INSTITUTE
FOR
POLICY
REFORM

Working Paper Series

The objective of the Institute for Policy Reform is to enhance the foundation for broad based economic growth in developing countries. Through its research, education and training activities the Institute encourages active participation in the dialogue on policy reform, focusing on changes that stimulate and sustain economic development. At the core of these activities is the search for creative ideas that can be used to design constitutional, institutional and policy reforms. Research fellows and policy practitioners are engaged by IPR to expand the analytical core of the reform process. This includes all elements of comprehensive and customized reforms packages, recognizing cultural, political, economic and environmental elements as crucial dimensions of societies.

1400 16th Street, NW / Suite 350
Washington, DC 20036
(202) 939 - 3450

INSTITUTE
FOR
POLICY
REFORM

IPR55

Persistence of Corruption

Jean Tirole

Institut D'Economie Industrielle
Universite des Sciences Sociales de Toulouse

and

Senior Research Fellow
Institute for Policy Reform

October, 1992

The problem of corruption plagues large numbers of developing nations. While factors related to the social fabric certainly play a role, it seems futile to ascribe corruption to particular cultures or racial groups. Rather it is important to understand the historical reasons and institutional factors that make some societies more corrupt than others. A central theme of this paper is that history matters.

The main focus is on the interaction between individual incentives and collective reputation. In a corrupt (honest) society the general suspicion (trust) makes honesty a low (high-)-yield investment. Besides this potential for multiple equilibria with different levels of corruption, the paper also unveils some reasons for persistence of corruption. Because individuals may be locked in corruption by their past behavior, collective reputations tend to be long lasting; worse still, new generations suffer from the original sin of their elders long after the latter are gone. The paper thereby offers some explanation for why corruption tends to ratchet up but not down and for why it is difficult to root out corruption once it has taken hold. Finally, the paper reviews two alternative causes of the persistence of corruption.

This paper was prepared under a cooperative agreement between the Institute for Policy Reform (IPR) and Agency for International Development (USAID), Cooperative Agreement No. PDC# 0095-A-00-1126-00. Views expressed in this paper are those of the author and not necessarily those of IPR or USAID.

Author's Acknowledgements

The author is grateful to Drew Fudenberg, David Martimort, Patrick Rey, Paul Seabright and Barry Weingast for helpful comments. Jean Tirole is the Scientific Director, Institut d'Economie Industrielle, Touslouse, Senior Fellow, Institute for Policy Reform, Washington.

Executive Summary

It is commonplace to observe that corruption is a central issue faced by development policies. The large disparity in corruption patterns across countries and across epochs is puzzling. While factors related to the social fabric such as a family-centered ethos or the existence of tightly-knit clans certainly plays a role, it seems futile to ascribe corruption to particular cultures or racial groups. Rather it is important to understand the historical reasons and institutional factors that make some societies more corrupt than others. This paper explores what economic theory might have to say about corruption. Its starts with a brief review of the theoretical work relating institutions and corruption. The focus of the paper however is on an aspect of corruption neglected by economic theory, namely that it is a *societal phenomenon.* By this I mean that the incentives for an individual to engage in corrupt activities depend on whether the rest of society engages in corrupt activities. A second central theme is that *history matters.* In particular a society in which corruption develops unfettered today is more likely to be corrupt tomorrow than an identical society that takes a better start.

The paper first analyzes a situation in which economic activity requires trust between contracting parties that they will not engage in corrupt activities. The parties make inferences about the honesty of their potential trading partners on the basis of an imperfect observation of their track record, namely whether they engaged in corrupt activities in the past. Because the track record is imperfectly observed, inferences are also based on the past behavior of the entire society. If society as a whole is honest, people are willing to trust individuals whom they haven't heard to be corrupt; individuals therefore have an incentive to invest in a reputation for honesty. In contrast, in a corrupt society, the general suspicion makes honesty a low-yield investment,

and distrust is indeed justified. The combination of *individual and collective reputations* may thus imply different equilibrium levels of corruption for a given society.

We next analyze hysteresis. We look at an economy starting with a low level of corruption, and perturb the economy by introducing a *transitory* large private gain of being corrupt, due to a political shock or a short term relaxation in the enforcement of anticorruption measures. The resulting increase in corruption persists both in the short run and in the long run. Corruption may persist in the short run because the corrupt generation is locked into corruption. It persists in the long run because the new generations suffer from the original sin of their elders and have no incentive to behave honestly. Thus corrruption tends to ratchet up. It does not ratchet down easily as short run crackdowns on corruption have limited efficiency.

We then apply similar ideas to the phenomenon of extortion. In a non-corrupt equilibrium, government officials do what they are meant to do even if they are offered no bribe, potential contractors and other private parties offer no bribe, and government officials indeed have no incentive to engage in extortion. In a corrupt equilibrium, private parties attach a low probability of being able to conduct business without giving bribes and they do offer bribes. In turn, government officials are better off reacting negatively to the absence of a bribe.

Last the paper analyzes two alternative causes of the persistence of corruption: dynamics of organizations and budgetary reasons.

1 Introduction.

It is commonplace to observe that corruption is a central issue faced by development policies. It affects all aspects of public life: enforcement of laws, collection of taxes and tariffs, management of public contracts, housing subsidies, police work, credit, building and business permits, and so forth. In many countries, corruption has become institutionalized. There are agreed scales of charges for public services, and markets for public offices are well developed (for instance, superintending engineers' posts on the coastal deltas in India cost up to 40 times the annual salary for that rank, for an expected duration on the job of two years [1]).

The large disparity in corruption patterns across countries and across epochs is puzzling. An African country (e.g., Zaire) will be completely corrupt while another (e.g., Kenya) will have kept a clean civil service. Most LDCs are affected by the plague to a much larger extent than developed countries, the recent growth of corruption in France or the Japanese scandals notwithstanding. Corruption was pervasive in England and several other European countries two centuries ago and has much subsided since. While factors related to the social fabric such as a family-centered ethos or the existence of tightly-knit clans certainly play a role, it seems futile to ascribe corruption to particular cultures or racial groups. Rather, it is important to understand the historical reasons and institutional factors that make some societies more corrupt than others. Only then will we be able to have a good grip on how to tackle the issue.

