mine is Bliss and Di Tella [1997]. They argue that corruption can make the economy less competitive, move to a monopoly outcome and that bureaucrats can gouge all the monopoly profits away. Svensson [2003] uses a similar model to accompany a survey from Uganda to illustrate that the size of bribe depends on a firm's prospects. He predicts that because of bribes, investment in a less profitable sector that features more liquid assets might be preferred to investment in a more profitable sector that features less investment reversibility precisely because officials require bigger bribes in the second scenario. Mauro [2004] incorporates corruption into a growth model, bringing attention to multiple equilibria as a potential cause of differences in development trajectories. In contrast to my model, his model focuses on governmental provision of a public good.

⁵ Paolo Mauro. Corruption and growth. *The Quarterly Journal of Economics*, 110 (3):681–712, 1995; Alberto Ades and Rafael Di Tella. Rents, competition, and corruption. *The American Economic Review*, 89(4):982–993, 1999; Rafael La Porta, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert W. Vishny. The quality of government. *Journal of Law, Economics, and Organization*, 15(1): 222, 1999; and Simeon Djankov, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer. The regulation of entry. *The Quarterly Journal of Economics*, 117(1):1, 2002

THE PAPER is organized as follows. First, I introduce the general model and define the equilibrium. I then look at the model's predictions: I study capital market outcomes; I study how to combat corruption with exit facilitation; I illustrate that transfer bribery might keep the economy in a bad equilibrium where small entrepreneurs do not start up their businesses. Then I study how the organization of inspection industry affects bribe-taking behavior. Finally, I discuss my model's limitations and potential extensions, and conclude.

1 The Model

Think of a story of a person who comes to a police inspector to pass a driving test. The police inspector can clearly see a bad driver, and perfectly understands the welfare costs of allowing bad drivers on the street; but denying a driver's license to a good driver does not produce a welfare externality, assuming away congestion issues. There are always obscure things, like missing a look in a rear-view mirror, that can be used to fail a candidate with a comment of "reckless driving". These things make the implicit threat of failing a candidate safe for the inspector. The question becomes: would a bribe in this situation make a difference?

AGENTS INTERACT in a single-period game. There is a continuum measure 1 of ex-ante identical agents, whose preferences are defined over a single good, which can be consumed or invested. There are two possibly overlapping subsets of agents: *investors* and *inspectors*, both of positive mass; those who do not belong to either set are *outsiders*. An agent becomes an investor with probability γ , and η is the probability that one becomes an inspector.

I postpone discussion of model variations to the conclusion.

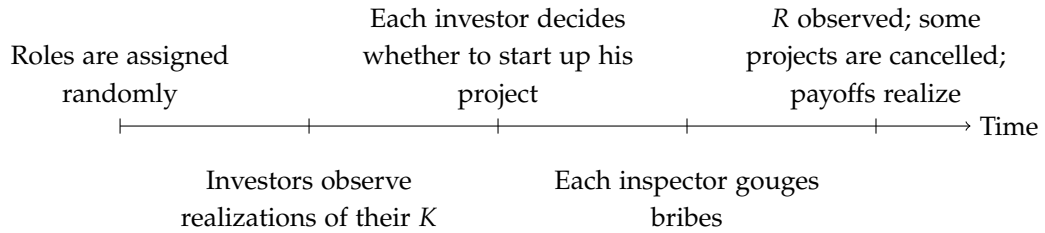


Figure 1: Timing of the game

INVESTORS draw a *project* of size K , where K is the required number of units that must be invested, from a distribution with pdf $f_K(\cdot)$ and cdf $F_K(\cdot)$. A project returns a random, idiosyncratic payoff $R \geq 0$ per unit of investment, drawn from pdf $f_R(\cdot)$ and cdf $F_R(\cdot)$ that

The heterogeneity of K could be motivated not only by technology, but also by the pledgeable income of investors.

is not observable by the investor at the time of investment, and is independent of K .

After investment, each investor is assigned a random inspector, who is supposed to approve the project, but instead attempts to gouge a *bribe*, a sum of money s , from the project's profits. If the realized project's profits after paying a bribe are too small, the project is cancelled, and the investor loses $1 - \phi$ of his investment; ϕ is the *recovery rate* of investment. Since the probability of turning up as an inspector for the investment of the agent who serves as the inspector for your own project is zero, the decision of an agent in the role of a inspector does not interact with the decision of the same agent in the role of an investor.

Each investor must decide whether to pursue his investment project. Starting a project of size K earns the expectation of

$$[RK - s \vee \phi K] - K = \left(\left[R - \frac{s}{K} \vee \phi \right] - 1 \right) K.$$

Here $a \vee b$ is an operator of $\max(a, b)$.

If the after-bribe net return is less than ϕ , the investor cancels the project. The investor cannot be liable for the project that is not lucrative enough to pay for the bribe that it faces. In other words, an investor cannot be *forced* to pay a bribe; the investor can instead choose to take everything he can and walk away.

An investor starts his project if his expected net return is positive, i.e., if

$$E\left[R - \frac{s}{K} \vee \phi\right] - 1 \geq 0. \quad (1)$$

Let \hat{s} denote the value of s such that (1) holds with equality (implicitly indexed by K). It is profitable for an investor to start a project of size K if and only if $s < \hat{s}$.

Result 1 *If participation constraint (1) is satisfied for some value of K (ϕ), it is satisfied for the same bribe size for projects with larger K (ϕ) too.*

If returns are drawn from an exponential distribution, the borderline \hat{s} is governed by

$$E\left[R - \frac{\hat{s}}{K} \vee \phi\right] = \phi + e^{-\alpha(\frac{\hat{s}}{K} + \phi)} \left(\frac{1}{\alpha} - \phi \right) \geq 1 \Rightarrow \hat{s} \leq \left(\phi + \frac{\ln \frac{1/\alpha - \phi}{1 - \phi}}{\alpha} \right) K.$$

AN INSPECTOR observes neither K nor R , so his bribe demand cannot depend on either. However, in equilibrium, each inspector knows which projects are deemed good enough for participation by investors. An inspector's problem is to choose bribe demand s to solve

$$\max_s sP(R > s/K + \phi) = s \int_0^{+\infty} (1 - F_R(s/K + \phi)) f_K(K) dK. \quad (2)$$

Inspectors informed about size K will charge bribes as a function of K ; I postpone this issue to Subsection 1.3. Most of the results are derived without uncertainty about K , and are extended where possible to cases of uncertainty and imperfect information. This is the principal difference between my model and one of Bliss and Di Tella [1997]: they use heterogeneity in fixed costs and get the result that less efficient firms exit the market. In my model, imperfect information of inspectors generates corruption that makes *small* firms less efficient after a bribe, even if they were equally efficient before a bribe.

The first-order condition is

$$\int_0^{+\infty} (1 - F_R(s/K + \phi)) f_K(K) dK = s \int_0^{+\infty} 1/K f_R(s/K + \phi) f_K(K) dK,$$

$$s^* = \frac{\int_0^{+\infty} (1 - F_R(s^*/K + \phi)) f_K(K) dK}{\int_0^{+\infty} 1/K f_R(s^*/K + \phi) f_K(K) dK} = \frac{E_K[1 - F_R(s^*/K + \phi)]}{E_K[1/K f_R(s^*/K + \phi)]}. \quad (3)$$

AN EQUILIBRIUM (pure strategy perfect Bayesian) is a collection of

- $s^* \in R_+$: the size of bribe, amount of money taken out of the project's profits if the project is pursued;
- $K^* \in R_+$: the critical level of investment such that investors with projects of size $K \geq K^*$ decide to pursue them;

such that

- s^* solves the inspector's problem (2) given rational beliefs that only projects above K^* are implemented, and
- an investor with a project of size K^* is weakly better off starting the project, and all owners of projects with $K < K^*$ in support of distribution of projects find it suboptimal to pursue the project, given rational beliefs about the bribe size s^* .

