Decentralized Bribery and Market Participation

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Abstract

I propose a bribery model with decentralized bureaucratic decisionmaking. There are multiple stable equilibria: high levels of bribery reduce the economy's productivity due to suppression of small businesses, and reduces the total graft even though it might increase the individual bribe amount. The coordinated deviation to a better participation equilibrium is impossible due to decentralization. Anti-corruption efforts, even temporary, might be useful if they invite better participation.

Keywords: corruption, bribery, decentralization.

JEL: D73.

The Russian language distinguishes between two different classes of bribery: *likhoimstvo* is bribery for actions that an official should be preventing; and *mzdoimstvo* is bribery for actions that an official should be doing for free. Both are *corruption*, using public office for personal gain. The first kind of bribery sometimes 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"[1] has significant economic consequences.

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

Empirical literature measures the extent of corruption by conducting surveys among entrepreneurs and asking how frequently one had to pay a bribe, or how big was the last bribe the surveyed person paid. But when the expected bribe is too high, corruption deters entry, and all "invisible investors" who could have entered, but did not, do not have a chance to answer such a survey. I argue that while eradicating corruption might not be plausible, fighting corruption to lower bribes and make entry easier might be sufficiently rewarding.

To illustrate my point, I propose a model of bribery that does not require the influence of centralized government (for examples of business-to-business corruption, see The Independent (1995); The Register (2012); The St. Petersburg Times (2012)). 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 approach.

Because bribes are illegal, they have to be charged *before* the returns can be harvested (so that there is no problem of shirking away from the paying of the bribe), but *after* the investment decision has been made (so that potential bribe-payers identify themselves). When the expected bribe is too large, investors with smaller projects would not start up their projects. Inspectors would expect larger projects to start up, and react by further increase of the expected bribe. Decentralization of decisionmaking makes the cooperation of inspectors harder, keeping the economy below the production possibility frontier. Hence, I argue, the potential difference in corruption between seemingly similar countries might be in the equilibirum participation patterns, and not in something fundamental (see Del Monte and Papagni (2007) on differences in corruption across regions of Italy).

The literature has reached an empirical consensus that corruption is detrimental to welfare, and significantly reduces both long-term growth and near-term investment. Governments spend more on capital investment (and choose less efficient projects), but less on maintenance, healthcare and education. Corrupt economies are mostly closed and heavily regulated. Corruption is enforced by a lack of education, low income levels and ethnic heterogeneity, weak institutions, and lack of trust in the society[2].

There is a vast theoretical literature on corruption. 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; **?** 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 siphon 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 with 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.

The rent seeking literature, pioneered by Tullock (1967) and Krueger (1974), argues that transfers are not necessarily harmless to society since the very existence and maintenance of these transfers is usually an outcome of the political struggle between transfer-payers and transfer-receivers (Tullock, 1971). Moreover, corrupt bureaucrats have to pay homage to supervising bureaucrats and to combat peer bureaucrats in turf wars, increasing the welfare costs of corruption transfers (Hillman and Katz, 1987; Kahana and Qijun, 2010). The wastefulness of the transfer technology, coming either from diverting resources from productive ends to redistribution by investors or from misallocation of resources by bureaucrats, is

[2]See Mauro (1995, 1997); Tanzi and Davoodi (1997); Ades and Di Tella (1999); La Porta et al. (1999); Djankov et al. (2002); Fan et al. (2009).

complementary to my argument, which does not rely on any competition, innate or induced.

This paper is organized as follows. First, I introduce the general model and define the equilibrium. I then look at the model's predictions: I show 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.Finally, I discuss my model's limitations and potential extensions, and conclude.

1 The Model

Think of a person who comes to a driver license issuing facility to pass a driving test. The inspector can clearly see a bad driver, and perfectly understands the welfare costs of allowing bad drivers on the street. Denying a driver's license to a good driver does not produce a welfare externality, ignoring congestion. The inspector can deny a license to a qualified applicant, and there are ways to do so safely: missing a look in a rear-view mirror can be inflated into "reckless driving". Would coercing a bribe in this situation make a difference?

