Corruption and Decentralisation

Emanuela Carbonara[*]
Wadham College, University of Oxford
Dipartimento di Scienze Economiche, Università di Bologna[†]

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Abstract

This paper studies the impact of decentralisation on corruption in a hierarchy, where decentralisation is intended as the delegation of power to lower levels. More decentralisation has a positive impact on corruption, raising individual propensity to accept bribes. It has also a two-fold effect on incentives to monitor corrupt activities by higher levels. It causes a loss in control, reducing their willingness to monitor. It also increases the bribe paid to lower levels, enhancing their propensity to corruption and raising the higher layers' monitoring. When this second effect dominates, decentralisation, although creating agency problems, can help in controlling corruption.

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[†]Address for correspondence: Dipartimento di Scienze Economiche, 2 piazza Scaravilli, 40126 Bologna, Italy. Tel. +39 051 209 8122. Fax. +39 051 209 8040. *e-mail*: carbonara@economia.unibo.it.

1 Introduction

This paper studies how the internal organisation of institutions influences their members' propensity to corruption. The aim is that of analysing which (and whether) institutional reforms are needed in systems plagued by widespread corruption.

The internal organisation specifies the allocation of powers to each member of an institution. A centralised setting attributes all powers to an oligarchy, concentrating them in the hands of very few individuals. A decentralised system spreads powers among several individuals, possibly specialising their competence. Between these two extremes, there is a variety of intermediate cases, each with its own impact on corruption.

We consider a hierarchy consisting of three layers, a principal, a manager (supervisor, *she*) and N agents. The principal tries to limit corruption by both choosing an appropriate allocation of power and providing incentives to each layer to monitor subordinates. We assume that corruption is harmful and should be minimised.[1] This is in line with the most recent literature, mainly empirical, which shows that corruption has highly undesirable effects on economic systems. Specifically, it decreases the rate of growth of a country's GDP and the productivity of public investments (see Mauro, 1995, Tanzi, 1998, Tanzi and Davoodi, 1997).

Traditionally, the discretionary power held by members of an organisation is regarded as one of the major sources of corrupt behavior. Klitgaard (1988) states that corruption depends positively on the amount of monopoly power and discretion enjoyed by the participants to an organisation. This statement is rather intuitive. The more specialised competencies are, the more those who hold power can abuse of it to pursue their personal interest, at the detriment of the whole organisation. It is also very likely that the bribers' willingness to pay increases with the power held by the bribee, because the latter has greater opportunities to succeed in performing the

[1] For quite a long time, corruption was not considered damaging but rather seen as a means to improve efficiency and help growth, especially in those developing countries where economic activity is impeded by red tape and bureaucratic regulations. See Bardhan (1997).

corrupt act he is being paid for. Then, the direct effect of decentralisation on corruption is positive.

This conclusion is incomplete, because it does not take into consideration the impact of decentralisation on monitoring and deterrence. Transferring power from one layer to another not only directly affects each layer's propensity to corruption, as described by Klitgaard. It also changes the incentives superiors have to monitor subordinates.

The intuition for the above statement can be provided as follows. As in Aghion and Tirole (1997), we distinguish between two different sources of power. There is the power attributed by a contract (*formal authority*) and the power that derives from the knowledge of crucial information (*real authority*). By revealing such information strategically, members of an organisation can pursue their own goals, even if they lack formal authority.

Delegation of formal authority lowers the superiors' incentives to perform their screening and detection activities because they have little power to stop the agents' decisions (this effect is called "basic trade off" in Aghion and Tirole (1997)). Decentralisation then encourages corrupt activities.[2]

There is also a countervailing effect. If the principal tries to enhance the incentives to monitor by paying managers a reward directly proportional to the number of corruption cases uncovered and to the amount of bribes retrieved, an increase in decentralisation raises the managers' monitoring effort, both because corruption tends to increase, as argued above, for any level of monitoring effort and because bribes are larger.[3]

If this second, "bribe - confiscation" effect dominates the basic trade off, equilibrium monitoring increases. Given that corruption reacts negatively to an increase in monitoring, we may have equilibria where specialisation and decentralisation decrease corruption.

We also show that there is always some corruption in equilibrium, no matter the degree of decentralisation or the intensity of incentives. This

[2]This confirms the statement in Rose-Ackerman (1978), that decentralisation increases the risk of corruption since it limits review and detection.

[3]We limit attention to linear incentives, without considering more complex schemes. This is in line with the empirical evidence, that shows the prevalence of such schemes in organisations, see Mookherjee and Png (1995).

result confirms the findings of previous literature on collusion and corruption.[4] According to that literature, sometimes it is too costly to eradicate corruption, given the means controlled by the principal. This partially explains what happens in our model, where the principal should increase the manager's payment beyond the level of retrieved bribes in order to induce a level of monitoring that discourages corruption. However, this result is due to the basic trade off, that keeps the manager's monitoring effort low enough to render some corruption always profitable. The manager also faces a trade off between allowing some corruption, that will yield rewards if uncovered and the losses from corruption, losses he suffers together with the whole organisation (for instance, lower bonuses at the end of the year or worse reputation on the job market). The optimal solution to such trade off implies a positive level of corruption.

Finally, if the manager too can be corrupt (and collude with subordinates when she discovers they are corrupt), overall corruption may be lower than with a honest manager. This is because more corrupt acts are committed and the organisation's performance is worse on average. At the margin, an additional corrupt act reduces the subordinates' expected gain from illegal activities, reducing their propensity to corruption. Moreover, the probability of obtaining a side payment higher than the compensation she would obtain if she denounced the agent enhances the manager's incentives to monitor. Interestingly, this result is more likely if the organisation is rather decentralised, because then the bribes exchanged are very large.

The issue of the design of institutions and corruption is central to the present political debate. The idea that institutional reforms are needed to reduce corruption and that the latter is influenced by the existing institutional structure is quite widespread (see various IMF and World Bank's reports). Our results stress that it is crucial not to overlook the changes in the structure of incentives that such reforms imply. Moreover, the presence of both a basic trade off effect and monitoring imperfections indicate that anti - corruption policies have to combine monitoring and detection with incentive schemes aimed directly at the corruptible layers (those in contact

[4]See Kofman and Lawarrée (1993) and Laffont and N'Guessan (1999)

with the bribers). In other words, institutional reforms *per se* cannot eliminate corruption. The empirical evidence on the subject seems to support these conclusions. The most striking examples are certainly Eastern European Transitional Economies and China. The situation in those countries is very peculiar because crime and corruption can exploit several legal loopholes that render them especially profitable, especially in Eastern Europe (particularly Russia). In both cases, decentralisation without setting up an efficient system of monitoring and without designing proper incentive schemes has brought a massive increase in corruption (see Manion, 1996 for references about China and Leitzel (1997) for Russia).