There are three classes of outcomes, depending on the investors' participation:

abundance: all projects are started;

restriction: only a subset of project sizes is started;

autarky: no projects are started.⁶

Result 2 *An equilibrium exists if the support of K is compact.*

I next study the properties of equilibria. The model is compact, yet it allows me to convey the main result: corruption can be so rampant that small projects are not viable, and only big projects can start. This only increases the bribe size, securing the separation between equilibria. Hence, even decentralized transfer bribery can harm the economy, and the harm is not limited to the less lucrative projects being cancelled due to a too small outcome of R .

When there is no uncertainty about K , Equation (3) can be rewritten as $\frac{s}{K} = \frac{1 - F_R(s/K + \phi)}{f_R(s/K + \phi)}$. Assuming the right-hand side to be decreasing (the *increasing hazard rate* assumption is satisfied by a large family of distributions) will guarantee the inspector's problem to have a unique solution. However, in Subsection 1.3 I'll give an example of distributions of K and R that produce an increasing right-hand side of Equation (3) even though the distribution of R has a nonincreasing hazard rate.

⁶ If a restriction equilibrium exists where only the best type of projects start up, then an argument similar to the intuitive criterion of [Cho and Kreps \[1987\]](#) rules out the autarky equilibrium: the bribe cannot be expected to be so big that the best possible project is not executed, because what type of projects would support these bribes?..

1.1 Inspector's Problem and Capital Markets

Consider an outcome where all investors have the same project size equal to K . The bribe size chosen by inspectors from (2) is then

$$\frac{s}{K} = \frac{1 - F_R(s/K + \phi)}{f_R(s/K + \phi)}. \quad (4)$$

Hence, the bribe is a fixed proportion of the size of capital. Assuming the decreasing hazard rate of f_R would produce a unique bribe size choice \bar{s} . Instead, I assume the existence of a positive bribe size. Then, the expected return of the investment project of size K is

$$E\pi(K) = E[RK - \bar{s} \vee \phi K] - K = K \left(\int_{\frac{\bar{s}}{K} + \phi}^{+\infty} \left(R - \frac{\bar{s}}{K} - \phi \right) dF_R + \phi - 1 \right).$$

Conditional on starting up and not cancelling a project, the return on projects in corrupt societies is higher than in less corrupt societies. Unconditionally, the return would be lower, but this would not be observable in data.

WHAT IS THE RETURN RATE TO CAPITAL? The derivative of expected profit with respect to K from the point of view of an investor who takes the bribe size as given is

$$\frac{\partial E\pi(K)}{\partial K} = \overbrace{\left(\int_{\frac{\bar{s}}{K} + \phi}^{+\infty} \left(R - \frac{\bar{s}}{K} - \phi \right) dF_R - 1 \right)}^{\text{Average return}} + K \overbrace{\frac{\bar{s}}{K^2} \left(1 - F_R \left(\frac{\bar{s}}{K} + \phi \right) \right)}^{\text{Extra chance of not cancelling}}.$$

TOBIN'S MARGINAL Q, the ratio of marginal productivity to the average productivity of capital, exceeds 1. The expected profit per unit of investment has to be nonnegative, or investors would not start their projects. Since the imposed bribe is a fixed cost, even with a linear production function, projects exhibit increasing returns to scale. This provides investors incentives to merge projects, or to attract foreign investment. Aggregating projects by some agents increases the bribe size expectations, which in turn indirectly imposes an externality on other investors, discouraging smaller investors from starting their smaller projects. Such megalomania, however, is fruitless strategically. In the current model, the bribe constitutes a fixed proportion of the project's size. The bribe size will increase if investors merge their projects⁷, resulting in no change of average productivity of a merged project. Another argument against the scale increase is that it is easier for corrupt inspectors to target a bigger project to leech a bribe from, but the strategic search by inspectors is outside of the scope of current paper.

⁷ Here I think about a hypothetical splitting of the set of investors into a continuum of non-overlapping constellations of the same finite size.

This result hinges upon the assumption of constant returns to scale, represented by independence of R and K . If real enterprises exhibit decreasing returns to scale, a similar argument will demonstrate that the Tobin's marginal Q in data can be higher than what would be in the world without corruption.

1.2 Recovery Rate Affects Bribery

THE RATE OF RECOVERY, defining when an investor decides that the bribe demand is too high and decides not to pursue the project, has a strong effect on corruption. Consider a function $H(x|\phi) = \frac{E_K[1 - F_R(x/K + \phi)]}{E_K[1/K f_R(x/K + \phi)]}$, a reformulation of (3). The bribe size demanded by inspectors will be the intersection of the 45° line with $H(x|\phi)$.

Result 3 Suppose there is no uncertainty about the project size K . Then an increase in ϕ reduces the bribe level $s = H(s|\phi)$ as long as $F_R(\cdot)$ has an increasing hazard rate.

If returns are exponentially distributed, with no uncertainty about investment size, the recovery rate has no effect on the equilibrium bribe demand.⁸ However, most common distributions feature an increasing hazard, and the result is very intuitive: a better recovery rate makes it less unattractive for the investor not to pursue a project, which causes inspectors to reduce their demands.

Result 4 Either (i) if $f'_R(\cdot) > 0$ on $(\phi, \phi + s^*/K^*)$; or (ii) $f_R(\cdot)$ is close to uniform; are sufficient to guarantee that increases in ϕ weakly reduce the bribe level.

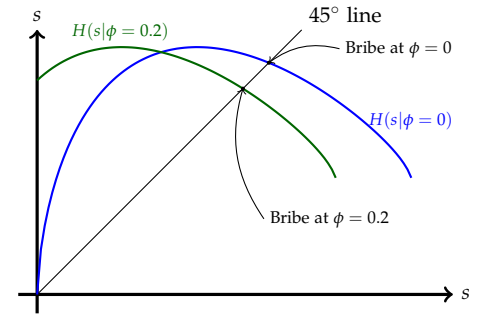
These are sufficient conditions for

$$\frac{\partial H(x|\phi)}{\partial \phi} = \left(-\frac{E_K[f_R(x/K + \phi)]}{E_K[1/K f_R(x/K + \phi)]} - H(x|\phi) \frac{E[1/K f'_R(x/K + \phi)]}{E[1/K f_R(x/K + \phi)]} \right) < 0 \quad (5)$$

to hold. Figure 2 illustrates the logic. A cleaner but significantly stricter assumption that $f'(\cdot)$ is positive on the whole support of R is clearly violated by any distribution of R with unbounded support.

BETTER RECOVERY RATES can reduce bribes because inspectors realize that investors have a better outside opportunity, and will tolerate bribes less. This can motivate corruptioneers to demand industry-specific investments from potential investors before they can apply for a permit. This also suggests that industries with better recovery rates should suffer less from corruption, especially when one endogenizes decisions by corrupt officials to choose the industry to target. For example, software development, which is easy to set up and sell

⁸ One can see that in Subsection 1.3, with the uncertainty about the project size distribution, the recovery rate change does not matter. The right-hand side of Equation (5) is exactly zero.



NOTE: f_R is Beta(0.1, 0.3), $K_H = 2$, $K_L = 1$, $K = K_L$ with probability $\lambda = 0.5$.

Figure 2: Increase in recovery rate lowers the bribe.

out, is likely to be less rife with corruption than highway construction, which features significant investment into industry-specific equipment. This seems to be a strong and intuitive recipe for fighting corruption: make investment more recoverable, possibly by focusing on industrial development with more recoverable investments. This does not mean that government should subsidize cancellations, because then less lucrative projects may start up just to get canceled.

To ease presentation, ϕ will be set to 0 for the rest of the paper.