Agents interact in a single-period game[3]. There is a continuum measure 1 of ex-ante identical risk-neutral 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. Role assignment is random.

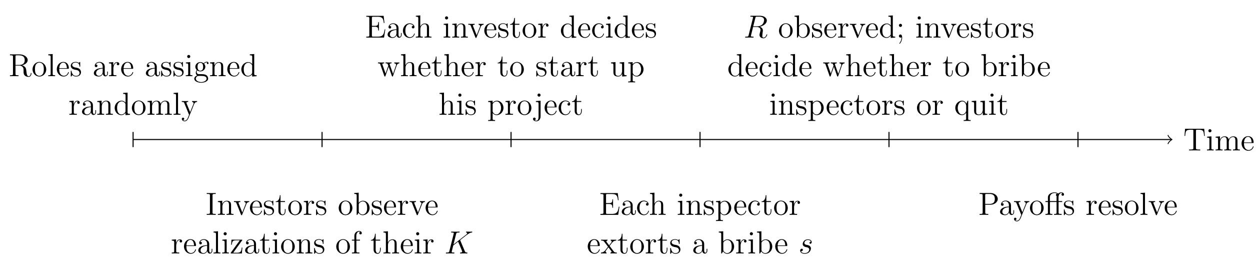


Figure 1: Timing of the game

Investors draw a *project* of size K, where K is the required number of units that must be

[3]I postpone the discussion of model variations to the conclusion.

invested. This can take two values, K_L and K_H, with probabilities λ and $1-\lambda$.[4] A project returns a random, idiosyncratic payoff $R \geq 0$ per unit of investment, drawn from pdf $f_R(\cdot)$ and cdf $F_R(\cdot)$, independent of K.

After investment, each investor is assigned a random inspector, who is supposed to approve the project, but instead attempts to extort a *bribe*, a sum of money s, from the project's profits. If the realized project's profits after paying the bribe are too small, the project can be cancelled, and the investor recovers fraction ϕ of his investment.

Each investor must decide whether to pursue his investment project. Starting a project of size K earns the expectation of[5]

$$E_R[(RK - s) \vee \phi K] - K = (E_R[(R - s/K) \vee \phi] - 1)\, K.$$

If the after-bribe net return is less than ϕ, 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

$$E_R[(R - s/K) \vee \phi] - 1 \geq 0. \tag{1}$$

Result 1 *If the 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.*

The characterization of participation decision is straightforward if there is no uncertainty about the bribe size. 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 $s < \hat{s}$.

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

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

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

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

An inspector observes neither K nor R, so his bribe demand cannot depend on either. In equilibrium, each inspector knows projects of which sizes are started up by investors, and this will form his beliefs $E_K[\cdot]$ about the possible size of the project at his mercy. Since inspectors are risk-neutral, the amount of projects per inspector does not affect the decision for each individual project. An inspector's problem is to choose bribe demand s to solve

$$\max_s sP\left(RK - s > \phi\right) = sE_K\left[(1 - F_R(s/K + \phi))\right]. \tag{2}$$

The first-order condition[6] is

$$E_K\left[(1 - F_R(s^*/K + \phi))\right] = s^* E_K\left[1/K f_R(s^*/K + \phi)\right],$$

$$s^* = \frac{E_K\left[(1 - F_R(s^*/K + \phi))\right]}{E_K\left[1/K f_R(s^*/K + \phi)\right]}. \tag{3}$$

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 bribe gets paid;
- $K^* \in R_+$: 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 ($E_K[\cdot] = E[\cdot|K \geq K^*]$), and

[6]When there is no uncertainty about K, signals do not matter, and 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 1.2 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 nondecreasing hazard rate.

- an investor with a project of size K^* is weakly better off starting the project, and all owners of projects with $K < K^*$ find it suboptimal to pursue the project, given rational beliefs about the bribe size s^*.