The paper is organised as follows. The next section describes the model. Section 3 characterises the consequences of decentralisation when only the lowest hierarchical layer is corruptible. Section 4 depicts the optimal anti corruption policy. Section 5 considers the problem of a corrupt top manager. Section 6 concludes. The Appendix contains the proofs.

1.1 Related Literature

The positive relation between monopoly power and the extent of corruption is stated also by Shleifer and Vishny (1993). When many officers are in charge of a decision, they exert a *multiple veto power* on each other, preventing the others from providing the corrupt service, reducing the "value" of their act. In their model, decentralisation unambiguously increases corruption, eliminating this veto problem. Banerjee (1997) claims that public bureaucracies are affected by corruption, red tape and weak incentives just because governments acts to improve social welfare. Paradoxically, inefficiencies and corruption would not occur if the government were not interested in social welfare, since the bureaucrats, allocating scarce resources to those people who have the highest ability to pay, would not be acting illegally.[5] Bac (1996) investigates the relation among the structure of hier-

[5] As Banerjee (1997), also Acemoglu and Verdier (1997) point out that the crucial issues in explaining corruption are agency problems between the government and its bureaucrats and the inability of the government to make interventions without recurring to a bureaucracy. The opportunity for the bureaucrats to gain rents from corruption can lead to misallocation of talents (as these rents will attract not only those who are more able to

archies, the monitoring technology and the extent of internal and external corruption. Structure of hierarchies means the number of layers and the span of control for each layer and not the allocation of power, as in our model. He concludes that a flatter hierarchy is to be preferred when monitoring is not specialised (a given monitoring effort implies the same detection probability on all subordinates, which is equivalent to saying that there are economies of scale in monitoring), whereas a steeper structure reduces the risk of internal corruption, because the total amount of bribes that could be used to corrupt the manager is lower.

Other contributions have considered the interaction of corruption at different levels of a hierarchy. Cadot (1987) shows, in a dynamic model, how the combination of strong power - e.g. regulatory or granting permits - and low wages for public officers create "basic incentives" for corruption, conclusion in line with the observation of high levels of corruption in many Third World countries. Basu, Bhattacharya and Mishra (1992) consider that not only lower officers have the problem of being caught after accepting a bribe, but also their corrupt superiors. Corruption becomes a recursive problem. A good deterrence policy is that of increasing the probability that a corrupt officer is caught rather than stiffening the penalty imposed.

2 The Model

The organisation Consider an organisation consisting of three hierarchical levels, a principal, a manager and N agents. The principal lacks either the expertise or the time to perform the activity the organisation has been set up for. She then delegates all her control power to the lower layers. She is aware that her organisation is affected by corruption and her aim is to reduce corruption. The principal decided the allocation of authority to the hierarchical layers below, chooses the penalties to impose on corrupt agents and the compensation policies for the manager who report cases of corruption.

The second hierarchical level is a central office (manager, *she*) who has

perform a particular activity, but also others, who would perform better if assigned to other tasks).

the task to coordinate the activities performed by the agents and to detect corruption.

The third level consists of N agents (representing local offices). Each agent (*he*) is in charge of one productive activity and has the task to screen a certain number of potential projects and to report information about them to the central office. Agents are in direct contact with "clients" or "project proponent".Both the top manager and the local offices can be corrupt.

To minimise corruption, the principal decides on the allocation of control, choosing whether to delegate the power to select a project to the central office or to the local ones. In the first case the central office checks the information reported by the agents and decides which projects to implement. In the second case, which correspond to a more decentralised setting, this decision remains in the hands of the local offices and the superior layer performs only tasks of general supervision and detection of corruption.

The activity performed in the organisation consists of selecting and realising many different projects.

Before production starts, the principal chooses the structure of the organisation, deciding the allocation of *formal authority*.

In that follows it will be assumed that the the agent has formal authority (decentralisation) with probability z, whereas with probability $1-z$ the manager is in control (centralisation).[6]

To interpret z, it could be imagined that the allocation of control depends on an external event, which occurs with probability z and whose occurrence takes place or is observed only after the parties have exerted effort but before project implementation.[7] It could also be imagined that each productive activity consists of a continuum of elementary decisions, to be taken simultaneously, so that z represents the share of those decisions delegated to the agent. By taking these decisions according to his own interests, the agent can jeopardise the top manager's objectives and prevent

[6]Probably, the two most common cases are $z=0$ (full centralisation) and $z=1$ (full decentralisation), however, modeling the degree of decentralisation as a continuous variable helps when comparative statics is performed. This procedure has no influence on the quality of the results, since a result verified for any z must be true also for $z \in \{0,1\}$.

[7]This would be a case of contingent control in the spirit of Aghion and Bolton (1992).

her from taking certain actions and z represents the share of veto powers in the agent's hands.

If the manager has formal authority, she is in the position to overrule the agents and pursue her own goals. Conversely, if the agents have authority, they are in charge of the decision process in the activity they control and the manager cannot intervene to change their decisions, even if they are at odds with her personal interests.

The principal can never be corrupt. This assumption is certainly plausible in case the organisation described were a private financial institution. It is hard to think that shareholders, especially those in control of the majority stake, choose to risk bankruptcy. Even in case of public institutions, if the aim is the elimination if corruption, there must be some corruption free body, like, for example, the civil society.[8]

Initially, it will be assumed that only agents can be corrupt. This hypothesis will be removed later.

Projects At the beginning of the production process, each agent is randomly matched with a "client", who proposes a project.

There are either good or bad projects. Each type occurs with *ex ante* probability $\frac{1}{2}$.

Payoff from good projects. All good projects are equal. They all yield a positive payoff to the principal. The top manager's profit from a good project is $G_1 > 0$, whereas the agent's payoff is $g_1 > 0$.

Payoff from bad projects. Bad projects cause a loss to all parties. They yield $-G_2$ and $-g_2$ (G_2, $g_2 > 0$) respectively to the principal and to the agent. Without bribery, a bad project would never be chosen.

Each project implies benefits and losses to all parties and not only for the principal. This hypothesis is intended to capture the idea that production decisions in an organisation affect all its members, in terms of both their productivity and reputation. In general, G_1 and g_1 have the nature of

[8]Elsewhere (Carbonara, 1999) we analyse the case where the highest layer is corruptible, showing how the organisation is shaped to maximise the principal's gains.

non-monetary, private benefits and losses and cannot be transferred. Generalising them to monetary payoffs is however possible. In that case, G_1 and g_1 can be interpreted as the increase (or decrease) in the parties' expected wage in the job market due to their performance. The assumption that all parties are affected by corruption is usually absent in principal-agent models of corruption but plays quite an important role in a party's decision to accept a bribe. For example, in the "pre-tangentopoli" era in Italy, it is plausible to assume that gains and losses from public-investment decisions were low. Choosing inefficient alternatives had little consequences for all bureaucrats. After the scandals that broke out in the early '90's there has been an increasing public concern about investment decisions. The press often reports cases of inefficiency and this brings about investigations where responsible are punished. The parameters G_1 and g_1 are a simple way to capture these aspects.