1.3 The Squandering Virulence of Corruption

THE ENVIRONMENT that I will use for this part features heterogeneity with respect to project size and exponential returns. Let $K \in \{K_L, K_H\}$ with probabilities λ and $1 - \lambda$ correspondingly, and $R \sim \text{Exp}(\alpha)$, so that $P(R > t) = e^{-\alpha t}$. Then, if both types of projects are getting started up, the utility of the inspector as a function of the bribe amount s is

$$sP(RK > s) = s \left(\lambda e^{-\alpha \frac{s}{K_L}} + (1 - \lambda) e^{-\alpha \frac{s}{K_H}} \right). \quad (6)$$

TO SOLVE FOR EQUILIBRIUM, first consider the best response of inspectors. The first-order condition of the inspector's problem (6) is

$$s = \frac{1}{\alpha} \frac{\lambda e^{-\alpha \frac{s}{K_L}} + (1 - \lambda) e^{-\alpha \frac{s}{K_H}}}{\frac{\lambda}{K_L} e^{-\alpha \frac{s}{K_L}} + \frac{1 - \lambda}{K_H} e^{-\alpha \frac{s}{K_H}}} = \frac{K_L}{\alpha} \left(1 + \frac{\left(1 - \frac{K_L}{K_H}\right) e^{\alpha \frac{s}{K_H}}}{\frac{\lambda}{1 - \lambda} + \frac{K_L}{K_H} e^{\alpha \frac{s}{K_H}}} \right). \quad (7)$$

The right-hand side is an increasing function⁹ of s , starting from a value above $\frac{K_L}{\alpha}$ and converging to $\frac{K_H}{\alpha}$. Therefore, there is a solution.

When only K_H project size is started up, the inspector's first-order condition's right-hand side changes:

$$s = \frac{1}{\alpha} \frac{0 \times e^{-\alpha \frac{s}{K_L}} + 1 \times e^{-\alpha \frac{s}{K_H}}}{\frac{0}{K_L} e^{-\alpha \frac{s}{K_L}} + \frac{1}{K_H} e^{-\alpha \frac{s}{K_H}}} = \frac{K_H}{\alpha}. \quad (8)$$

THERE MIGHT BE MULTIPLE EQUILIBRIA under reasonable assumptions. Figure 4 shows an example of such an outcome. Both equilibria are stable: a tiny change in the fundamentals of both investors' and inspectors' problems do not make either equilibrium go away. It is obvious from Figure 4 that the abundance equilibrium needs small α to exist for every given λ . Lowering $\frac{K_H}{K_L}$ also lowers the bribe size without affecting the threshold bribe for participation constraint.

THE WELFARE COSTS OF BRIBERY are not as much in the loss of less lucrative projects, but in squandering small projects by staying in a

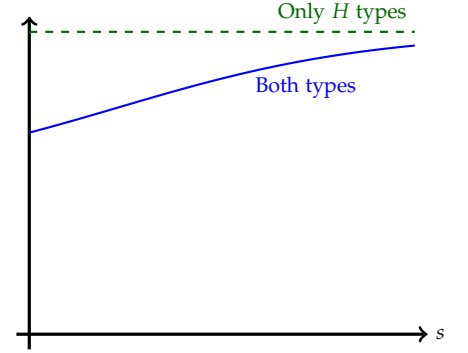
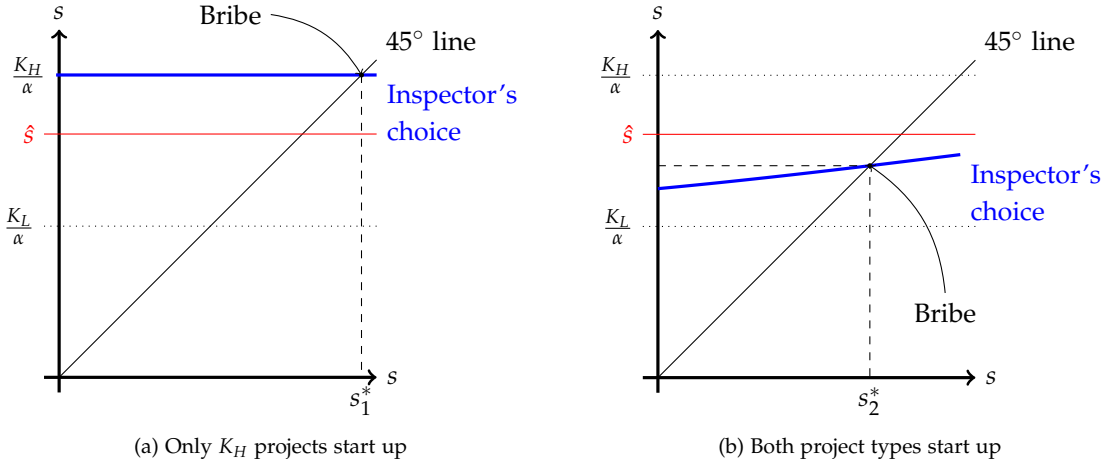


Figure 3: The right-hand side of Equation (7) (solid line) and Equation (8) (dashed line).

⁹ This is increasing because the likelihood of a continuing project to be of K_H type is increasing with the bribe size. Increasing hazard rate assumption on $f_R(\cdot)$ is no longer sufficient for the uniqueness of a solution to (7).



NOTE: $\alpha = 0.2$, $K_L = 1$, $K_H = 2$, $\lambda = 0.8$. Since $K_L = 1$, \hat{s} is the bribe that agents with type L projects can pay and be indifferent between starting up the project or not; see Equation (1). For K_H projects, $2\hat{s} > \rho \frac{K_H}{\alpha}$, so restricted equilibrium exists.

Figure 4: Multiple equilibria

restricted equilibrium. Even if temporary effort in lowering bribes cannot remove bribes completely, it can be strong enough to move the economy into an equilibrium where more projects are started up. Both inspectors and investors are interested in this outcome—large project investors start paying smaller bribes, small project investors now find bribes small enough to start their small projects, and inspectors collect bigger graft. Unfortunately, they cannot coordinate on such deviation since the bribe-taking decision is decentralized.

IF INSPECTORS HAD PERFECT INFORMATION about every project's size, this shortcoming would not be an issue, as inspectors could charge bribes proportional to the size of the project. Even imperfect information would ease the participation constraint on the small projects' investors, potentially inviting them to participate. This would not, however, destroy the restricted equilibrium. Assume that the inspector obtains a correct signal with probability q , and with probability $1 - q$ he gets an incorrect signal. In a two-state world where both types of projects start up, the inspector would update an apriori belief in probability of observing a low-type project conditional on the signal:

$$\lambda_H = \frac{(1-q)\lambda}{q(1-\lambda) + (1-q)\lambda}, \quad \lambda_L = \frac{q\lambda}{q\lambda + (1-q)(1-\lambda)}.$$

Based on λ_L and λ_H , each inspector will solve two different problems to choose the bribe size. These problems are illustrated in Figure 5. This creates two bribe levels, s_H^* and s_L^* . When $q > 1/2$, $\lambda_L < \lambda < \lambda_H$ and $s_L^* < s^* < s_H^*$, where s^* is the outcome of a model with $q = \frac{1}{2}$.

The inspector can convey his bribe expectations by citing the "violated" statute codes: a corrupt traffic officer could threaten a driver with KY plates with a speeding ticket, and a driver with NH plates with reckless driving.

Result 5 *If restricted equilibrium exists, for large enough q the abundance equilibrium exists.*

This does not remove the existence of the restricted equilibrium. Even if the q is big enough, so that the abundance equilibrium exists, a belief that small businesses do not start up will lead inspectors to disregard their signals. Even if investors could coöperate and start up a positive mass of small projects to manifest their collective potential, the decentralization of decisionmaking would neither allow individual inspectors to comprehend the organized deviation nor to attempt lowering the bribe to attract small businesses. Unless $q = 1$, the problem of squandering small projects persists.

2 Bribery and Punishment

ANTI-CORRUPTION EFFORT is taken worldwide in order to suppress the rent-seeking behavior. Lowering bribes even temporarily can let the economy to move from a worse equilibrium to a better one. However, economies often have different responses to the same treatment. How do punishments affect the incentives of the agents in this model?