The topic of many articles and books [2], corruption hasn't yet attracted much attention from economic theorists, and therefore its analysis lacks ad-

[1] *The Economist*, May 4, 1991, India survey, pages 15-18.

[2] See, e.g., Gould (1980), Hager (1973), Klitgaard (1986, 1989, 1991), Myrdal (1970), Lui (1986), Noonan (1984), Rose-Ackerman (1978), and Theobald (1990).

equate foundations based on information economics and game theory (note that Robert Klitgaard's fascinating books on the topic constantly point at the relevance of information economics). A proper understanding of the phenomenon seems to require an examination of its microstructure. The modest purpose of this paper is to provide a start in this direction. The paper considers only a small number of facets of this large problem, and it leaves policy implications aside.

The unifying theme of this research is that *history matters.* In particular, a society in which corruption develops unfettered today is more likely to be corrupt tomorrow than an identical society that takes a better start. This conclusion will not come as a surprise to those who have observed the persistence of corrupt practices and witnessed the many unsuccessful attempts to eradicate them. It is nevertheless important to identify the several causes of hysteresis.

There is a recent, but large theoretical literature on the phenomenon of collusion in organizations, which we briefly review in section 2. Most of it can be applied to corruption. In this paper, however, we will focus on some aspects of corruption that have not been analyzed in the economic theory of collusion, namely that corruption is a *societal phenomenon.* By this I mean that the incentives for an individual to engage in corrupt activities depend on whether the rest of society engages in corrupt activities.

We first develop an abstract model in which economic activity requires trust between contracting parties that they will not engage in corrupt practices. The parties make inferences about the honesty of their potential trading partners on the basis of an imperfect observation of their track record, namely whether they engaged in corrupt practices in the past. Because one's real track record is partially observed by potential trading partners, individ-

uals may have an incentive to develop or maintain a reputation for honesty. On the other hand, because this track record is not perfectly observed, inferences are also based on the society's behavior as a whole. This combination of *individual and collective stigmas* is what in our model gives scope for multiple equilibria. If society as a whole is honest, people are willing to trust individuals whom they have not heard to be corrupt. And because society will trust them in the future if they keep a clean record, individuals are willing to invest in a good reputation. In contrast, in a corrupt society, the general suspicion makes honesty a low-yield investment, and distrust is indeed justified (section 3).

We then study the issue of persistence of corruption by analyzing the sensitivity of equilibrium to initial conditions. In the benchmark, the economy is in a stationary equilibrium and has a low level of corruption. We then slightly perturb the economy by assuming that at the initial date (date 0), there is a one-shot increase in the gain to being corrupt (or a relaxation in the enforcement of anticorruption laws). The agents alive at date 0 engage in the corrupt activity at that date. The economy is otherwise unchanged at date $1, 2, \cdots$. We then ask whether the temporary increase in corruption necessarily has lasting effects, or whether the economy is able to go back to the low steady state level of corruption. Interestingly, we find that the economy must remain corrupt not only in the short run, but also in the long run. Our analysis unveils two effects: First, the agents who were alive at date 0 have smeared their reputation. In our model, they have more incentives to engage in corrupt activities than if they had always behaved honestly. They are thus *locked into corruption.* This idea explains the short-run persistence of corruption. Shortly after date 0, there are lots of agents locked into corruption. This first effect however does not explain why the steady state is

affected by this one-shot increase in corruption, since we assume that agents are progressively replaced by new ones (that is, our model is one of overlapping generations). That is, why do the agents who arrive with an unsmeared reputation also necessarily engage in corrupt activities? Why do the young inherit the corrupt practices of their elders? The answer is that in the early periods after date 0, and because of imperfect observation of track records, the large number of agents who have been corrupt at date 0 and therefore remain corrupt raises a general suspicion. This suspicion affects new agents if their "age" (or more realistically, whether they had opportunities to get corrupt earlier) is not observed. Agents who arrive at date 1 are victims of this suspicion for at least a number T of periods and, if T is large enough (that is, if agents are not replaced very fast), have no incentives to remain honest. This implies that the number of agents with a smeared record does not decrease. In turn, agents who arrive at date 2 are victims of this suspicion for at least T periods, and decide to become corrupt. And so forth. We therefore obtain a *vicious circle of corruption*, where the new generations suffer from the original sin of their elders long after the latter are gone.

It should also be noted that in this model, *corruption ratchets up and not down*, in the sense that a one-shot reduction in corruption due, say, to tough enforcement of anticorruption laws has no lasting effect. It takes a minimum number of periods without corruption to upset the corrupt equilibrium. At this stage we have but an example, and no general result showing that the level of corruption in society increases faster than it decreases, but we find the example suggestive of why short run crackdowns on corruption often have limited efficiency. We hope that further work will investigate the generality of this conclusion.

While sections 3 and 4 analyze the possible breakdown of desirable eco-

nomic activity due to lack of trust and widespread corruption, section 5 uses similar modeling and ideas to study the development of other, *undesirable* activities. More precisely, we analyze the phenomenon of extortion. Suppose a foreign company wants to do business in a country and wonders whether it should bribe low-or high-level government employees to process goods through customs, issue work permits for company personnel or building permits for plants, grant a government contract or provide police protection. It has been well documented by Jacoby et al (1977) and many others that this is unfortunately one of the first questions business persons confront. Leaving aside any moral issue, we ask whether there can exist multiple equilibria with different levels of extortion. This is indeed the case. In a noncorrupt equilibrium, government officials do what they are meant to do even if they are offered no bribe, firms can get away by offering no bribe, and government officials have no incentive to give them trouble given that they will not be offered bribes in the future. In a corrupt equilibrium, firms attach a low probability of being able to conduct business without giving bribes, and they do offer bribes. Government officials are reluctant to do their job in the absence of a bribe because this might reveal their "softness" to future bribers. Again, the multiplicity of equilibria stems from the combination of individual and collective reputations (section 5).