It is assumed here that the outcome of a project, by itself, does not constitute evidence of corruption. This can be justified with the hypothesis that the manager needs evidence to sue an agent, even if she could infer from the project's outcome that corruption took place.[9]

Production If agents recognise a good project, they always suggest it. If the project is bad, instead, two cases can occur: if the agent is honest, he reports what he found to the manager, who then discards the project. If the agent is corrupt, he lies to the superior, stating that the project is good.

The manager has the task to verify the nature of the recommended projects. She performs a different kind of monitoring when she has formal authority than when she has not. When she has formal authority, the manager verifies the reported information. This represents *ex ante* monitoring in the sense of Aghion and Tirole (1997): the superior monitors to acquire information that allows her to evaluate the decisions taken by the subordinate.

[9]Alternatively, it can be thought that the agent makes a mistake when assessing a project's quality. This feature can be introduced explicitly into the model by assuming that the agent observes a signal about the project's nature, signal correct with a given probability $\gamma > 0$. It would always be possible that the project is bad even if the agent is honest and observing a bad outcome would not imply that bribery occurred. However, it can be shown that this complicates notation without changing the nature of results.

In case she did not agree and has formal authority she can impose a different course of action. It is therefore monitoring that takes place before the agent exerts his actions and not after, that would be a mere assessment of the results obtained.[10] The flow of information goes upstream and screening is sequential. The superior layers have no opportunity to collect information directly because they have no direct contact with the projects and they can only verify the information reported by the subordinates, screening only the projects not previously rejected by some lower layer. The agents have then filtering power, which make them an indispensable character for clients.

If the agent has formal authority, he chooses and implements projects directly, without waiting for the manager's approval. Then, the manager's monitoring and project implementation are simultaneous and the manager checks to uncover corruption.

Only clients with bad projects bribe. Implementing a good project is always desirable and, if the clients know the nature of the project they propose, they try hard to prove their nature. For example, if they are denied implementation after refusing to pay a bribe, they can denounce the agent. However, also a scenario where both good and bad projects bribe is possible. Agents could avoid to pronounce a clear rejection for a good project that refuses to pay and simply delay implementation, until the client resolves to pay "to oil the wheels". To simplify the model, only bad projects offers a bribe. It can be shown that the alternative hypothesis would not change our results substantially.

The manager checks the information about one specific project with effort e_M (where the subscript M stays for *manager*) and learns with probability e_M the true type of the project suggested, $e_M \in [\underline{e}_M, \overline{e}_M]$, $0 < \underline{e}_M < \overline{e}_M < 1$. She repeats the same activity for all recommended projects, bearing a cost equal to

$$c_M(N^R, e_M) = N^R \frac{e_M^2}{2} \tag{1}$$

[10]This is the typical definition of monitoring in the incentive literature, *i.e.* *ex post* monitoring, where a more appropriate term would be *auditing* (see Baron and Besanko, 1984).

where N^R is the number of recommended projects.

The probability $1 - e_M$ then measures the extent of the agent's *real authority,* because it is when such circumstances occur that, no matter who actually holds formal authority, the agent has full decision power, being the other party uninformed.

Finally, if the manager is herself corrupt, an agent may try to collude with her, either to avoid being monitored in the first place or not to be denounced if found out having suggested a bad project.

Timing

1. The principal chooses the allocation of control power in the organisation.

2. The agent is matched with a client and screens the project he offers.

3. If bad, the client offers the agent a bribe.

4. The agent decides whether to accept and then communicates to the top manager the information he has and, when he has formal authority, the projects he is going to implement.

5. If the manager has formal authority, she screens the information obtained by all agents. If she discovers a bad project, she reports the agent to the principal and receives a share s of the bribe. The bad project is stopped.

6. If the agent has formal authority, projects are implemented and the manager screens for corruption.

The timing is depicted in Figure 1.

Preferences and Utility Functions The manager and the agents are risk neutral. Agents can be either corrupt or honest. We assume that being corrupt is not an intrinsic quality of agents but depends on the specific circumstances they find themselves in. Each agent has a private-information cost h of being corrupt, cost that measures their degree of honesty: the higher h, the more honest they are. If an agent is offered a bribe high enough, he becomes corrupt.

The allocation of power affects the amount a client is willing to pay. Usually, the bribe is increasing in the agent's discretion, for greater is the likelihood that a client obtains what he is paying for. In order to describe the parties' utility functions the cases of non-corrupt and corrupt agents should be distinguished.

No corruption (*first best*). If all agents are honest, only good projects are implemented. In this case there is perfect coincidence of interests between each agent and the manager.

Each agent has an expected payoff $U_A = \frac{g_1}{2}$, whereas the manager's total payoff is

$$U_M = N\left[\frac{G_1}{2} - \frac{e_M^2}{2}\right] \tag{2}$$

hence, the manager exerts only the minimum effort $\underline{e}_M$.

Corruption. In this case, both good and bad projects are recommended, bad provided that the clients who propose them offer the agents a bribe.

When the manager has formal authority, she can stop a bad project, if informed, which is a typical case of veto power. Moreover, on the basis of that information, the manager can take the agent to court. The bribe is confiscated (a share $s \leq 1$ given to the manager as a reward for cooperation) and the agent is fired. If the agent is corrupt, the probability of being caught depends on the central office's effort and is equal to e_M.

When the agents have formal authority a bad project cannot be stopped (by the same definition of *formal authority).* However, if the top manager has evidence that the project is bad, an agent can be convicted and the bribe confiscated. The manager obtains a share sb as compensation.

A client with a bad project attributes a value v to its implementation. His willingness to pay for corrupt services is therefore strictly linked to the probability of having his project chosen. This probability is increasing in the degree of decentralisation z and decreasing in the manager's effort e_M.

If the agent has formal authority (which happens with probability z), the client is sure to obtain implementation. If the manager has formal authority (case with probability $1-z$), the bad project is chosen only if the manager is not informed, which, given her effort e_M happens with probability $1-e_M$. Therefore, the client's willingness to pay is

$$b(z) = [1 - e_M (1-z)]\, v \tag{3}$$

The value v is common knowledge and agents have all the bargaining power and can behave as perfectly discriminating monopolists, seizing the entire client's willingness to pay (3). Each agent's cost h of being corrupt is distributed uniformly over the interval $[0,1]$. The higher h the less prone to corruption an agent is.