2.1 Multiple Inspectors

HAVING TO PASS JUST ONE INSPECTOR is a simplification. This subsection studies the change in equilibrium in case investors face multiple inspectors. Obviously, when inspectors can conspire, they behave as in the case of a single inspector.

WHEN APPROVALS OF TWO INSPECTORS ARE NECESSARY for the investor to harvest returns, this will bring more project cancellations into the economy. Since inspectors cannot conspire, each inspector will have less effect on a change in probability of soliciting a bribe by changing his own bribe size, hence the total graft will grow.

Result 6 *When the solution to (3) is unique, increasing the number of inspectors per project weakly increases the graft.*

WHEN ONE INSPECTOR OUT OF MANY IS SUFFICIENT for the project to continue, and investor can appeal the decision of a previous inspector, the outcome becomes more interesting. Each investor has a sequence of inspectors, assigned independently and anonymously ex-ante, and the negative decision of each inspector can be overruled

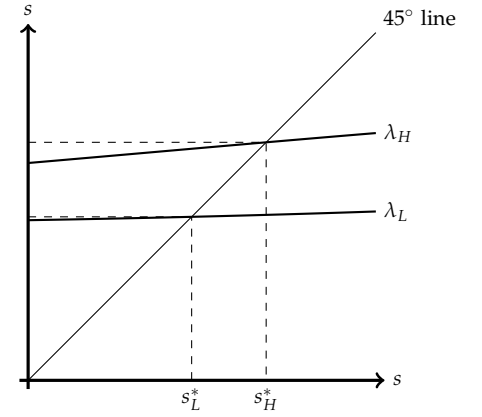
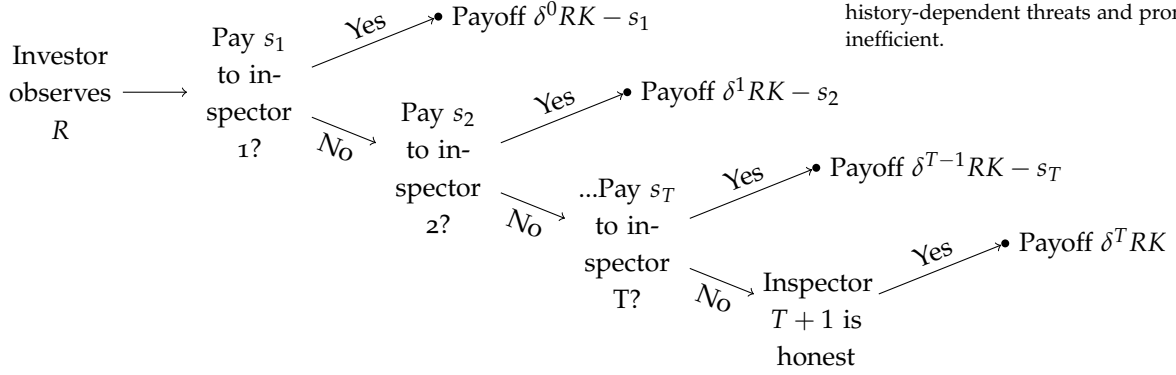


Figure 5: Two bribe levels.

This part mirrors the findings of [Shleifer and Vishny \[1993\]](#).

Similar findings are reported in [Arbatskaya \[2007\]](#) and [Janssen and Roy \[2002\]](#). [Drugov \[2010\]](#) argues that competition in bureaucracy might induce more investment in avoiding externalities; this is not a problem here, but this is a valuable argument for a mechanism design problem of convincing investors to choose better projects. Subsection 2.2 considers this problem while answering why do we need to keep inspectors around.

by the next one. There is always an honest inspector at step $T + 1$, honest inspector never takes bribes. The investor makes a decision of whether to pay a bribe or to go to a next inspector for an appeal, and he has a rational belief that these inspectors will expect depending on how long the investor kept appealing¹⁰. Each change of an inspector will shrink the return by a factor $\delta < 1$ due to accomodating to unreasonable demands of the previous inspector. The timing is summarized in Figure 6.



¹⁰ I think here about a person who tries again and again to pass the driving test. Inspectors from the traffic authorities know the quantity of previous trials, but do not know which inspector will be approached next, and the quantity of inspectors is big enough to make history-dependent threats and promises inefficient.

The belief in a sequence of $\langle s_t \rangle_{t=1}^T$ constitutes a part of equilibrium definition now, and it should coincide with true choices of inspectors $\langle s_t^* \rangle_{t=1}^T$ to be rational. When $s_{t+1} > s_t$ for every $t > 1$, there is no reason to go to the second inspector, and the previous results apply. When $s_{t+1} < s_t$, the problem of an inspector who is approached on the step t is

$$\max_s sP(RK - s > \max(0, \delta RK - s_{t+1})).$$

Since there is an honest inspector, the investor will earn at least $\delta^T RK$, so zero does not matter.

$$s_t = \arg \max_s sP\left(R > \frac{s - s_{t+1}}{(1 - \delta)K}\right).$$

Obviously, picking $s_t < s_{t+1}$ is a waste of opportunity: all investors would agree to a bribe lower than what the next inspector demands. Therefore, in optimum $s_t > s_{t+1}$ for every t . The first-order condition is then

$$\frac{s_t^*}{(1 - \delta)} = \frac{\int_0^{+\infty} \left(1 - F_R\left(\frac{s_t^* - s_{t+1}^*}{(1 - \delta)K}\right)\right) f_K(K) dK}{\int_0^{+\infty} 1/K f_R\left(\frac{s_t^* - s_{t+1}^*}{(1 - \delta)K}\right) f_K(K) dK} = \frac{P\left(R > \frac{s_t^* - s_{t+1}^*}{(1 - \delta)K}\right)}{E[1/K f_R\left(\frac{s_t^* - s_{t+1}^*}{(1 - \delta)K}\right)]}. \quad (9)$$

Figure 6: Timing of the Bargain for the Bribe

I will use s^* to denote the bribe size in the baseline model, and I will assume the increasing hazard rate in this part of the subsection.

This should not be interpreted as “superior corrupt bureaucrats make less money in bribes than their corrupt underlings”. It means that a superior will take a smaller bribe for the same job. This is a no-persecution scenario; with an active anti-corruption effort, superiors have more to lose, and therefore might be motivated to bribe even smaller (possibly zero!) amounts. This can be the story behind the assumption of existence of honest inspectors.

When there is no uncertainty about K , the first-order condition can be rewritten as

$$\frac{s_t^*}{(1-\delta)K} = \frac{1 - F_R\left(\frac{s_t^* - s_{t+1}^*}{(1-\delta)K}\right)}{f_R\left(\frac{s_t^* - s_{t+1}^*}{(1-\delta)K}\right)} \equiv H_R\left(\frac{s_t^* - s_{t+1}^*}{(1-\delta)K}\right). \quad (10)$$

If the second inspector is honest, $s_2^* = 0$, then $s_1 \leq s^*$, with equality when $\delta = 0$. Competition among inspectors can lower bribes, and potentially might make the participation constraint for investors slacker. This result does not depend on not having uncertainty about K , but it has an implicit assumption that the participation decision by investors does not change. Since the bribe is lower, allowing for participation decision to change will replace the equality sign with \leq sign.

If $s_2^* > 0$ and δ is close enough to zero, $s_1^* > s^*$. The ability to screen investors, albeit imperfectly, allows inspectors to gouge bigger bribes from more lucrative projects. This effect might be big enough to actually increase the total graft.

To solve for the bribery outcomes, observe first that investors are self-selecting into groups based on R . If an investor with $R = \bar{R}$ for some \bar{R} decides to pay the bribe at period t , all investors with $R > \bar{R}$ too decide to pay the bribe before period $t + 1$.