This equilibrium is perfect Bayesian because inspectors's beliefs about the distribution of projects' sizes depends upon the equilibrium decisions of investors.

Result 2 *An equilibrium exists.*

There are three classes of outcomes, depending on the investors' participation, where no investors are indifferent between participation and abstaining[7]:

- **full participation:** both K_H and K_L type projects start up;
- **partial participation:** only K_H projects started up;
- **no participation:** no projects are started up.[8]

The "full participation" and the "no participation" equilibria are pooling, whereas the partial participation equilibrium is separating.

Result 3 *When $F_R(\cdot)$ features nondecreasing hazard rate[9], the equilibrium bribe in full participation equilibrium is smaller than the equilibrium bribe level in partial participation equilibrium.*

This result is somewhat generalizable: under assumptions on the behavior of $\frac{E_K[1-F_R(s/K)]}{E_K[f_R(s/K)]}$ not necessarily implied by the increasing hazard rate of $F_R(\cdot)$, one can show that in equilibria with better participation of smaller-size projects inspectors lower bribes.

Next, I 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,

[7]The equilibria where investors with $K = K^*$ are indifferent between participating and not, and they therefore split nontrivially between participating and abstaining, can be shown to be unstable.

[8]If a partial equilibrium exists, then an argument similar to the intuitive criterion of Cho and Kreps (1987) refines away the no participation 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?

[9]Technically, "nondecreasing hazard rate" can be relaxed to "$x - \frac{1-F_R(x)}{f_R(x)}$ is increasing".

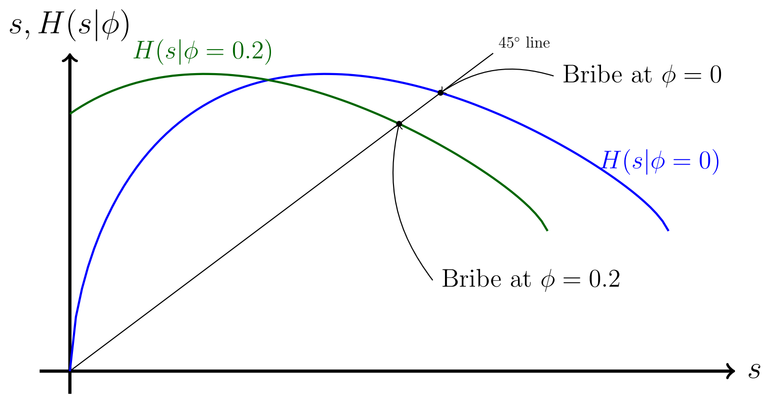
and only big projects can start up. This only increases the bribe size, securing the separation between equilibria. Hence, even decentralized transfer bribery can harm the economy, and the harm is not limited to the less lucrative projects being cancelled due to a too small outcome of R.

1.1 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 4 *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.[10] However, most distributions feature an increasing hazard rate, and the result is very intuitive: a better recovery rate makes it more attractive for the investor to cancel a project, which causes inspectors to reduce their demands.



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

Figure 2: Increase in recovery rate lowers the bribe.

[10]One can see that in Subsection 1.2, with the uncertainty about the project size distribution, the recovery rate change does not matter. The right-hand side of Equation (4) is exactly zero.

Result 5 *If $E_K[{}^1\!/\!_K f_R'(s^*/K+\phi)]$ is not too negative for $\lambda \in \{\lambda_H, \lambda_L\}$, increase in ϕ reduces the bribe level s^*.*

These are sufficient conditions for

$$\frac{\partial H(x|\phi)}{\partial \phi} = \left(-\frac{E_K[f_R({}^x\!/\!_K + \phi)]}{E_K[{}^1\!/\!_K f_R({}^x\!/\!_K + \phi)]} - H(x|\phi) \frac{E[{}^1\!/\!_K f_R'({}^x\!/\!_K + \phi)]}{E[{}^1\!/\!_K f_R({}^x\!/\!_K + \phi)]} \right) < 0 \qquad (4)$$

to hold at $x = s^*$. Figure 2 illustrates the logic[11]. A cleaner but significantly stricter assumption that $f_R'(\cdot)$ 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 bribe-takers 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 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 corruption fighting: make investment more recoverable, possibly by stimulating industries with easier recoverability. 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.