The agent's gain from being corrupt is

$$\Pi_A = (1-e_M)\,(b-g_2) - e_M z g_2 - h \tag{4}$$

if the agent decides to accept a bad project and the manager has not the knowledge to stop him, the agent suffers the expected loss g_2, but gains the bribe $b(z)$. When the manager has information and the project suggested is bad, the bribe is confiscated but the loss g_2 is born as long as the principal has not formal authority to stop the project.[11] Substituting $b(z)$ from (3) in the expression above and rearranging terms, the agent's gain from corruption becomes

$$\Pi_A = [1 - e_M(1-z)]\,[(1-e_M)v - g_2] - h \tag{5}$$

A corrupt agent (characterised by $h \leq \tilde{h}$) has the following payoff

$$U_A^C = \frac{g_1}{2} + \frac{1}{2}\Pi_A \tag{6}$$

The manager chooses her monitoring effort after having observed the agent's report, which can either be "yes, the project is good" or "no, it should be discarded". Given the structure of the model, when a project

[11]From (4) it can be seen that a corrupt agent, if caught by the manager, prefers to be stopped, that is he prefers not to have formal authority. When the agent is caught and the project stopped the bribe is confiscated, but if he has not formal authority, at least he does not bear the loss g_2.

is rejected it is never good, as even the most corrupt agent would never discard a good project. The manager never checks a negative report and monitors only the projects accompanied by a "yes" report (or, in case of agents' formal authority, the projects they implement).

If the loss G_2 from a bad project is small enough, when the manager is not able to find any information, she prefers to approve an agent's recommendation rather than implement no project. This requires that the expected return from a project chosen by an agent (who could be either honest or corrupt) is always positive.

Assume that the manager believes that an agent is corrupt with probability $\tilde{h}$. Then, she approves a project of unknown quality if the following condition is satisfied

Assumption 1 $\frac{1}{1+\tilde{h}}G_1 - \frac{\tilde{h}}{1+\tilde{h}}G_2 > 0.$

Assumption 1 represents the manager's expected payoff from a project recommended by an agent corrupt with probability $\tilde{h}$. The probability that the project is good conditional to having been recommended is $\frac{1}{1+\tilde{h}}$ and a good project yields G_1. The conditional probability that the project is bad and yield G_2 is $\frac{\tilde{h}}{1+\tilde{h}}$. [12] When *Assumption 1* is satisfied and the manager is not informed, even if she has formal authority, the agent will actually take the final decision (exert real authority).

Given the probability that an agent is corrupt, $\tilde{h}$, the manager's payoff, conditional on a good report, is

$$U_M = N\left(\frac{1+\tilde{h}}{2}\right)\left[\frac{G_1}{1+\tilde{h}} + \frac{\tilde{h}}{1+\tilde{h}}\left(e_M sb(z) - (1-e_M(1-z))G_2\right) - \frac{e_M^2}{2}\right] \tag{7}$$

[12] The conditional probability that a project is good given that it is recommended is obtained by Bayes rule $P(good \mid recomm) = \frac{P(good \cap recomm)}{P(recomm)}$. A project is recommended either if it is good or if the agent is corrupt. Then $P(recomm) = \frac{1+\tilde{h}}{2}$. Given that all good projects are recommended, the joint probability that a project is good and recommended is $\frac{1}{2}$. Then $P(good \mid recomm) = \frac{1}{1+\tilde{h}}$. Similarly, the conditional probability $P(bad \mid recomm) = \frac{P(bad \cap recomm)}{P(recomm)} = \frac{\tilde{h}}{1+\tilde{h}}$ since only corrupt agents recommend bad projects and the probability that a agent is corrupt is $\tilde{h}$.

where $N\left(\frac{1+\tilde{h}}{2}\right) = N^R$, the number of recommended projects. The first term in brackets in (7) represents the expected gain if the project is good (conditional probability of a good project times the gain from a good project). The second term is the expected payoff if the project is bad. If the manager has neither information nor formal authority, she cannot overrule the agent who proposes a bad project. Therefore, she bears the expected loss G_2. Conversely, if she has information, she bears the loss only to the extent the agent has formal authority and cannot be stopped (the share of control powers in the agents' hands is z). In any case, the manager is rewarded with a share sb of the bribe each time she denounces a corrupt agent, which happens if she is informed. The third term is the cost of monitoring.

3 Can decentralisation decrease corruption?

In this section we analyse the impact of decentralisation on all parties' optimal decisions. Also, the probability $\tilde{h}$ that an agent is corrupt is endogenised. The aim is that of finding the conditions that allow decentralisation to reduce corruption.

The principal pursues the objective of minimising equilibrium corruption $\tilde{h}^*(z,s)$ by choosing the degree of decentralisation z and the share s for the manager. After z and s have been chosen, agents report their information and the manager verifies it. Solving this game backwards, the interaction between the manager and the agents is considered first.

As long as $\Pi_A > 0$ in (5), the agent accepts the bribe. The value of h that, given e_M, makes an agent just indifferent between being corrupt and not being corrupt is found by solving $\Pi_A = 0$ and is

$$\tilde{h} = [1 - e_M(1-z)]\,[(1-e_M)v - g_2] \tag{8}$$

The value $\tilde{h}$ represents a threshold such that all agents with $h < \tilde{h}$ choose to be corrupt, whereas all those with $h > \tilde{h}$ prefer to remain honest. If $F(\tilde{h}) = \Pr(h < \tilde{h})$ (in this case just equal to $\tilde{h}$ due to the uniform distribution of h over the interval $[0,1]$), $F(\tilde{h})$ represents also the share of corrupt agents and the diffusion of corruption.

In order for $\tilde{h}$ to be positive in equilibrium, given that $1 - e_M(1 - z) > 0$, it must be that $[(1 - e_M)v - g_2] > 0$ in (8), *i.e.*

$$e_M < \tilde{e}_M = \frac{v - g_2}{v} \tag{9}$$

Notice that $0 < \tilde{e}_M < 1$ if $v > g_2$. Then, if the loss to the agent is larger than the client's valuation of the project, corruption is not possible. Conversely, if v is large, a relevant value $\tilde{e}_M$ always exists. We therefore introduce the following assumption

Assumption 2 $v > g_2$.

From expression (8) two important properties of the model can be obtained. All proofs are relegated to the Appendix.

Lemma 1. *Given e_M, $\tilde{h}$ is increasing in z.*

Lemma 1 implies that, other things being equal, the direct effect of an increase in the agent's formal authority increases corruption. An agent with more power has better opportunities to implement a bad project and this raises the client's willingness to pay. If monitoring is unchanged, a higher bribe inevitably implies a larger propensity to corruption for each agent. Empirical evidence from transition economies seems to support this result. In those countries, decentralisation was not accompanied by an improvement in the measures against corruption, which has then increased massively.