Section 6 examines two alternative causes of the persistence of corruption. We argue that corrupt officials have incentive to promote corrupt officials, thus perpetuating corruption. We then consider the "budgetary explanation" for persistence, namely that low levels of tax collection associated with corruption prevent countries from providing a decent compensation to government employees, which in turn induces the latter to become corrupt. Section 7 offers concluding remarks.

Before turning to the analysis, I should point out that I do not subscribe to the view that corruption is a lesser harm. It has become fashionable in some academic circles in the last thirty years to argue that corruption is a market mechanism that frees the economy from the evils of excessive bureaucracy. While this view has the merit of questioning the organization of bureaucracy, it ignores the substantial efficiency costs of corruption, not to mention moral and social effects and the implications for income distribution (including those due to the diversion of international aid). These efficiency costs include, among others, the selection of incompetent contractors and civil servants, the many barriers to entry into business, the shortage of tax and duty income, and the costs associated with tolerated pollution and job safety infringements. Accordingly, we will model corruption as a socially costly activity.

2 Review of some formal work on collusion.

The general concept of collusion is a good starting point for the study of corruption. Collusive phenomena have been emphasized by sociologists and organization theorists (Crozier, Dalton, Cyert-March) who have argued that group behavior is best predicted by the analysis of group as well as individual incentives. The more specific issue of regulatory capture has been a recurrent theme in political science (Montesquieu, Madison, Marx, Bernstein, Truman) and political economy (Stigler, Becker, Peltzman).

In our view, a natural way to approach the phenomenon of collusion is to use information economics. Collusion comes from the existence of discretionary power which is itself connected with an agency problem. Decentralized information is a source of power that gives rise to externalities and therefore to gains from trade among members of an organization.

Many situations involving collusion can be modeled with a three-tier "principal-supervisor-agent" framework. A supervisor (official) monitors and obtains information about an agent (citizen, firm) on behalf of a principal (collectivity). For example, the tax collector collects taxes and the procurement officer signs contracts with suppliers on behalf of the collectivity. In this framework, the possibility of collusion between the supervisor and the agent arises from the superior information the supervisor has about the agent relative to the principal (superiority which is a main raison d'être of the supervisor). This basic three-party framework can be extended in several directions, such as the existence of several agents (interest groups) who compete for a favor or else are extorted by the supervisor. This multi-agent analysis is useful for example to analyze regulatory restrictions to entry into an industry, favoritism in auctions, the power of rival interest groups in public decision making or gaming among employees in a firm.

I have reviewed the growing theoretical literature on collusion elsewhere (Tirole (1992)). Let me recall a few conclusions. First, collusion is costly in the sense that the principal must expend more resources to obtain the same information. Second, in some circumstances, it is optimal to eliminate all collusion. In such cases, an outsider observer might easily overlook the hidden cost of collusion. This cost is implicit in the organizational response that eliminates incentives for collusion. In other circumstances however, some collusion should be tolerated. This is for example the case when it is unknown whether collusion would occur in the absence of an organizational response. (The survey quoted above describes three other motivations for tolerating collusion unveiled in the literature.) Third, the supervisor's incentive to collude can be reduced through the use of incentive schemes; for instance tax collectors can be rewarded on the basis of how much they collect. Job rotations,

by shortening the agent-supervisor relationship, also contribute to curbing corruption. Fourth, and quite importantly, the agent's stakes in collusion and the supervisor's discretion ought to be reduced to fight collusion. Such a policy is costly because it implies a suboptimal use of the supervisor's decentralized information. For instance, procurement contracts are auctioned off to the lowest monetary bid, even though it would be desirable to account for (manipulable) quality dimensions of bids. In the same spirit, low powered incentive schemes such as cost-plus procurement contracts are attractive in that they leave little discretion to offficials (except to accountants) [3]. Fifth, an informational approach to collusion rationalizes the existence of watchdog groups and of institutions limiting instruments available to the supervisor.

Because collusion theory has been developed with a focus on firms' internal organization and regulatory capture, its message for development economics is not yet fully decoded. One would for instance like to further analyze the "sets of institutions and incentives that are likely to be most conducive to achieving a least-cost outcome" (Anne Krueger). For instance, are tariffs or import licenses more prone to collusion? What should competition and regulatory policies look like in countries with substantial corruption problems? One would also like to know more about the relationship between ownership and corruption. While privatization and competition seem to limit corruption, one would want to know when these benefits exist and are largest, all the more that some sectors of the economy (procurement, public services, schooling, housing, redistribution) are likely to remain publicly owned or regulated. We leave these topics to future research.

[3] See Laffont-Tirole (1992).

3 Individual and social stigmas: The case of trust.

This section develops a simple model in which the efficient organization of economic activity requires a minimum level of trust between contracting parties. More precisely, a principal (the buyer of a service) will contract with an agent (the supplier of the service) only if she is sufficiently confident that the agent will not engage in corrupt activities. The principal has some, albeit imperfect information about the agent's track record, namely about whether the agent has engaged in corrupt activities in the past.

Matching. We consider a stationary economy in which agents alive at date t remain in the economy up to (at least) date $t+1$ with probability $\lambda \in (0,1)$. With this "Poisson death process", we assume that each quit is offset by the arrival of a new agent, so that the population of agents is constant. The model is a matching model. At each date t, each (alive) agent is matched with a new principal[4]. The principal decides whether to offer task 1 or task 2 to the agent. Task 1 is the efficient task. Task 2 is a less efficient task, but, for the principal, it is less sensitive to the agent's choosing to be corrupt. [In a slightly different version of the model, task 2 corresponds to the absence of a hire]. We will make an assumption guaranteeing that it is always optimal for the principal to at least offer task 2 to the agent rather than not hiring him. Once hired, the agent chooses whether to engage in the corrupt activity, that is whether "to cheat" (behave dishonestly). The principal's payoff from task 1 in the period is H if the agent behaves honestly and D if he cheats. Similarly her payoffs from task 2 are h and d. That task 1 is more sensitive to corruption than task 2 (given that the principal faces

[4]Principals can be either short lived or long lived.

a nontrivial choice) means that

$$H > h \geq d > D.$$

We also assume that $d \geq 0$ so that it is optimal to hire the agent.