1.2 Decentralized Corruption Deters Entry

For this part, I will use an environment that features heterogeneity with respect to project size and exponential returns: $R \sim Exp(\alpha)$, so that $P(R > t) = e^{-\alpha t}$. As seen from Result 3

[11] When intersections with the diagonal are "from above", with $s < H(s|\phi)$ for s locally on the left from intersection (and vice versa from the right), like on Figure 2, these are local maxima. Intersections "from below", when $s > H(s|\phi)$ locally on the left of intersection, are local minima.

and will be seen from the presentation, this specific assumption about the distribution of R is easily generalizable.

If both types of projects are getting started up, the utility of the inspector as a function of the bribe amount s is

$$sP(RK > s) = s\left(\lambda e^{-\alpha\frac{s}{K_L}} + (1-\lambda)e^{-\alpha\frac{s}{K_H}}\right). \tag{5}$$

To solve for the equilibrium, consider the best response of inspectors. The first-order condition of the inspector's problem (5) is

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

The right-hand side is an increasing function[12] of s, starting from a value above $\frac{K_L}{\alpha}$ and converging to $\frac{K_H}{\alpha}$. Therefore, (6) has a solution.

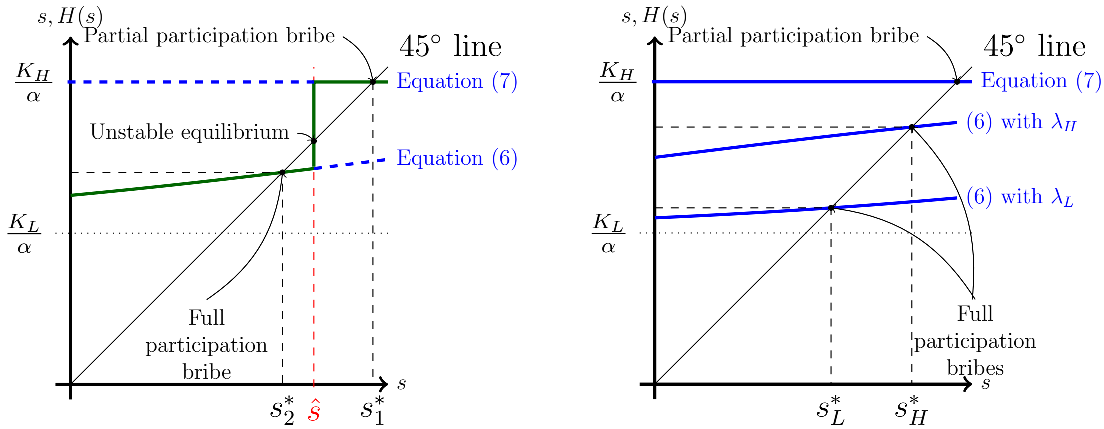
When only projects of size K_H are started up, the inspector's first-order condition's right-hand side changes:

$$s = \frac{1}{\alpha}\frac{0\times e^{-\alpha\frac{s}{K_L}} + 1\times e^{-\alpha\frac{s}{K_H}}}{\frac{0}{K_L}e^{-\alpha\frac{s}{K_L}} + \frac{1}{K_H}e^{-\alpha\frac{s}{K_H}}} = \frac{K_H}{\alpha}. \tag{7}$$

There might be multiple equilibria under reasonable assumptions. Figure 3a shows an example of such an outcome. The bribe s_1^* is a partial participation equilibrium bribe: when inspectors demand this bribe, only projects of size K_H start up. Inspectors, expecting only projects of type K_H, pick their bribe size extortion decision according to (7), and choose s_1^* as their bribe choice. The bribe of size s_2^* is the full participation equilibirum bribe: both types of projects find it optimal to start up, since even smallest projects will start up ($s_2^* < \hat{s}$). Inspectors, expecting both types of projects to start up, choose the extorted bribe

[12]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 (6).

size using Equation (6), and choose s_2.