Lemma 2. *As e_M increases, $\tilde{h}$ decreases, reducing corruption.*

Lemma 2 proves the negative effect of an increase in monitoring on the agents' propensity to corruption. When the manager increases her effort, raising the expected punishment for corrupt individuals, they choose to be less corrupt, unless the higher monitoring is compensated by an increase in the expected returns from bad projects (which does not happen here, because z does not vary).

Given z and s, from (7), the first order condition is [13]

[13]It can be checked directly from (7) that the second order condition for a maximum is satisfied.

$$e_M = \frac{\tilde{h}}{1+\tilde{h}} \left[sb(z) + (1-z)G_2 \right] \tag{10}$$

Substituting the for the expected bribe $b(z)$ from (3) and solving for e_M, we find the manager's optimal response to $\tilde{h}$, response that takes into account the changes in the expected bribe due to changes in monitoring effort.

$$e_M(\tilde{h}) = \frac{\tilde{h}\left(sv + (1-z)G_2\right)}{\left(1+\tilde{h}\right) + sv\tilde{h}(1-z)} \tag{11}$$

This allows us to show the next result.

Lemma 3. *(i)The manager's reaction function $\phi(e_M)$ is overall increasing and strictly convex. (ii) Corruption as a function of e_M, $\tilde{h}(e)$, is discontinuous at $e_M = \tilde{e}_M$. It is decreasing and convex with respect to e_M for $e_M \in [0, \tilde{e}_M)$ and then reaches 0 for $e_M \in (\tilde{e}_M, 1]$.*

The properties of the schedule $\tilde{h} = \tilde{h}(e)$ have been discussed before.

The manager's reacts positively to an increase in expected corruption. A higher $\tilde{h}$ implies a larger probability both to retrieve a share s of a bribe and to bear a higher loss from bad projects, loss that could be stopped if the manager were informed. The manager's incentives to exert effort are thus enhanced. The function $\phi(e_M)$ is convex, which means that expression $e_M(\tilde{h})$ is concave. Effort increases at decreasing rates, property that reflects decreasing returns to monitoring for given z. This effect is due to the fact that an increase in $\tilde{h}$ raises the number of projects the manager has to monitor, which causes an overload effect (represented in expression (10) by the term $(1+\tilde{h})$ at the denominator). The manager's cost, in fact, depends positively also on the number of recommended projects (see expression (1)). The schedules $\phi(e_M)$ and $\tilde{h}(e_M)$ are represented in Figure 2.

The existence of a value $\tilde{e}_M$ such that for $e_M > \tilde{e}_M$ there is no corruption means that there are levels of monitoring in the admissible range such that corruption is inhibited. However, as it is also possible to infer from Figure 2, such levels of monitoring never occur in equilibrium. The following proposition formalises this result.

Proposition 1. *If $v - g_2 > 0$, there exists a unique equilibrium $(e_M, \tilde{h}^*)$, with $e_M \in [0, \tilde{e}_M)$ and $\tilde{h}^* \in [0, \min\{v - g_2, 1\}]$.*

Proposition 1 is the main result in this section and implies that if the client willingness to pay is high enough (or, conversely, if the loss due to a bad project is not too large) and Assumption 2 holds, at the equilibrium detection is not enough to prevent corruption, which is always positive. Given the size of the losses g_2 and G_2, the bribe $b(z)$ and the degree of decentralisation z, this equilibrium is unique. The intuition for this result lies in the fact that corruption represents a source of income for the manager, who is rewarded each time she discovers a corrupt act. She faces a trade off, where she balances gains and losses from corruption and the optimal strategy is to admit some corruption, limiting her monitoring effort. The manager's incentives to monitor are also reduced by the basic trade off, that reduces her power to intervene when corruption takes place, and by the positive probability that she is not informed and therefore not able to stop a bad project.

4 Policies to reduce corruption

At the stage before, the principal chooses z and s, $0 \leq s, z \leq 1$ to minimise equilibrium corruption $\tilde{h}^*(z, s)$.

The following result is immediate to check.

Lemma 4. *In equilibrium, for any z, $\tilde{h}^*(z, s)$ is always decreasing in s.*

The manager's effort is always increasing in s, which means that, for any level of $\tilde{h}$, the manager's reaction function shifts outwards. An agent's propensity to corruption does not depend directly on s, then the only effect that matters is the indirect one, through e_M. Lemma 2 establishes that higher monitoring implies lower corruption.

From the mere point of view of reducing corruption $s^* = 1$, even if, in a more general setting, the principal may prefer to reinvest a share of the proceeds from fighting corruption to improve police equipment or hire external auditors and detectives. [14]

[14] It can be shown that, from a quantitative point of view, a more general specification

Differentiating the manager's reaction function given by (11) with respect to z the following result can be proved.

Lemma 5. *Given $\tilde{h}$, $\frac{\partial e_M}{\partial z} < 0$ if and only if $\tilde{h} < \tilde{h}_G = \frac{2G_2}{s^2 v^2}$.*

Lemma 5 states that the manager reduces her effort when the degree of decentralisation increases if and only if corruption is low. As already shown, more decentralisation causes a loss in control to the manager, who becomes less able to interfere with the agent's decisions and faces weaker incentives to exert effort and bear the cost of it. When there is little corruption, the manager has not much incentive to monitor because the probability of discovering corrupt acts and being rewarded is low. An increase in decentralisation raises the number of cases where the manager cannot stop a bad project even if informed and her effort is ineffective. Then, she tends to save on effort costs reducing e_M. This is more likely to happen when G_2, the loss the manager suffers from a bad project, is high relative to $s\,v$, the share of the bribe she receives if she discovers and reports corruption. In this case, the basic trade off dominates.

Conversely, if $\tilde{h} > \tilde{h}_G = \frac{2G_2}{s^2 v^2}$, the manager's reaction function moves downward when decentralisation increases, implying a higher effort e_M for any level of $\tilde{h}$. In this second case, the bribe - confiscation effect dominates. Since $\tilde{h}$ is large, the probability of discovering corruption is relatively higher and decentralisation increases the bribes paid to agents. The manager's incentives to monitor become stronger.[15]

The main issue we want to investigate in this section is how equilibrium corruption changes with decentralisation. Lemma 1 has shown that, for given e_M, an increase in z increases corruption. We now check whether this result still holds in equilibrium, when e_M too changes.

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would entail a different value $0 < s^* < 1$ and a different z. Qualitatively, the conclusions presented in this section would be confirmed.