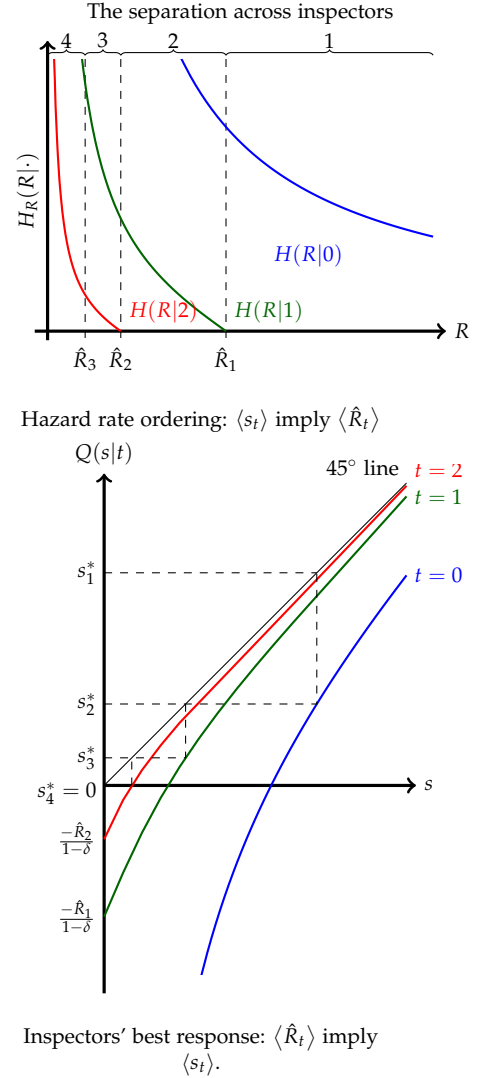
LESS LUCRATIVE PROJECTS END UP IN A CHAIN OF APPEALS and changes of the inspectors. Lucrative projects find it more costly to appeal. The estimates of corruption based on reports of those who complain about losses due to red tape are likely to underestimate the true losses, and the bribes the complainers report are likely to be smaller than what compliant agents pay. Denote the return of a project whose investor is indifferent between paying the bribe at period t and appealing to the next inspector by \hat{R}_t ; investors with $R \leq \hat{R}_t$ projects complain. Therefore, the distribution of R gets *worse* with every iteration in a hazard rate stochastic dominance sense, *lowering* $H_R(\cdot)$. Denote the hazard rate of the distribution that the t -period inspector faces by $H_R(\cdot|t)$.

Let $K = 1$ for brevity. Rewrite equation (10) to get

$$s_{t+1}^* = s_t^* - (1-\delta)H_R^{-1}\left(\frac{s_t^*}{1-\delta} \middle| t\right) \equiv Q(s_t^*|t). \quad (11)$$

Since $H_R(\cdot|t)$ is decreasing, the right-hand side of the previous equation is increasing. Since the hazard rate is positive, the right-hand side is less than zero in the neighborhood of $s_t^* = 0$.

This system of equations, combined with $s_{T+1}^* = 0$, can be solved as shown on Figure 7.



NOTE: $F_R(x) = 1 - \exp(-(0.4x)^2)$, $\delta = 0.5$. $\hat{R}_1 = 1.3885$, $\hat{R}_2 = 0.5697$; these are equilibrium in a game where the fourth inspector is honest.

Figure 7: Solving (11).

SOCIAL WELFARE can be affected via two channels. First and foremost, some agents suffer the red tape costs δR . These agents tolerate the red tape costs precisely because these costs are small. This opportunity however allows inspectors to price discriminate investors, potentially extracting bigger total amount of bribes by “taxing” highly productive entrepreneurs more. The total output might simultaneously grow due to lower bribes on less productive firms, hence bigger participation of less lucrative enterprises. When switching from the world of the baseline model to the world of an opportunity to switch your inspector, one will see more projects starting up, positive usage of the opportunity to switch, less reports of shutting down projects due to bribe and more reports of exposure to bribes per capita; but it is hard to predict whether the total graft will increase or decrease. The amount of surplus left for investors might either increase due to more projects starting up and potentially lower bribes, or decrease due to potentially bigger bribes and price discrimination by corrupt officials.

2.2 Why Have Inspectors?

I assume inspectors are kept in the economy to prevent harmful projects from happening. In order to obtain the independence of findings of the paper from the interactions of bribe-taking inspectors with harmful projects, I need to show that there is an equilibrium in a metagame, where investors choose not to participate in bad projects. In other words, I design a punishment mechanism that makes the choice of the project type efficient.

Consider a modification of the original setup where investors can choose between executing a *good project* of size $K = 1$ with return R , or a *bad project* of the same size with return $(1 + \theta)R$ and a negative externality of $-k\theta R$ imposed on all other agents in the economy. I assume $k > 1$, so that maximization of the total output calls for starting up good projects instead of bad ones. Since projects are infinitesimal, the effect of unleashing a marginal bad project on the welfare of individual inspector’s utility is negligible. Inspectors can see the nature of the project perfectly¹¹.

Cadot [1987], Acemoglu and Verdier [2000], Drugov [2010] make similar arguments in similar frameworks.

WHEN ONLY THE INSPECTOR IS PUNISHED, one can imagine a detection and punishment technology that takes away the collected bribe s with probability $G(s/s^*)$, where s^* is the average bribe in the economy. What $G(\cdot)$ can ensure an equilibrium where only good projects are started up? The inspector’s problem is therefore twofold: one bribe level for good projects, another bribe level for bad ones.

¹¹ Imperfect observability obtains similar results.

$$s_g^* = \arg \max_s (1 - F_R(s))(1 - G(s/\bar{s}^*))s = \frac{1}{\frac{f_R(s_g^*)}{1 - F_R(s_g^*)} + \frac{g(s_g^*/\bar{s}^*)^{1/\bar{s}^*}}{1 - G(s_g^*/\bar{s}^*)}}. \quad (12)$$

$$s_b^* = \arg \max_s (1 - F_R(s/(1 + \theta)))(1 - G(s/\bar{s}^*))s = (1 + \theta) \frac{1}{\frac{f_R(s_b^*/(1 + \theta))}{1 - F_R(s_b^*/(1 + \theta))} + (1 + \theta) \frac{g(s_b^*/\bar{s}^*)^{1/\bar{s}^*}}{1 - G(s_b^*/\bar{s}^*)}}. \quad (13)$$

I assume that the right-hand sides of Equations (12) and (13) have a unique intersection with 45° line. The equilibrium therefore is adjusted to include:

- \bar{s}^* , the average bribe in equilibrium,
- s_b^* and s_g^* , bribe levels for bad and good projects, respectively.
- and each investor's decision whether to pursue a "bad" project or a "good" project.

Result 7 When $g(\cdot) = 0$, $s_b^* = (1 + \theta)s_g^*$. When $\frac{g(t)}{1 - G(t)}$ is increasing, and right-hand side of Equation (13) is decreasing¹², $s_b^* \leq (1 + \theta)s_g^*$. In both cases, all investors pursue bad projects.

¹² The first assumption is the increasing hazard rate assumption for $G(\cdot)$; the second one is implied by increasing hazard rates of both $G(\cdot)$ and $F_R(\cdot)$, but does not necessarily require them.

If taking bigger bribes is riskier, bad projects are becoming even more profitable because inspectors are taking away smaller share of the rents by bribes. Punishing inspectors more will lower the bribes taken away from the investors, but this will only improve the bad investors' post-bribery returns.