Agents' preferences. There are three types of agents: "honest", in proportion α, "dishonest", in proportion β and "opportunistic", in proportion γ, where $\alpha + \beta + \gamma = 1$[5]. The proportions are the same for each cohort and therefore for the entire population. Honest agents have a strong distaste for and never engage in corrupt activities (alternatively, if corruption has a probability of being exposed and directly punished, "honest" agents might be ones for whom being punished is very costly). Dishonest agents always cheat, for instance because they derive a high benefit from it (alternatively, in a slightly different model, they might be transient agents who do not care about their reputation). Because honest and dishonest agents behave mechanistically (never and always cheat, respectively), the focus of our analysis is on opportunists. These have no aversion to being corrupt, but trade off the current benefit from corruption and the loss in reputation. Their benefits from being hired in tasks 1 and 2 and not cheating are B and b, respectively, where

$$B > b \geq 0.$$

They enjoy an additional short-run gain $G > 0$ from being corrupt in either task. That G is the same in both tasks simplifies the formal analysis. Note also that we do not model explicitly the role of anti-corruption campaigns. The simplest, albeit extreme interpretation of the model is that there is no hard evidence that could lead to the indictment of a corrupt agent. Alternatively, G could be an expected gain from being corrupt, which would allow

[5]This formulation of preferences is standard in reputation models, see, e.g., Diamond (1991).

a probability of confronting legal sanctions. Last the agents' discount factor is $\delta_0 \leq 1$. We will let $\delta \equiv \delta_0 \lambda$ denote the relevant discount factor.

Information. Agents know their own preferences (that is, their types). Principals know the proportions α, β, γ and imperfectly observe the track record of the agent they are matched with. There are several ways of formalizing the imperfect observability of the track record. We choose a simple one in order to easily illustrate the main ideas. The principal has probability x_k of finding out that the agent has engaged in the past at least once in a corrupt activity when the agent has in fact cheated k times[6]. So the *observed* track record, that is the information of the principal the agent is matched with is binary. The principal knows that the agent has been corrupt at least once, or has no such knowledge. The assumption that the principal does not know the agent's age is important for the second effect unveiled in section 4 and giving rise to everlasting effects of a one-time shock in corruption. Of course this assumption should not be taken too literally. It is a metaphor for the idea that the principal may not be fully informed about the number of times the agent had an opportunity to be corrupt in the past.

Assumption 1: $x_0 = 0 < x_1 \leq x_2 \lneq x_3 \leq \cdots < 1$

and

$$x_{k+1} - x_k < x_k - x_{k-1} \qquad \text{for all k.}$$

Assumption 1 says that the leakage of information about corruption becomes more likely when the agent has cheated more in the past; and that this

[6]It would be interesting to extend the analysis to alternative information technologies. In particular it would seem reasonable to allow for forgetfulness (witnesses or evidence disappear over time). Our insights ought to carry over to such specifications, but new insights (such as the possibility of an individual's resuming an honest behavior after being corrupt) would arise.

We have performed a different check of robustness by assuming that once an individual is exposed a public file exposes him for the rest of his life. The expressions of Y and Z below are slightly altered, but the analysis goes through under the same assumptions 1 through 4.

increase occurs at a decreasing rate. This assumption simplifies the analysis by garanteeing that an individual is locked in corruption after having been corrupt a certain number of times.

We now demonstrate the possibility of coexistence of two equilibria.

a) Low corruption equilibrium. Suppose that all opportunists always behave honestly. A principal offers task 2 to an agent who she knows has been corrupt in the past, since the agent is necessarily a dishonest agent and since $d > D$. In contrast, when the principal has no such information, the agent may be honest or opportunistic, or else be a dishonest agent with a deceivingly clean observed track record. The proportion of honest and opportunistic agents in the economy is $(\alpha + \gamma)$. The proportion of dishonest agents with a clean track record is βY where Y is the average probability that past corruption activities go unnoticed [7]:

$$Y = (1-\lambda)\left[1 + \lambda(1-x_1) + \lambda^2(1-x_2) + \cdots + \lambda^k(1-x_k) + \cdots\right].$$

The probability that the agent will not cheat given a clean observed record is $(\alpha+\gamma)/(\alpha+\gamma+\beta Y)$. The principal offers task 1 if and only if the following assumption holds:

Assumption 2:

$$\frac{\alpha+\gamma}{\alpha+\gamma+\beta Y}(H-h) + \frac{\beta Y}{\alpha+\gamma+\beta Y}(D-d) > 0.$$

Do opportunists have an incentive not to become corrupt? By never being corrupt, they keep a clean (real and observed) record and are always offered task 1. Their payoff is therefore $B+\delta B+\delta^2 B+\cdots = B/(1-\delta)$. Suppose that they instead cheat today and keep cheating in the future. Their expected payoff is then

$$(B+G) + \delta(B+G)[1/(1-\delta) - Z] + \delta(b+G)Z,$$

[7] The proportion of "newborns"(who therefore have not yet cheated) is $(1-\lambda)$, the proportion of "one-period old"(who have cheated once) is $(1-\lambda)\lambda$, and so forth.

where

$$Z = x_1 + \delta x_2 + \delta^2 x_3 + \cdots$$

is the present discounted probability of being found out in the future given that one has cheated once and will continue cheating. So, a necessary condition for a low corruption equilibrium is:

Assumption 3: $G/(1-\delta) \leq \delta(B-b)Z$.

Appendix 1 shows that *the low corruption equilibrium indeed exists under assumptions 1 through 3.* The intuition is that from assumption 1, the agent has more incentive to be corrupt, the more he has been corrupt in the past. In this sense, *agents are locked into corruption once they start being corrupt.*

Note also that a low corruption equilibrium exists only if the principals are not poorly informed [8]. Agents must have enough incentives to maintain their reputation for honesty.

b) High corruption equilibrium. Suppose now that opportunists are always corrupt and principals always offer task 2. Because keeping a clean slate has no value, it is indeed optimal for opportunists to be always corrupt. Is it optimal for a principal to offer task 2 to an agent with a clean slate? Such an agent is honest with probability $\alpha/[\alpha + (\beta+\gamma)Y]$ and either opportunistic or dishonest with probability $(\beta+\gamma)Y/[\alpha+(\beta+\gamma)Y]$. We thus make

Assumption 4:

$$\frac{\alpha}{\alpha+(\beta+\gamma)Y}(H-h) + \frac{(\beta+\gamma)Y}{\alpha+(\beta+\gamma)Y}(D-d) < 0.$$

The high corruption equilibrium exists if and only if assumption 4 holds. Note that assumption 4 holds when there are enough opportunistic and dishonest agents and when the principals' information is not very precise.