[15]To show that the sign of $\frac{\partial e_B}{\partial z}$ depends on the relative size of the basic trade off vs the bribe confiscation effect, totally differentiate expression (10), that gives e_B for given $\tilde{h}$ and b. Obtain $\frac{de_B}{dz}\left(2 - \tilde{h}s\frac{\partial b}{\partial e_B}\right) = \tilde{h}s\frac{\partial b}{\partial z} - 2G_2$. The l.h.s. is positive, since $\frac{\partial b}{\partial e_B} < 0$. The r.h.s. has an ambiguous sign. If the bribe confiscation effect $\tilde{h}s\frac{\partial b}{\partial z} > 0$ (recall $\frac{\partial b}{\partial z} > 0$) is larger than the basic trade off effect G_2, then $\frac{\partial e_B}{\partial z} > 0$ and vice-versa.

Proposition 2. *(i) When* $\frac{\partial e_M}{\partial z} < 0$, *(the basic trade off dominates)in equilibrium* $\frac{d\tilde{h}^*}{dz} > 0$, *whereas* $\frac{de_M^*}{dz} \gtrless 0$. *(ii) When* $\frac{\partial e_M}{\partial z} > 0$, *(the bribe - confiscation effect dominates)* $\frac{de_M^*}{dz} > 0$ *and* $\frac{d\tilde{h}^*}{dz} \gtrless 0$.

If the basic trade off is strong enough, the agent's expected gain decreases with decentralisation. Her incentives to monitor are lower and corruption raises in equilibrium. Conversely, given that the bribe paid to agents increases with decentralisation, the manager's reward is larger too. If this second, bribe - confiscation effect, is stronger than than the basic trade off, monitoring is higher in a decentralised environment. If the change in z provokes a big reaction in e_M^*, theindirect, negative impact of increased deterrence on $\tilde{h}$ dominates the direct, positive influence due to the higher bribe and $\tilde{h}^*$ decreases in equilibrium. In this case, decentralisation can prove an effective device to fight corruption.

5 A corrupt manager

So far, we have ruled out the possibility that the manager is corruptible and can help agents to implement bad projects in exchange of a side payment. We now introduce this possibility, finding that a new, more powerful version of the bribe - confiscation effect always increases the manager's effort in equilibrium, whereas the final effect on corruption is still indeterminate, depending on the strength of the contrasting forces highlighted by Lemmas 1 and 2. More interestingly, at a given level of decentralisation, a corrupt manager tends to work harder than an honest one if z is large. In fact, with high decentralisation, a honest manager has little power to avoid bad projects and low incentives to work. Conversely, a corrupt manager bears losses from bad projects in any case, because she accepts them in order to obtain the side payment from the agent. When z is large, bribes and corruption are both high, which improves monitoring.

The game in this section is as follows. If the manager finds out that a project is bad and that the agent who recommended it is corrupt, she demands a side payment in order not to denounce him and, when she has formal authority, not to stop the project.[16] If the payment is made, the

[16] It can be checked that both the manager and the agent strictly prefer to stop a bad

project is completed and the agent retains his job. If the manager holds all bargaining power, she will ask for the entire bribe paid to the agent, $b(z)$.[17]

The timing of the game is modified as follows

1. the principal chooses z and s.

2. The agent is matched with a client.

3. If bad, the client offers a bribe to the agent.

4. The agent decides whether to accept and then reports to the manager the information he has, and, when he has formal authority, the projects he has chosen.

5. If the agent has formal authority, selected projects are implemented. If the manager detects corruption, the agent has to transfer the bribe to her.

6. If the manager has formal authority and detects corruption, the manager approves the agent's recommendations if and only if the agent commits himself to transfer her the bribe he receives from the client.[18] Projects are then implemented.

In order to render the analysis more interesting, we assume that clients cannot observe with certainty whether a manager is corruptible. If they knew the manager's nature with certainty, they would be sure that their (bad) project is going to be implemented. Their willingness to pay would not depend on z and would always be equal to v, the value they attach to their bad projects. Then, neither the manager's nor the agents' payoffs

project. We assume however that they have reputation concerns that prevent them from doing so. Moreover, in many legal systems, punishments for bribers are relatively mild. If let down, they may be tempted to denounce corrupt agents.

[17] It can be checked that different distributions of the bargaining power would not change the results.

[18] Notice that here we consider only *ex-post* corruption, namely corruption takes place only *after* the manager monitored, once the agent has been discovered. There is also the possibility of *ex-ante* corruption, that is corruption *before* monitoring takes place. However, since trying to corrupt the manager would reveal the project's nature, the results and the size of the transfer would remain the same.

would depend on z and decentralisation would have no effects on equilibrium corruption. Since empirical evidence seems to suggest this is not the case, we assume that clients believe that the manager is honest with probability p (and corrupt with complement probability $1-p$). A client's willingness to pay therefore is v if the agent has formal authority, if the manager has formal authority but is not informed or, if informed, is corrupt. These three cases happen with total probability $z+(1-z)[(1-e_M)+e_M(1-p)]$. Then, the expected bribe is

$$b^{CM}(z) = [1 - e_M(1-z)p]\ v \tag{12}$$

Clearly, the manager is corrupt if the bribe is high enough to compensate her against all losses. Then it must be that[19] $b^{CM}(z) > G_2$. This condition can be rewritten as $e_M < \frac{v-G_2}{v(1-z)}$. Recalling that $0 \leqslant e_M \leqslant 1$, the previous inequality is always satisfied if $v - G_2 \geqslant vp(1-z)$, which happens if and only if $z > \frac{G_2 - v(1-p)}{vp}$. Given that $z \in [0,1]$, a necessary condition for $z > \frac{G_2-v(1-p)}{vp}$ is that $v > G_2$, the client's valuation for the project has to be greater than the manager's loss from it. Calling $\hat{z}$ the value of z such that $\hat{z} = \frac{G_2-v(1-p)}{vp}$, for any $z \in [0, \hat{z}]$ the manager is honest. For any $z \in (\hat{z}, 1]$, the manager is corruptible. Since we are interested in this second case, in the following analysis we are going to assume that

Assumption 3 $z > \hat{z}$.

Whenever clients observe $z > \hat{z}$, they believe that the manager is corrupt with probability p.

A corruptible manager's payoff is

$$U_M^{CM} = N\frac{1+\tilde{h}}{2}\left[\frac{G_1}{1+\tilde{h}} + \frac{\tilde{h}}{1+\tilde{h}}\left(e_M b^{CM}(z) - G_2\right) - \frac{e_M^2}{2}\right] \tag{13}$$

where the header CM stands for "corrupt manager". The number of recommended projects is $N\frac{1+\tilde{h}}{2}$. Given that they are recommended, there is a conditional probability equal to $\frac{1}{1+\tilde{h}}$ that each of them is good and a conditional probability $\frac{\tilde{h}}{1+\tilde{h}}$ that each is bad. In this latter case, an informed

[19]We assume that the manager's private cost of corruption is constant and normalised to zero.

manager gets the entire bribe $b(z)$ (and not only a share s of it), but also the loss G_2.