PUNISHING INVESTORS FOR BRIBERY seems cruel in the context of the baseline model of the paper, where all projects are beneficial and not paying a bribe means your project is not happening, but this is an effective tool to make bad projects less attractive. To make bad projects more detectable¹³, a benevolent planner should not impose a penalty on inspectors. Holding an investor liable increasingly more with the bribe size might make the participation constraint for bad projects worse. Assume for the rest of this subsection that inspectors are not punished (so $s_b^* = s_g^*(1 + \theta)$), whereas the investor loses her project altogether if the bribery is detected in the interactions with the inspector. The participation decision is then

$$(1 - G(s_g^*/\bar{s}^*))E[R - s_g^* \vee 0] - 1 > 0$$

for good projects, and

$$(1 - G(s_b^*/\bar{s}^*))E[(1 + \theta)R - s_b^* \vee 0] - 1 > 0$$

for bad projects. The equilibrium when only good projects start up imposes $\bar{s}^* = s_g^*$, and it should be the case that good projects have

¹³ Imagine observing citizens' income or consumption with noise, which could be caused by the family structure. This allows to detect inspectors with unusually large income, but very imperfectly. Bigger difference between s_b^* and s_g^* will make the detection more reliable. Simultaneously, since the planner would want to induce an outcome where no investors are pursuing a bad project, a large bribe for the bad project is not affecting anyone's welfare.

higher expected return. Therefore, in such equilibrium two conditions should hold:

$$\underbrace{(1 - G(1))E[R - s_g^* \vee 0]}_{\text{Good project return}} > \max[\underbrace{(1 - G(1 + \theta))(1 + \theta)E[R - s_g^* \vee 0]}_{\text{Bad project return}}, 1]. \quad (14)$$

Result 8 *The equilibrium where only good projects start up exists when $(1 - G(1))$ is big enough and $(1 - G(1 + \theta))$ is small enough.*

One would need a *more* increasing $G(\cdot)$ if inspectors were prosecuted for the size of taken bribe to make bad projects go away. Nothing yet prevents $G(1)$ from being equal to 0 to stay in line with the body of the paper.

The equilibrium where only bad projects start up might exist at all times when the “good” equilibrium exists. In this case, $s_b^* = \bar{s}^*$. Manipulating $G(\cdot)$ to induce exit from such an equilibrium requires making the following equation to hold:

$$\underbrace{(1 - G(\frac{1}{1+\theta}))E[R - s_g^* \vee 0]}_{\text{Good project return}} > \max[\underbrace{(1 - G(1))(1 + \theta)E[R - s_g^* \vee 0]}_{\text{Bad project return}}, 1]. \quad (15)$$

Result 9 *An equilibrium where only bad projects start up does not exist if $(1 - G(\frac{1}{1+\theta}))$ is big enough, and $(1 - G(1))$ is small enough.*

$G(t) = 1 - ct^{\rho-1}$ for $\rho < 0$ satisfy incentive constraint conditions in both Results 8 and 9.

More tolerance towards petty bribery might induce the transition from an equilibrium where only harmful projects start up to the equilibrium where only good projects are started up.

SUMMING UP, an arrangement when inspectors are expected to make discretionary decisions about which projects should be allowed to start up can only work out if investors are also punished for bribery. For k , the parameter of destructiveness of bad projects, big enough, the negative consequences of allowing transfer bribery to go on might be better than negative effects of investors switching to bad projects. The penalty for bribery should be harsh enough to have enough freedom to discourage bad projects from running, but should not be too harsh, so that investors are still starting up their projects. Inspectors are pivotal in this setup: it’s their ability to distinguish good projects from bad and solicit bigger bribes from latter that allows the policymaker to prevent the spread of bad projects under the form of “fighting the corruption”. This is why corruption is hard to weed out: it serves a beneficial purpose of creating incentives for

inspectors to utilize their specialized skills of distinguishing projects properly, stimulating investors to stay away from bad projects.

2.3 Why Some Investors Are Not Asked For A Bribe?

Assume no heterogeneity of projects. The distribution of project returns $F_R(\cdot)$ features an increasing hazard rate. Assume inspectors get punished (their bribe collection get taken away) with probability $G(\Gamma/\Gamma^*)$, where Γ is the total collected graft and Γ^* is the average graft per inspector in the economy. This is in contrast to the previous, where the probability of punishment depended on the size of each individual bribe. Just as before, $G(\cdot)$ has properties of a cdf, and features increasing hazard rate.

ASSUME THERE IS LESS INSPECTORS THAN INVESTORS in the economy, and therefore each inspector has to deal with $\frac{\gamma}{\eta} > 1$ investors on average. Assume that the number of investors for each inspector is assigned randomly, according to a distribution with mean γ/η , after the initial investment.

If inspector is assigned just one investor, his bribe level choice will be, as before,

$$s_1^* = \frac{1}{\frac{f_R(s_1^*)}{1-F_R(s_1^*)} + \frac{1}{\Gamma^*} \frac{g(s_1^*/\Gamma^*)}{1-G(s_1^*/\Gamma^*)}}. \quad (16)$$

Under increasing hazard rate assumption, s_1^* exists and is strictly positive.

ASSUME NOW THAT AN INSPECTOR FACES TWO INVESTORS. If the inspector is approached by investors in sequence, and the first investor chose not to pay bribe and not to go forward with the project, then the bribe charged from the second investor can be obtained from (16). Now assume the first investor has paid Γ . What is the payment the second investor is going to get charged?

$$s_2^* = \arg \max_s (1 - G(\Gamma+s/\Gamma^*)) (s + \Gamma) (1 - F_R(s)) + (1 - G(\Gamma/\Gamma^*)) \Gamma F_R(s). \quad (17)$$

Rewrite the first-order condition to get

$$s_2^* + \Gamma = \frac{1 + \frac{1-G(\Gamma/\Gamma^*)}{1-G(s_2^*+\Gamma/\Gamma^*)} \frac{f_R(s_2^*)}{1-F_R(s_2^*)} \Gamma}{\frac{f_R(s_2^*)}{1-F_R(s_2^*)} + \frac{1}{\Gamma^*} \frac{g(s_2^*+\Gamma/\Gamma^*)}{1-G(s_2^*+\Gamma/\Gamma^*)}} \Rightarrow$$

$$s_2^* = \frac{\overbrace{1 - \frac{\Gamma}{\Gamma^*} \frac{g(s_2^*+\Gamma/\Gamma^*)}{1-G(s_2^*+\Gamma/\Gamma^*)}}^{\text{Due to higher risk of punishment}}}{\frac{f_R(s_2^*)}{1-F_R(s_2^*)} + \frac{1}{\Gamma^*} \frac{g(s_2^*+\Gamma/\Gamma^*)}{1-G(s_2^*+\Gamma/\Gamma^*)}} + \frac{\overbrace{\frac{G(s_2^*+\Gamma/\Gamma^*)-G(\Gamma/\Gamma^*)}{1-G(s_2^*+\Gamma/\Gamma^*)} \frac{f_R(s_2^*)}{1-F_R(s_2^*)}}^{\text{Due to already having } \Gamma \text{ of graft.}}}{\frac{f_R(s_2^*)}{1-F_R(s_2^*)} + \frac{1}{\Gamma^*} \frac{g(s_2^*+\Gamma/\Gamma^*)}{1-G(s_2^*+\Gamma/\Gamma^*)}} \Gamma. \quad (18)$$

The importance of the second term depends upon which hazard rate grows faster, $\frac{f_R(\cdot)}{1-F_R(\cdot)}$ or $\frac{g(\cdot)}{1-G(\cdot)}$. The question is: is there a big enough bribe that might interest the inspector?

Result 10 If $\frac{\Gamma}{\Gamma^*} \frac{g(\Gamma/\Gamma^*)}{1-G(\Gamma/\Gamma^*)} < 1$, $s_2^* > 0$.

The right-hand side of (18) obviously does not have to be above zero, as the second term might be not big enough to dominate the first term, and the first term eventually will become negative; particularly, it is always negative when $\frac{g(\Gamma/\Gamma^*)}{1-G(\Gamma/\Gamma^*)} \frac{\Gamma^*}{\Gamma} > 1$. There might not be an interior solution, and instead one can get a solution at $s_2^* = 0$.

Result 11 $s_2^* = 0$ when Γ/Γ^* is big enough ($\frac{\Gamma}{\Gamma^*} \frac{g(\Gamma/\Gamma^*)}{1-G(\Gamma/\Gamma^*)} > 1$) and (18) has at most one solution.