(a) Non-informed inspectors (b) Informed inspectors

Note: $\alpha = 0.2$, $K_L = 1$, $K_H = 2$, $\lambda = 0.6$. 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, $2\hat{s} > K_H/\alpha$, so partial participation equilibrium exists. For Figure 3a, the solid line connects the relevant parts of Equations (6) and (7) to reveal the best response of the investors. For Figure 3b, the expected return of the low-type project allows for the existence of full participation equilibrium. λ_H and λ_L are defined below, in Equation (8).

Figure 3: Multiple equilibria

Both equilibria are stable: a tiny change in the fundamentals of both investors' and inspectors' problems do not make either equilibrium go away. The full participation equilibrium needs either large enough λ or $E[R] = \frac{1}{\alpha}$ to exist: $\hat{s}(K)$ increases in $^1/\alpha$ slower than the right-hand side of (6). Lower $\frac{K_H}{K_L}$ too lowers the bribe size without affecting the participation constraint for K_L types.

The welfare costs of bribery are not as much in the loss of less lucrative projects (the ones that get cancelled), but in squandering small projects in the partial participation equilibirum. Even though a 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. Indeed, were inspectors able to communicate and make centralized decisions, they could facilitate movement into a better equilibrium, for instance by announcing ex-ante that they are going to charge a smaller bribe. If inspectors could coördinate on such centralized deviation, they would do so.

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.[13] Even imperfect information would ease the participation constraint on the small projects' investors, potentially inviting them to participate. This would not, however, destroy the partial participation equilibirum.

Assume that the inspector obtains a correct signal with probability $q > \frac{1}{2}$. The inspector would update an apriori belief in probability of observing a low-type project conditional on the signal:

$$\lambda_H = \frac{(1-q)\lambda}{q(1-\lambda)+(1-q)\lambda}, \quad \lambda_L = \frac{q\lambda}{q\lambda+(1-q)(1-\lambda)}. \tag{8}$$

Since $q > 1/2$, $\lambda_L < \lambda < \lambda_H$. Based on the signal, each inspector will choose the bribe size. These problems are illustrated in Figure 3b: s_L^* is the bribe chosen when inspector observes L, and s_H^* is chosen when H is observed.

Result 6 *If partial participation equilibrium exists, for large enough q the full participation equilibrium exists.*

This does not remove the existence of the partial participation equilibrium. Even if q is big enough, so that the full participation equilibrium exists, a belief that small businesses do not start up will lead inspectors to rationally disregard their signals. Investors with small projects will stay away, supporting the belief of inspectors. 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 Discussion

Competition among investors is assumed away to illustrate that the multiplicity of equilibria is not driven by strategic complementartities or rent seeking. One could assume that the

[13]The inspector can convey his bribe expectations by citing the "violated" statute codes: a corrupt traffic officer could threaten a driver with Kentucky plates with a speeding ticket, and a driver with Rhode Island plates with reckless driving.

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 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 corruption (see Ades and Di Tella (1999)).

Risk aversion 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 aversion of inspectors, on the other hand, will somewhat change the inspector's problem. Particularly, if the Bernoulli utility of s dollars of bribe is $u(s) = (s+\mu)^\rho - \mu^\rho$, where $\rho \in (0,1)$ and $\mu > 0$, the inspector's choice equation becomes

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

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. If, in addition, $u'(0) = \rho\mu^{\rho-1} \leq 1$, this can be interpreted as a wasteful bribe-pocketing technology, where the transfer of s produces $(s+\mu)^\rho - \mu^\rho \leq s$ of cash in inspector's pocket. Other forms of utility functions are also possible. But even the simplest risk aversion in inspectors make the bribe size dependent upon the bribe opportunities. A larger number of projects per inspector might enable the inspector to risk more, and charge bigger bribes.