Differentiating (13), the first order condition for e_M yields

$$\frac{\tilde{h}}{1+\tilde{h}} b^{CM}(z) - e_M^{CM} = 0 \tag{14}$$

which is increasing in $\tilde{h}$ and $b(z)$. Substituting the expression for $b^{CM}(z)$ from (12) into (14) and solving out for e_M^{CM}, the manager's best response function is

$$e_M^{CM}\left(\tilde{h}\right) = \frac{\tilde{h}v}{\left(1+\tilde{h}\right) + \tilde{h}(1-z)pv} \tag{15}$$

It can be readily checked, by twice differentiating (15), that the inverse of $e_M^{CM}\left(\tilde{h}\right)$, $\phi^{CM}(e_M)$, is continuous, increasing and strictly convex. Moreover, for given $\tilde{h}$, an increase in z increases e_M^{CM}, that is $\frac{\partial e_M^{CM}}{\partial z} > 0$, the direct impact of decentalisation on the manager's effort is always positive. The intuition for this result is that a corrupt manager has the opportunity to uncover a higher bribe when decentralisation increases and faces stronger incentives to exert effort.

The agent's gain from corruption is

$$\Pi_A^{CM} = b(z)(1-e_M^{CM}) - g_2 - h \tag{16}$$

so that the threshold level $\tilde{h}$ is

$$\tilde{h}^{CM} = b(z)(1-e_M^{CM}) - g_2$$

substituting the value for $b(z)$ from (12) and rearranging terms

$$\tilde{h}^{CM} = [1 - e_M(1-z)p]\, v(1-e_M) - g_2 \tag{17}$$

Lemma 6. *(i) There exists a unique value* $0 < \hat{e}_M^{CM} < 1$, $\hat{e}_M^{CM} = \frac{(1+(1-z)p) - \sqrt{(1-(1-z)p)^2 + 4\frac{g_2}{v}p(1-z)}}{2p(1-z)}$, *such that* $\tilde{h}^{CM} > 0\ \forall e_M \in \left[0, \hat{e}_M^{CM}\right)$ *and* $\tilde{h}^{CM} = 0$ *elsewhere.*

(ii) The agent's propensity to corruption as a function of e_M, $\tilde{h}(e_M)$, *is overall decreasing and convex in* $\left[0, \hat{e}_M^{CM}\right]$.

The agent's gain from corruption is decreasing in the manager's monitoring effort: the property stated by Lemma 2 still holds. Differentiating equation (17) with respect to z it can be seen that $\frac{\partial \tilde{h}}{\partial z} = (1 - e_M) e_M pv > 0$. Decentralisation, increasing the expected bribe $b^{CM}(z)$, has a positive direct effect on $\tilde{h}$. Then also Lemma 1 is still true.

The results in Proposition 2 are then modified as follows.

Proposition 3. *In equilibrium,* $\frac{d e_M^*}{d z} > 0$. *If the direct impact of z on e_M^*,* $\frac{\partial e_M^*}{\partial z}$ *is large enough, then* $\frac{d \tilde{h}^*}{d z} < 0$.

Differently from Proposition 2, decentralisation always increases the manager's monitoring effort in equilibrium. If this increase is large enough, decentralisation decreases equilibrium corruption. When the manager is corruptible, the only effect still at work is bribe-confiscation, whereas the basic trade off does not exist. In fact, as shown above, $\frac{\partial e_M^*}{\partial z} > 0$ always. This is because the loss from a bad project is borne in any case by a corrupt manager, even when she has formal authority and discovers that corruption took place between the agent and the client. In that case, she does not stop the project, but only requires a side payment from the agent. More decentralisation means a higher prospective bribe to seize. If the bribe confiscation effect is strong enough, the manager responds to an increase in decentralisation exerting a much higher effort, which may discourage an agent from accepting a bribe.

An interesting issue to explore is whether the presence of a corrupt superior increases corruption among the agents compared to the case where the manager is honest.

From equation (17) it can be seen that $\tilde{h}^{CM}$, for given e_M^{CM}, is lower than $\tilde{h}$ in (8). Moreover, it can be readily verified that the maximum monitoring level beyond which $\tilde{h}^{CM} = 0$, level established in Lemma 6, is $\tilde{e}_M^{CM} < \tilde{e}_M$ where $\tilde{e}_M$ is given by (9). Then, $\tilde{h}^{CM}$ lies always underneath $\tilde{h}$ and crosses the horizontal axis before. Both schedules have the same intercept $v - g_2$.

We can prove the following result. To simplify the algebra we consider only two values for p, $p = 1$ (that is, the client is sure that the manager is honest), $p = 0$ (the client is sure that the manager is corrupt). These two cases lead to very similar conclusions.

Proposition 4. *When $p = 1$, then*

(i) $s < \bar{s}$*, then, in equilibrium,* $\tilde{h}^{CM*} < \tilde{h}^*$ *but* $e_M^{CM*} \gtrless e_M^*$.

(ii) If $s > \bar{s}$*, there exists* $\bar{z}$*, such that, if* $z < \bar{z}$ *then, in equilibrium,* $e_M^{CM*} < e_M$ *but* $\tilde{h}^{CM*} \gtrless \tilde{h}^*$.

When $p = 0$, then

(iii) If $v > \bar{v}$*, then, in equilibrium,* $\tilde{h}^{CM*} < \tilde{h}^*$ *but* $e_M^{CM*} \gtrless e_M^*$.

(iv) If $v < \bar{v}$*, there exists* $\bar{\bar{z}}$*, such that, if* $z < \bar{\bar{z}}$ *then, in equilibrium,* $e_M^{CM*} < e_M$ *but* $\tilde{h}^{CM*} \gtrless \tilde{h}^*$.