ZERO BRIBE backlashes on the first period, where the inspector has to take into account that another person will come when choosing Γ , and being too greedy with the first applicant might prevent from taking a bribe from the second applicant.

The problem facing the inspector when the first investor is approaching him is even less analytical. However, one can clearly see already that taking s_1^* from all investors becomes less probable. This not only creates some variance in the coerced amounts even without any project heterogeneity, but also can lower Γ^* to less than $\frac{\gamma}{\eta} s_1^*$, which would happen if punishment were happening on a case-by-case basis. Therefore, assuming away the costs of decisionmaking, a way of fighting corruption might be to increase the amount of decisions per inspector, against the intuition of decentralization. This also will make the participation constraint of investors slacker. On the other hand, insufficiently increasing hazard rate of $G(\cdot)$ might put the economy in the situation where bribe-takers after taking a lot of bribes are asking for a very big bribe, because the second term of (18) dominates.

3 Discussion

COMPETITION AMONG INVESTORS is assumed away to illustrate that the multiplicity of equilibria is not driven by strategic complementarities. One could assume that the returns' distribution is stochastically improving if there are fewer projects starting up. This could obtain two equilibria, one with high profits and high bribes, and one with low profits and low bribes, depending upon the functional form of stochastic improvement. On the other hand, more competition induces more innovation, and hence in the long run the total graft

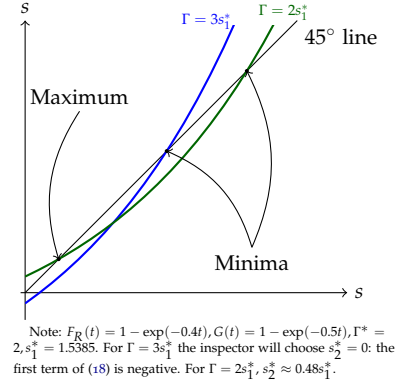


Figure 8: Solving (18).

might be higher in a more competitive allocation. This ambiguity is hard to resolve in general scenario, but empirical evidence does suggest that a lack of competition is part in parcel with corruption¹⁴.

RISK-AVERSITY is not modeled explicitly, but the results are robust. Risk-averse investors will have a stronger participation constraint, but will not change investors' behavior after investment, since I assume no uncertainty about R at the point of decision to pay the bribe. Hence, the bribe amount will not be affected unless the set of participating projects is affected. The risk-aversity of inspectors will somewhat change the inspector's problem. Particularly if the utility of s dollars of bribe is $(s + \mu)^\rho - \mu^\rho$ for $\rho \in (0, 1)$ and $\mu > 0$, the inspector's choice becomes

$$s = \rho \frac{E_K[1 - F_R(s/K)]}{E_K[1/K f_R(s/K)]} + \overbrace{\mu \left(\left(1 + \frac{s}{\mu} \right)^{1-\rho} - 1 \right)}^{\text{increases in } s, \text{ but } < s}.$$

When μ is zero, only the first term remains. The second part of right-hand side increases slower than left-hand side for big enough s , so the optimal solution exists if the solution existed originally. Solution is continuous in μ and ρ , particularly around $\rho = 1$. If, in addition, $\rho\mu^{\rho-1} \leq 1$, this can be interpreted as a wasteful bribe-pocketing technology, where the transfer of s produces $(s + \mu)^\rho - \mu^\rho < s$ of cash in inspector's pocket. Other forms of utility functions are also possible. But even the simplest risk-aversity in inspectors make the bribe size depend upon the bribe opportunities available: a larger number of projects per inspector will enable the inspector to risk more, and charge bigger bribes.

Risk-aversity would, however, make a difference if we discuss the welfare implications of transfer bribery. Even in the abundance equilibrium some projects do not continue because of the bribe threshold, so some value is lost, hence the transfer bribery worsens the total welfare in the risk-neutral world. However, in the risk-averse world, it is possible that the utility ex-ante, before the role assignment, will be higher in the world with corruption, since corruption redistributes some income across agents in the economy. This is a plausible argument for economies where the proportion of investors is small, the return of a project features a fat tail, and the disposable income of an outsider or a non-bribing official is low. However, rather than allowing corruption to run rampant, a better policy recommendation in this scenario would be to look for reasons why the fraction of investors is so small.

PRIVATE INFORMATION ABOUT RETURNS is a seemingly innocuous

¹⁴ Alberto Ales and Rafael Di Tella. Rents, competition, and corruption. *The American Economic Review*, 89(4): 982–993, 1999

assumption. One could have two distributions of return, a stochastically better one and a stochastically worse one, and disregard the uncertainty about the investment size. Then an argument similar to the one presented in Subsection 1.3 will be applicable: projects with worse return might be socially optimal to implement, but the bribe might be too large to start up these projects.

However, if it's the *inspectors* who have private information about the prospects of individual projects, the outcome changes somewhat from the baseline scenario. Indeed, if the inspector could credibly communicate his good signal to an investor, the inspector could count on a larger bribe. But there is no reason to report such signal truthfully when the inspector cannot credibly prove that this is the true signal. Whether it is possible to harvest bigger bribes depends on whether investors will believe the inspector's signals. In fact, Subsection 2.1 can be perceived as inspectors collecting information about projects' returns.

In a restricted equilibrium, investors would be interested in credibly revealing their investment size, hoping to get a smaller bribe, which would overcome the squandering problem. Revealing R , however, is never optimal: the inspector will immediately demand the whole profit, since it's likely that he cannot commit to a bribe in advance due to the illegal nature of bribery.

HONEST INSPECTORS that do not ask for bribes will relax the participation constraint, creating a more hospitable atmosphere for small businesses, but simultaneously they will let big fish go away non-squeezed. The body of corrupt officials might actually be interested in cleansing the ranks to induce better participation of investors, depending upon the shape of $f_R(\cdot)$ and $f_K(\cdot)$, but not necessarily to the socially optimal levels.

INCOME INEQUALITY AND GROWTH are the usual determinants of effective governance. Income inequality in societies where investors earn more on average than workers is likely to be positive. If small businesses are suppressed, and the heterogeneity with respect to K is induced by limited pledgeable income of the poor, this is likely to create a version of the poverty trap, where poor entrepreneurs can never earn enough to start up a business large enough to feed the corrupt, whereas rich dynasties run large-scale enterprises even though they might suffer from decreasing returns to scale. Growth is not modeled explicitly for brevity. As Alesina and Angeletos [2005] emphasize, it is important to recognize that the problem of bad equilibrium with high corruption being stable is not that there is just a sequence of beliefs that lead to a bad equilibrium. The bad stable

equilibrium is corresponding to a long historical experience of high corruption that suffocates small-scale businesses. Short-term losses are multiplied by long-term iterations, generating cross-country growth divergence.

A GENERAL EQUILIBRIUM MODEL—featuring the choice of the role, the decision of each investor to run a “good” project (like the one I discussed) or a “bad” project (with unfavorable properties like negative externalities), the decision of the informed inspector to prevent bad projects or ask for a bribe, and decisions of a policymaker regarding the inspectors’ remuneration package, taxation and supervision over the inspectors—would be richer, and would provide a better view of ways in which corruption hurts the society. One could contemplate the wage effects: higher wage of outsiders would actually lower the coerced bribe amount, because the projects would become less profitable. One could also see that squandering of small projects would lead to lower demand for labor, and therefore lower wages, having an indirect effect on ex-post inequality. However, this will complicate the mathematics, and obscure the main interaction I want to study: between “good” project starters and corrupt inspectors.

4 Conclusion

In this study, I find that transfer bribery is not economically neutral. Not only does it destroy some of the output of less productive projects, it can shrink the set of projects that are started up. Bribes that are too high might not only kill the *less lucrative* projects, but also can discourage *small* businesses from opening up, since bureaucrats cannot distinguish the investment size from the investment’s return. This is not due to credit constraints of the investors, but rather due to their limited liability with respect to bribes and an ability to choose whether to pursue a small project.