We conclude that the low and high corruption equilibria both exist when

[8] If the x s are close to zero, Z is close to zero and assumption 3 is violated.

assumptions 1 through 4 hold [9] . The role of imperfect observability is highlighted by the facts that assumption 3 is violated if the principals' information is very bad and that assumption 4 is violated if the principals' information is very good.

Remark (comparison with the economic theory of discrimination): Our imperfect observability assumption is reminiscent of that made in Arrow's (1973) statistical theory of discrimination of minorities by employers [10] . Arrow looks a one-shot employment decision and assumes that workers first invest in skills and then the employers run an imperfect test of the resulting ability. Because the test is imperfect, the employer uses the prior beliefs about whether the worker has invested in assessing the worker's true ability. If a prior belief that the worker has invested also makes it more profitable for the worker to invest, there is scope for multiple equilibria. The literature has interpreted the multiplicity of equilibria as the possibility of a differential treatment of workers based on their race, sex or other observable characteristics. There is an analogy between the theory of discrimination and the (more dynamic) theory of corruption developed here. In the corrupt equilibrium, agents face a general suspicion of corruption and do not gain from not becoming corrupt, in the same way that a discriminated against group has little incentive to invest in skills if the employer puts more weight on prior beliefs

[9]Sah (1991) has developed a theory of crime in which the multiplicity of equilibria has a different origin. In Sah's model, the probability of being caught and punished for a crime decreases with the number of other criminals, assuming that the budget for crime investigation is not very responsive to the level of crime. The individuals' choices of whether to commit a crime are therefore strategic complements: The more people commit crime, the more incentives the individual has to commit a crime. While the multiplicity of equilibria can be illustrated in a static framework, Sah's model is actually an intertemporal one in order to highlight the idea of osmosis; the focus is not on reputation as in the present paper, but on local learning about the probability of punishment. Individuals learn slowly about this probability by observing whether their neighbors get punished when they commit a crime.

[10]See also Akerlof (1976), Coate-Loury (1991), Kremer (1992), Lundberg-Startz (1983), Milgrom-Oster (1987), and Phelps (1972) for related ideas.

than on imperfectly measured ability. There is however a sense in which the statistical discrimination theory is not about societal behavior and norms. For, the multiplicity of equilibria in the discrimination model is independent of whether there are other employers or workers besides the employer and the worker in question. The low and high corruption equilibria in our model could similarly coexist with single long-lived principal and agent, under the strong assumption that the principal does not observe her per- period payoff (otherwise the principal perfectly knows the agent's track record). Another reason why our model of corruption is a genuine model of social as well as individual behavior is that in nonstationary equilibria (see the next section), agents with identical preferences may have different records and behave differently; agents are then assessed on the basis of predicted average behavior, which in general differs from one's behavior.

4 Persistence of corruption.

We now investigate the effect of a one-time shock in corruption on the equilibrium. To keep the analysis simple, we specialize the model further by making

Assumption 5: $x_1 = x_2 = \cdots = x \quad \in (0,1)$.

That is, the probability of exposure of corrupt activities is independent of the number of past corrupt acts. Assumption 5 implies in particular that an opportunist remains corrupt once he has started; it also implies that $Y = 1 - \lambda x$ and $Z = x/(1-\delta)$.

The low corruption equilibrium exists if and only if assumptions 2 and 3 hold, which we will assume. Suppose now that the economy faces a temporary shock at date 0. The gain from being corrupt at that date is very large, and so all agents alive at date 0 get corrupt. The parameters of the model (including

the gain G from cheating) are unchanged at dates $1, 2, \cdots$. We show that under an additional assumption, the economy cannot go back to the low corruption equilibrium. Indeed, the unique equilibrium exhibits a high level of corruption forever.

Let us perform the following thought experiment. Suppose that the opportunistic agents born at date 1 through t behave honestly before and at date t. This presumption gives the best chance to the existence of trust at date t. The probability of honest behavior at date t given an observed clean record and given that opportunists born at or before date 0 are locked into corruption is

$$\begin{aligned} p(t) &\equiv \frac{\alpha + \gamma(1-\lambda)\left(1 + \lambda + \cdots + \lambda^{t-1}\right)}{\left[\alpha + \gamma(1-\lambda)\left(1 + \lambda + \cdots + \lambda^{t-1}\right)\right] + \left[\beta Y + \gamma(1-x)(1-\lambda)\left(\lambda^t + \lambda^{t+1} + \cdots\right)\right]} \\ &= \frac{\alpha + \gamma(1-\lambda^t)}{\left[\alpha + \gamma(1-\lambda^t)\right] + \left[\beta Y + \gamma(1-x)\lambda^t\right]}. \end{aligned}$$

Suppose $p(1)(H-h) + (1-p(1))(D-d) < 0$. Recalling that $p(\infty)(H-h) + (1-p(\infty))(D-d) > 0$ (this is assumption 2) and noting that p is an increasing function, we let T denote the largest t such that

$$p(T)(H-h) + (1-p(T))(D-d) < 0.$$

That is, under the most optimistic assumption, principals still do not trust agents with observed clean records at date T; thus $(T+1)$ is a minimum length for suspicion to phase out. Suppose now that

Assumption 6: $G\left(1 + \delta + \cdots + \delta^{T-1}\right) \geq x\delta^T(B-b)/(1-\delta)$.