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 shapes of distributions of R and K, but not necessarily to the socially optimal levels.

Income equality and growth are the usual criteria of effective governance. 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 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' renumeration 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 outside investor-inspector communications would actually lower the coerced bribe amount, because the projects would become relatively 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 obscure the main interaction I want to study: between "good" project starters and corrupt inspectors.

3 Conclusion

In this study, I find that transfer bribery is not economically neutral. Too high bribes 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. Joint deviation into a better equilibrium where small projects start up is not feasible due to decentralization. A large enough crackdown on corruption, even temporary, can invite better participation by lowering the bribes temporarily, which will change the beliefs of inspectors and lower the bribes in the long run. Granted, it increases both the amount of bribes collected and the amount of those who pay bribes, both common measures of corruption size in the economy, but it makes all agents better off.

A Proofs of Results

Result 1: Fix the level of bribe s. Let $K' > K$, and let for K hold $E[R - \frac{s}{K} \vee \phi] \geq 1$. Observe that $\frac{s}{K'} < \frac{s}{K}$, and therefore $R - \frac{s}{K'} > R - \frac{s}{K}$ for every R. Therefore, $[\big(R - \frac{s}{K'}\big) \vee \phi] \geq [\big(R - \frac{s}{K}\big) \vee \phi]$. Take expectations to obtain the result.

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

Result 2: Equilibrium with no participation always exists. The existence of both full and partial participation equilibria can be verified by solving (3).

Result 3: For the purpose of clarity, $\phi = 0$; nothing changes if ϕ is positive. If only K_L (K_H) types of projects were present in the economy, which would correspond to $\lambda = 1$ ($\lambda = 0$), nondecreasing hazard rate property of $F_R(\cdot)$ drives the bribe levels in such economies to be

$$s_L/K_L = \frac{1 - F_R(s_L/K_L)}{f_R(s_L/K_L)}, \qquad s_H/K_H = \frac{1 - F_R(s_H/K_H)}{f_R(s_H/K_H)}.$$

Therefore, $s_L/K_L = s_H/K_H$, which, particularly, means that $s_H > s_L$. Also, nondecreasing hazard rate property guarantees that $s/K_L < \frac{1-F_R(s/K_L)}{f_R(s/K_L)}$ when $s < s_L$, and opposite is true if $s > s_L$. Similar statements hold for s_H. Therefore,

$$sf_R(s/K_L)/K_L > 1 - F_R(s/K_L), s > s_L$$
$$sf_R(s/K_H)/K_H > 1 - F_R(s/K_H), s > s_H.$$

Opposite statements hold for cases when $s < s_L$ ans $s < s_H$. Now let us return back to the full participation equilibrium. For every $\lambda \in (0, 1)$, no bribe level above s_H can be a solution of the inspector's problem:

$$s \overbrace{\lambda f_R(s/K_L)/K_L + (1-\lambda) f_R(s/K_H)/K_H}^{E_K[f_R(s/K)/K]} > \overbrace{\lambda (1 - F_R(s/K_L)) + (1-\lambda)(1 - F_R(s/K_H))}^{E_K[1-F_R(s/K)]}$$
$$\Rightarrow s > \frac{E_K[1 - F_R(s/K)]}{E_K[f_R(s/K)]} \text{ when } s > \max(s_L, s_K) = s_H.$$

Equivalently, one can show that no bribe level below s_L can be a solution in the full participation model. Unless λ is equal to 0 (or 1), equilibrium bribe level cannot also be equal to s_H (or s_L). Therefore, the equilibrium bribe level is less than s_H.

Result 4: When there is no uncertainty, $H_R(s|\phi) = \frac{1-F_R(s+\phi)}{f_R(s+\phi)}$. When R distribution features an increasing 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 5: Both conditions are sufficient for (4) to hold.

Result 6: When the partial participation 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 to $t = \frac{1-F_R(t)}{f_R(t)}$ 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 full participation equilibrium.

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