As with any transfer, bribes can be beneficial if the alternative to becoming an investor is too grim: a society with high unemployment might be eager to forego a less lucrative portion of investment projects to redistribute the benefits obtained by entrepreneurs. I do not believe this benefit is effective in the long run, but it does explain why “baksheesh” corruption is only frowned upon in developing countries. It also makes it clear why entrepreneurs become interested in social responsibility and donating a portion of the incomes to the poor: they would rather give up a portion of their income before the needy become an authority and get the opportunity to issue permits. One example of such self-organization might be the trade unions in

US in 1950s (see [Hutchinson \[1969\]](#)); another is “patent trolling”, intellectual property protection run amok (see [Magliocca \[2006\]](#), [Diessel \[2007\]](#)).

On general, I argue, for corruption to be harmful to the society there is no need for governmental coffers or public good provision. Hidden fees in hotels and airports, yearly tuition raises, medical insurance plans with uncovered treatments, a required gratuity of 18% in some restaurants, scams regarding small recurrent credit card charges,—a lot of transactions put agents in a hold-up situation where they might end up sacking their investment. Corruption by governmental officials is the most unethical, as other economic agents have little success arguing that their functioning requires a monopoly. I argue that there is a problem of small businesses staying away from participation. I argue that competition among inspectors can make participation more attractive for small businesses. This does not mean that there should be a lot of inspectors, but it should be the case that the next inspector is able to overrule the rejection of the previous one.

Fighting corruption with penalties requires some sophistication. Penalties that are too big will incentivize away the bribe-taking behavior, but are also likely to scare away people from taking the inspector job. Designing a system that detects too large bribes and punishes the inspectors might only lower the bribe size, but will not provide incentives to stay socially responsible (i.e. not use harmful practices). The only way that bad projects can be prevented is when the residual claimants, the investors, are punished too, and punishing inspectors only makes the available signals—bribes—less informative. Unfortunately, this would never eliminate bribes. One way to make an inspector take zero bribes from at least some investors is to design a system that would informatively detect the aggregate graft for each inspector.

A Proofs of Results

RESULT 1: Let $K' > K$, and for K $E[R - \frac{s}{K} \vee \phi] \geq 1$. Observe that $\frac{s}{K'} < \frac{s}{K}$, and therefore $R - \frac{s}{K'} > R - \frac{s}{K}$ for every R . Therefore, $[R - \frac{s}{K'} \vee \phi] \geq [R - \frac{s}{K} \vee \phi]$. Take expectations to obtain the result.

Let $\phi' > \phi$. Observe that $[R - \frac{s}{K} \vee \phi] < [[R - \frac{s}{K} \vee \phi] \vee \phi'] < [R - \frac{s}{K} \vee \phi']$ for every R . Take expectation to obtain the result.

RESULT 2: The best response of inspectors to the boundary K is an increasing function $s^*(K)$ —the bribe given that all investors with projects above K start up their projects, the best response of investors

is $K^*(s)$ —the smallest project size that satisfies the participation constraint given bribe s . Their composition, $K^*(s^*(K))$, either is defined from the support of K to the support of K , in which case Kakutani's Theorem obtains the result, or is not defined at some point of K , in which case $s^*(K)$ constitutes a part of an autarky equilibrium, where no projects are started up.

RESULT 3: When there is no uncertainty, $H_R(s|\phi) = \frac{1-F_R(s+\phi)}{f_R(s+\phi)}$. When R distribution features a decreasing hazard rate, $H_R(\cdot)$ is decreasing. An increase in ϕ means a shift of $H_R(\cdot)$ to the left; hence, the intersection is happening at a smaller value of s .

RESULT 4: Both conditions are sufficient for (5) to hold.

RESULT 5: When the restricted equilibrium exists, it means that for H -type projects, $s_H^* = \frac{1-F_R(s_H^*/K_H)}{f_R(s_H^*/K_H)} K_H$ satisfies the participation constraint, or that $E[R - s_H^*/K_H \vee 0] > 1$. When $q = 1$, $s_L^* = \frac{1-F_R(s_L^*/K_L)}{f_R(s_L^*/K_L)} K_L$, and therefore $s_H^*/K_H = s_L^*/K_L$, since the solution is unique by assumption. Because of this, $E[R - s_L^*/K_L \vee 0] > 1$, and therefore participation constraint is satisfied. Finally, one can see that $s_L^*(q)$ is continuous in q around $q = 1$, therefore, there is q big enough that supports the existence of abundance equilibrium.

RESULT 6: Consider a problem of one of the two inspectors in this case. Let s^* denote the bribe that is going to be charged by another inspector:

$$\max_s sP(R > s+s^*/K) \Rightarrow \frac{s}{K} = \frac{1 - F_R(s+s^*/K)}{f_R(s+s^*/K)}.$$

In equilibrium, $s = s^*$, and therefore $\frac{2s^*}{K} = 2 \frac{1-F_R(2s^*/K)}{f_R(2s^*/K)}$. Thus, the total bribe of a duumvirate, $2s^*$, is an intersection of a 45° degree line and a curve *above* the first-order condition curve (4). Similar result holds for an arbitrary number of inspectors, provided that the solution is unique.

RESULT 7: First, let's establish that when $g(\cdot) = 0$, $s_b^* = (1 + \theta)s_g^*$, and all investors pursue bad projects. The first half of the result follows from (12) and (13). The second half follows from the fact that when it pays off to invest in a good project, it also pays off to invest in a bad project:

$$E[(1 + \theta)R - s_b^* \vee 0] = E[(1 + \theta)R - (1 + \theta)s_g^* \vee 0] = (1 + \theta)E[R - s_g^* \vee 0] > E[R - s_g^* \vee 0] > 1.$$

Observe that substituting $s_b^* = (1 + \theta)s_g^*$ into (13) produces

$$s_g^* \geq \frac{1}{\frac{f_R(s_g^*)}{1 - F_R(s_g^*)} + (1 + \theta) \frac{g((1 + \theta)s_g^*/s_g^*)^{1/s^*}}{1 - G((1 + \theta)s_g^*/s_g^*)}}.$$

The increasing hazard rate of $g(\cdot)$ and $\theta > 0$ imply that

$$(1 + \theta) \frac{g((1 + \theta)s_g^*/s_g^*)}{1 - G((1 + \theta)s_g^*/s_g^*)} > \frac{g(s_g^*/s_g^*)}{1 - G(s_g^*/s_g^*)},$$

and therefore the right-hand side of Equation (13) is less than the left-hand side when $s_b^* = (1 + \theta)s_g^*$. The assumption that the right-hand side of Equation (13) is decreasing therefore suggests that s_b^* should be less than $(1 + \theta)s_g^*$, and therefore bad projects are *more* beneficial for the investor than just $(1 + \theta)$ times the outcome of the good project.

RESULTS 8 AND 9: Direct consequence of Equations (14) and (15).

RESULT 10: The derivative of (17) at $s = 0$ yields:

$$(1 - G(\Gamma/\Gamma^*))(1 - F_R(0)) - g(\Gamma/\Gamma^*)\Gamma/\Gamma^*(1 - F_R(0)) + \underline{f_R(0)(1 - G(\Gamma/\Gamma^*))\Gamma} - \underline{f_R(0)(1 - G(\Gamma/\Gamma^*))\Gamma}.$$

If this is positive, $s = 0$ cannot be a local maximum, much less a global one.

RESULT 11: The first assumption is satisfied when the negative part of the first term of (18) is dominating ($\frac{\Gamma}{\Gamma^*} \frac{g(\Gamma/\Gamma^*)}{1 - G(\Gamma/\Gamma^*)} > 1$), and so the value of the right-hand side of (18) with ordinata is below 0. The intersection “from below”, like on Figure 8, will produce a local minimum.

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