Assumption 6 states that it is a dominant strategy for an agent born at date 1 to cheat at date 1 (and therefore forever) given that the agent will not be trusted before (at best) date $(T+1)$. The left hand side of assumption 6 is the gain from cheating from date 1 through date T (discounted at date 1), and the right hand side is an upper bound on the cost of not being offered

task 1 after date $(T+1)$. Note that assumption 6 requires T not to be too small, since with x_k constant for $k \geq 1$ assumption 3 is equivalent to $G \leq x\delta(B-b)$.

Consider now the generation born at date 2. All its elders have been corrupt in the past, and assumption 6 ensures similarly that cheating at date 2 and thereafter is a dominant strategy. By induction, the same is true for all generations. *Corruption has ratcheted up and does not subside even after the generation that has committed the original sin has by and large disappeared.*

This simple model also illustrates the possible failure of a short-run anticorruption campaign. Suppose that at date 1 (or, equivalently at any later date) the government runs a tough anticorruption campaign that lasts one period and makes it unprofitable for opportunists to engage in corruption at that date. Suppose further that the following strengthening of assumption 6 holds:

$$G\left(1+\cdots+\delta^{T-2}\right) \geq x\delta^{T-1}(B-b)/(1-\delta).$$

Then it is a dominant strategy for generations born at dates 1 and 2 to cheat at date 2, and corruption prevails at all dates after date 1. *The anticorruption campaign only implies a decrease in corruption during the campaign and has no effect thereafter. Corruption does not ratchet down.*

5 Extortion.

We now apply similar ideas to study extortion [11]. Extortion occurs if the briber (the principal) is sufficiently convinced that the bribee (the agent) will not provide a service in the absence of a bribe. By analogy with the model of

[11] See Strand (1990) for a different model of extortion. There, a bureaucrat asks for a bribe from a firm. The firm may accept the deal or report the attempt to extort to a government controller, who himself may or may not be corrupt. The firm is blacklisted if the controller is corrupt and receives a reward otherwise. A corrupt controller demands a bribe from the bureaucrat instead of punishing him.

section 3 where the agent wanted to develop a reputation for trustworthiness, the agent here wants to look tough and convince principals that he will not provide services for them unless they give a bribe. The model shares a number of similarities with the previous one, and will purposedly share some of its notation.

As before, the model is one of matching. In each period, the agent (the government official, the bribee) is matched with a new principal (the firm, the briber). The timing within the period is as follows: First, the firm decides whether or not to offer a bribe to the official. For simplicity, we let B denote the size of the bribe. The firm gains $V > B$ if the agent provides the service. Second, the agent decides whether to provide the service. There are three types of agents: "honest", in proportion α, "corrupt", in proportion β, and "opportunist", in proportion γ, where $\alpha+\beta+\gamma = 1$. The proportions are the same for each cohort. Honest officials always provide the service. Corrupt officials never provide the service unless they receive bribe B. Opportunists, when they are offered no bribe, trade off a short-term cost $c > 0$ of not providing the service and the long-term loss of reputation for being tough. They provide the service if offered a bribe. One can think of c as coming either from scruples associated with not doing one's job or from a probability of being caught and punished. The probability of survival λ and the relevant discount factor δ are defined as before.

We again posit imperfect information about the agent. The principal has probability x_k of finding out that the agent has been weak at least once in the past, when the agent has in fact been weak k times, where "being weak"

In Cadot (1987), a bureaucrat administers a test to grant a permit. There are two kinds of bureaucrats: "honest" (who grant the permit if and only if the candidate passes the test) and "corrupt" (who grant the permit if and only if they receive a bribe). The candidate, when asked for a bribe, can accept the deal or denounce the bureaucrat to a controller. Denunciation delays the permit (and, if the candidate does not know his ability, may not succeed).

or "giving in" means that the agent provides the service to a principal who does not offer the bribe[12]. The x_k sequence satisfies assumption 1.

a) No extortion equilibrium. In a no extortion equilibrium, the firms never offer a bribe even when they don't know of any occurrence in which the government official gave in. In such an equilibrium, opportunists always give in, since they will never be offered a bribe in the future. Is this rational for a firm not to offer a bribe when it does not know its faces an honest or opportunistic agent? Let

$$Y \equiv (1-\lambda)\left[1+\lambda(1-x_1)+\lambda^2(1-x_2)+\cdots\right]$$

denote the average probability over the population of opportunists and honest agents that an opportunist or honest agent is not observed to have been weak in the past. The firm does not offer a bribe to an official whose type it does not know if and only if the following assumption holds:

Assumption 7:

$$B > \frac{\beta}{\beta+(\alpha+\gamma)Y}V.$$

Assumption 7 states that the size of the bribe exceeds the conditional probability that the official is corrupt times the value of the service to the firm. Note that the no extortion equilibrium exists only if the firm is not perfectly informed about the agent's track record (if λ and the xs are close to 1, Y is close to 0 and assumption 7 is violated).

*b) Extortion equilibrium.*Suppose now that the firms offer a bribe to those agents who are not known to have given in, and no bribe to those who are known to have given in; and that opportunists do not give in (unless they have already given in at least $k^* > 1$ times, in which case they give in) when offered no bribe.

[12]It would be worth investigating alternative assumptions on individual reputations. This restrictive, but simple assumption allows us to make direct use of the preceding analysis.

If the firm knows that the official has given in at least once when offered no bribe, this official must be honest and therefore it is optimal for the firm not to offer a bribe. In contrast, if the firm does not know that the official has given in in the past, the firm optimally offers a bribe if the probability that the service will not be provided in the absence of a bribe times the value of the service exceeds the bribe:

Assumption 8:

$$B < \frac{\beta+\gamma}{\beta+\gamma+\alpha Y}V.$$

In an extortion equilibrium, it must also be the case that when offered no bribe an opportunist does not want to give in. Let z denote the present discounted expected number of bribes that the official receives by giving in and continuing to give in every time that he is not offered a bribe [13]. A necessary condition for the existence of the extortion equilibrium is that *Assumption 9*:

$$\delta\left(\frac{B}{1-\delta}-z\right) > c.$$

Conversely, the extortion equilibrium exists if assumptions 8 and 9 hold (the proof is almost identical to that in Appendix 1). Note that it can exist only if the principals' information is not too imprecise (if the xs are close to 0, z is close to $B/(1-\delta)$ and assumption 9 is violated).

We thus conclude that under assumptions 7, 8 and 9, the extortion and no extortion equilibria coexist. The formal analysis is almost identical to that of section 3. Yet the economics of trust (section 3) and extortion (this section) differ in a few respects. In the extortion context, individuals want to build a reputation for the behavior that society tries to eradicate. In the

[13] z is given by the following recursive equation: Let V_k denote the valuation of an opportunist who has given in k times in the past, and gives in whenever he has not been offered a bribe:

$$V_k = x_k\delta V_{k+1} + (1-x_k)(B+\delta V_k).$$

Let $x = \lim_{k\to\infty} x_k$ and $V_\infty = (1-x)B/(1-\delta)$. Then $z \equiv V_1$.

trust context, they want to build a reputation for honesty. This distinction will have implications when adapting the design of anticorruption policies to the targeted form of corruption. A careful analysis of this conjecture falls outside the modest scope of this exploratory paper[14].

6 Alternative causes of persistence.

There exist other reasons than those unveiled in this paper why corruption tends to persist once in place. The purpose of this section is to offer a brief and informal discussion of two such reasons; deeper analyses of these reasons are left for future research.

a) Hierarchies and promotions. Corruption may also persist because corrupt officials are likely to choose other corrupt officials to work with them and to succeed them. A benefit for a corrupt official from having a corrupt subordinate is that the official can extort the subordinate and obtain some of the bribes he collects. For example, the subordinate may be a tax collector who gives back a fraction of the bribes to his boss. Another benefit for a corrupt official from being surrounded by other corrupt officials is that these colleagues will be reluctant to denounce him by fear that they themselves might be exposed in a retaliation [15]. Last, a corrupt official is likely to prefer having a corrupt successor, since a corrupt successor will not perform as well as an honest one and therefore will not disparage the departing of-

[14]We can for instance point out that in this extortion model too strong a crackdown in a given period may be self-defeating. For, suppose that at date t the short-term cost c_t for the agent of not providing the service is so high that even the dishonest agents give in. Then at date t all types give in and no information is obtained if we assume that the information that an agent gave in is accompanied with the date at which he gave in. Extortion then resumes at date $t+1$. In this case, a short-run corruption campaign should be more discerning and should raise the cost of corruption while letting various types of agents separate.

[15]See Andvig-Moene (1990) for a model in which a bureaucrat's cost of being corrupt decreases with the number of corrupt colleagues (such colleagues can be bribed not to report corrupt transactions).

ficial's performance. For these three reasons, corruption in hierarchies such as government, courts and political organizations is likely to have a life of its own. This explanation for persistence, if it is relevant, suggests that an anticorruption campaign is likely to be efficient if it fries big fish, since honest individuals cannot easily move up a hierarchy run by corrupt officials.

*b) Poverty cycle.*Another factor of persistence is the possibility of a low-budget trap [16]. A government official, like any economic agent, has an incentive to behave only if the cost of cheating (the probability of being punished times the extent of the punishment) exceeds the benefit of misbehaving (the bribe). The monetary punishment when caught can be the loss of a well-paid job (plus, possibly, the confiscation of personnal assets). In particular, high wages for government officials act as a potential deterrent to corruption [17]. A country with a low level of tax collection or with high procurement expenditures pays low wages to its civil servants, who are then encouraged to become corrupt. Corruption in turn reduces tax collection and raises procurement expenditures, creating new budgetary problems. This yields a poverty cycle.

An objection to the previous reasoning is that the government could borrow internally or externally in order to give decent wages to the civil servants, get rid of corruption and escape the poverty trap and then reimburse its debt. Let us note however that it may not be easy to borrow internally substantial sums of private money in a poor country (in which, furthermore, the rich prefer to put their money abroad for safety and confidentiality reasons). Borrowing abroad is not easy either, if only because foreign creditors are worried by the possibility of repudiation of the debt. It is interesting to note in this respect that major international lenders often require tough budgetary disci-

[16]See, e.g., Klitgaard (1988).

[17]Alternatively, a corrupt official can be punished with prison and other nonmonetary punishments. These nonmonetary punishments may be too harsh if the courts are corrupt and if false evidence of corruption can be created to eliminate rivals or political enemies.

pline as a precondition for their loans. Future research ought to investigate the feasibility of an escape from the poverty trap in a situation of imperfect capital markets.

7 Concluding remarks.

This paper has emphasized the idea that corruption tends to ratchet up and persist, and that anticorruption campaigns should be well targeted and sustained. It has not investigated why it is in practice difficult to run an anticorruption campaign. We conclude with a few remarks on this issue, which has two facets. It is difficult to obtain evidence, or even *information* about corrupt activities, and even cases for which information is available are *hard to prosecute.*

The difficulty in obtaining information about corrupt activities is well-known. A related phenomenon is the scarcity of prosecution of corporate crime even in countries with low levels of corruption and well functioning legal systems. Whistle blowers usually lose their job and have trouble finding a new one, perhaps because of the employers' fear of recidivism. This difficulty of obtaining evidence is compounded in the case of corruption by the fact that those who have the evidence (the potential whistle blowers) are often themselves corrupt and are afraid of prosecution. It would therefore seem warranted to combine rewards for whistle blowing and immunity for corrupt informers. These policies however are costly. The (commonly used) policy of granting immunity validates some forms of corruption; it therefore does not increase the expected punishment for corruption as much as one would expect. Granting rewards on the other hand is difficult, for the same reason why granting a reward for an innovation is not the most common mechanism to encourage research and development: One cannot in general

specify ex ante a reward that is commensurate with the value of the information before receiving this information. Lastly, one should not ignore the cost of having a society of informers. Organizations work better when their members trust each other. This trust is hardly divisible, in that it is difficult to induce beneficial cooperation among the members while preventing detrimental collusion [18]. Encouraging members of an organization to rat on each other has unavoidable side effects. As is the case for immunity programs, this objection does not invalidate the point that one needs to obtain information about corruption in some manner; the objection is but a warning that such policies are costly.

The difficulty in prosecuting corrupt individuals is also well documented. Courts themselves may be corrupt. Furthermore anticorruption campaigns are often launched but not implemented by lack of political will. It is too often the case that politicians or the military in their quest for power choose the fight against corruption as their primary objective, and, once in power, are more preoccupied by self-enrichment and by the consolidation of a political base by allowing corruption than by the fight against corruption [19].

Corruption is a complex phenomenon. The modest object of this paper has been to shed some light on some of its facets. We hope that the topic will soon receive from economic theorists the attention it deserves.

[18] See Tirole (1992) for a formal model.

[19] Well-known cases include Collor, de la Madrid, Marcos and Mobutu.

References

Akerlof, G. (1976) "The Economics of Caste and of the Rat Race and other Woeful Tales", *Quarterly Journal of Economics*, 91: 599-617.

Andvig, J.C. and K.O. Moene (1990) "How Corruption may Corrupt", *Journal of Economic Behavior and Organization*, 13:63-76.

Arrow, K. (1973) "The Theory of Discrimination", in O. Ashenfelter and A. Rees (eds.) *Discrimination in Labor Markets*, Princeton University Press.

Becker, G. (1968) "Crime and Punishment: An Economic Approach", *Journal of Political Economy*, 76:169-217.

Cadot, O. (1987) "Corruption as a Gamble", *Journal of Public Economics*, 33:223-244.

Coate, S. and G. Loury (1991) "Will Affirmative Action Policies Eliminate Negative Stereotypes?", mimeo, University of Pennsylvania and Harvard University.

Diamond, D. (1991) "Monitoring and Reputation: The Choice between Bank Loans and Directly Placed Debt", *Journal of Political Economy*, 99: 689-721.

Gould, D. (1980) *Bureaucratic Corruption and Underdevelopment in the Third World: The Case of Zaire*, New York: Pergamon Press.

Hager, M. (1973) "Bureaucratic Corruption in India: Legal Control of Maladministration" *Comparative Political Studies*, 6:197-219.

Jacoby, N., Nehemkis, P. and R. Eells (1977) *Bribery and Extortion in World Business: A Study of Corporate Political Payments Abroad*, New York: Mac Millan Publishing Co.

Klitgaard, R. (1986) *Elitism and Meritocracy in Developing Countries: Selection Policies for Higher Education*, Baltimore: John Hopkins University Press.

Klitgaard, R. (1988) *Controlling Corruption*, Berkeley: University of California Press.

Klitgaard, R. (1991) *Adjusting to Reality*, San Francisco: ICS Press.

Kremer, M. (1992) "The O-Ring Theory of Economic Development", Mimeo,

Krueger, A. (1974) "The Political Economy of the Rent-Seeking Society", *American Economic Review*, 64:291-303.

Laffont, J.J. and J. Tirole (1993) *A Theory of Incentives in Regulation and Procurement*, MIT Press.

Lui, F. (1986) "A Dynamic Model of Corruption Deterrence", *Journal of Public Economics*, 31:215-236.

Lundberg, S. and R. Startz (1983) "Private Discrimination and Social Intervention in Competitive Labor Markets", *American Economic Review*, 73:340-347.

Milgrom, P. and S. Oster (1987) "Job Discrimination, Market Forces and the Invisibility Hypothesis", *Quarterly Journal of Economics*, 102:453-476.

Myrdal, G. (1970) "Corruption as a Hindrance to Modernization in South Asia" in *Political Corruption: Readings in Comparative Analysis*, ed. A. Heidenheimer, New York: Holt, Rinehart and Winston.

Noonan, J. (1984) *Bribes*, New York: Mac Millan.

Phelps, E. (1972) "The Statistical Theory of Racism and Sexism", *American Economic Review*, 62: 659-661.

Rose-Akerman, S. (1978) *Corruption: A Study in Political Economy*, New York: Academic Press.

Sah, R. (1991) "Social Osmosis and Patterns of Crime", *Journal of Political Economy*, 99:1272-1295.

Strand, J. (1990) "Bureaucratic Corruption in Government Contract Procurement: A Theoretical Model", mimeo, University of Oslo.

Theobald, R. (1990) *Corruption, Development and Underdevelopment*, Durham: Duke University Press.

Tirole, J. (1992) "Collusion and the Theory of Organizations", in J.J. Laffont (ed.) *Advances in Economic Theory: Proceedings of the Sixth World Congress of the Econometric Society*, Cambridge: Cambridge University Press.

Appendix 1
(Incentives to cheat in a low corruption equilibrium)

Let V_k denote an agent's expected present discounted value of present and future payoffs when the agent has cheated k times in the past. These are "continuation valuations". An agent who has cheated k times in the past will cheat again only if

(A.1) $$G + \delta V_{k+1} \geq \delta V_k.$$

Suppose that the agent finds it optimal to cheat when he has cheated k times, and not to cheat when he has cheated $(k+1)$ times. Then

(A.2) $$V_k = (1 - x_k) B + x_k b + G + \delta V_{k+1} \geq (1 - x_k) B + x_k b + \delta V_k,$$

and

(A.3) $$V_{k+1} = (1 - x_{k+1}) B + x_{k+1} b + \delta V_{k+1}.$$

$(A2)$ and $(A3)$ yield

(A.4) $$G \geq \delta (x_{k+1} - x_k) (B - b)/(1 - \delta).$$

On the other hand, the agent prefers stopping to cheat with record $(k+1)$ to cheating once more and then stopping. So

(A.5) $$G + \delta \tilde{V}_{k+2} \leq \delta V_{k+1},$$

where

(A.6) $$\tilde{V}_{k+2} = (1 - x_{k+2}) B + x_{k+2} b + \delta \tilde{V}_{k+2}$$

(A.7) $$\left(\tilde{V}_{k+2} \leq V_{k+2}\right).$$

Equations $A5$ and $A6$ yield

(A.8) $$G \leq \delta (x_{k+2} - x_{k+1}) (B - b)/(1 - \delta).$$

Inequalities $A4$ and $A7$ are inconsistent with assumption 1. So if it is optimal to cheat with record k, it is also optimal to cheat with any record $k' > k$.