If an honest manager is rewarded with a relatively low percentage of a retrieved bribe, for any level of $\tilde{h}$ her effort is higher if she chooses to be corrupt. In that case, she retrieves the entire bribe and the increase in her "reward" fully compensates the losses from bad projects. Similarly, a honest manager tends to exert more effort than a corrupt one if clients' willingness v to pay is very small. Such increase in e_M discourages corruption, that now, in the equilibrium is lower. Less corruption has a negative, indirect impact on monitoring, so that the final level e_M^{CM*} can be either larger or smaller than the honest manager's effort in equilibrium. Different is the case where the honest manager's reward is relatively high. Proposition 4, parts *(ii)* states that a corrupt manager works harder in a decentralised economy, because bribes are very high. Similarly, in part *(iv)* a corrupt manager exerts more effort when z is high, because the direct impact of z on $\tilde{h}$ increases her expected gain. Honest managers exert more effort in centralised environments, where the gains from stopping bad projects are large (they obtain a bigger share s of the bribe and avoid G_2) and outweigh a corrupt manager's benefit (who gets a low $b(z)$ and bears G_2). In a relatively decentralised environment, the presence of a corrupt superior unambiguously reduces corruption. Agents have a lower propensity to accept bribes when they face corruption at superior levels whereas a corrupt manager has a higher incentive to monitor. These two effects both work in the sense of reducing equilibrium corruption.

6 Conclusions

This paper has analyzed the effects of decentralisation on corruption in a hierarchical organisation, where decentralisation has been defined as the delegation of control power to lower layers. The principal stipulates a grand-contract with all subordinates, deciding how much control power to delegate them (all individuals placed at the same level receive the same contract) and how to compensate them if they report acts of corruption committed by their direct subordinates.

Decentralisation affects both the manager's incentives to monitor and the individual propensity to accept bribes. If the basic trade off dominates, the manager's best response is to decrease her effort when her power decreases. Hence, corruption tends to increase with decentralisation and the principal's best policy is to centralise. Conversely, if the bribe - confiscation effect dominates and is strong enough, decentralisation increases the marginal profitability of effort for the manager, who then monitors more. The higher level of monitoring discourages corruption and the principal's best policy is to decentralise.

Although a positive impact of decentralisation on monitoring here is obtained through monetary incentive schemes, a similar result may be obtained even without assuming that a manager is compensated by the principal directly. It is easy o imagine situations where a manager's payoff is proportional to the amount of bribes uncovered. For instance, her reputation improves substantially if she discovers serious cases of corruption, and she obtains higher private benefits.[20]

There are many institutions (either private or public) whose activity can be represented by the setting described above. The most direct example is that of a financial intermediary or a bank. There are N local offices or divisions, each specialised in a particular geographical area or in a given sector, who have to select projects to finance among many applicants. They screen

[20]In Italy, during the *"clean hands"* phase, many magistrates were involved in the investigation and prosecution of corrupt acts. However, it was those who handled the most serious cases, where huge bribes had been exchanged, who got the highest benefits, in terms of popularity, promotions and successful entry onto the political stage.

the projects proposed and report the information they find to the central office. As there is always a risky component in a project, a negative outcome can be either the result of "bad luck" or of a "bad" project, therefore a local office can decide to accept a bribe from a project of low quality and report false information to the superior layer. Another example is that of a public institution who has to implement projects in a given area, for instance, street lighting or motorways. In order to implement these projects, the institution stipulates procurement contracts with external firms, who have to be selected, in principle by following criteria of economic efficiency. Again, local offices (plausibly those situated in the area which is going to benefit from the project) have to screen applicants, who can bribe them to be chosen. It is because we think that our model applies to a variety of different scenarios that we have chosen to keep neutral names like "principal" and "manager" rather than "government" and "public officer". However, the main arena where our model can be tested and provide insights is that of governmental institutions and economic systems, especially developing countries and transitional economies, but also Western European ones, where bureaucrats and politicians are often corrupt.

An analysis of how institutions influence (and are also influenced) by corruption should be extended to the case where the whole hierarchy (and not only the last two layers) is corrupt. It is in this respect that the typical principal - agent framework, with which our papers maintains several links (although often rather weak), shows its main limits. Attention is then paid to the design of optimal incentive schemes that render corruption unattractive for agents and it is assumed that the principal is honest, which prevents the study of instances of rent seeking and rapacious behaviour at the top level. Indeed, this seems to be the problem affecting most corrupt economies, especially in developing countries. The literature on rent seeking seems to be not up to the task either. Usually it assumes complete and symmetric information, so that incentive problems are ruled out. An interesting direction of future research is the analysis of a framework where both these assumptions are removed, to study how a rapacious principal structures the organisation she control, delegating power to her subordinates in a way that maximises the rents she is able to extract from the organisations' productive activity.

In a related work (Carbonara, 1999) we show that a rent seeker may prefer a decentralised setting, especially when she faces a strong judiciary . We could then have cases where the amounts of rents collected are greater when subordinates hold monopoly power, result that contradicts the rent-seeking literature.

Finally, it would be very interesting to test the model presented in this paper empirically, trying to establish the effects of decentralisation on corruption in a cross section of countries. However, this is a very difficult task. Although corruption could be measured by means of qualitative indices like that provided by Transparency International (and used in other empirical works, like Mauro (1995) for instance), the real problem is to find proxies for the other variables in the model. Measuring the degree of decentralisation in a country is already a major difficulty. What could be used? A possibility may be the percentage of privatised assets. This proxy has the advantage of being rather homogeneous among countries but its main limit is that of being quite far from the definition of decentralisation adopted here. Another possibility may be the size of local governments. Apart from the actual availability of such data, which is rather limited, this proxy has the problem of not considering which powers are actually decentralised and the extent of the overlapping in competencies, elements which are crucial to our analysis. Other problems derive then from measuring the bribe - confiscation and the basic trade off effects. Possibly, the first effect may be proxied by monetary rewards to "inspectors" (mainly magistrates and the police) but the change in the incentives to monitor that follows a change in the allocation of powers seems a concept rather difficult to capture. Therefore, there is much room for future research in this direction.

A Appendix: Proofs

A.0.1 Proof of Lemma 1

From differentiation of expression (8), taking e_M as given.

□

A.0.2 Proof of Lemma 2

Given z, differentiating (8) with respect to e_M it can be checked that $\frac{\partial \tilde{h}}{\partial e_M} < 0$ if $e_M < \tilde{e}_M$.

□

A.0.3 Proof of Lemma 3

The first part of the lemma is proved by differentiation of (11). The second part follows from (8). When $e_M < \tilde{e}_M$, then $\frac{\partial \tilde{h}}{\partial e_M} < 0$ from (8) and $\frac{\partial^2 \tilde{h}}{\partial e_M^2} = 2(1-z)v > 0$. At $e_M = \tilde{e}_M$, $\tilde{h}(\tilde{e}_M) = 0$ and when $e_M > \tilde{e}_M$ then $\tilde{h} < 0$, so that, by definition of $\tilde{h}$, $\tilde{h} = 0$.

□

A.0.4 Proof of Proposition 1

If $v - g_2 < 0$ then $\tilde{h} < 0$, then, by definition of $\tilde{h}$, $\tilde{h} = 0$ and corruption is not possible. Assume $v - g_2 > 0$. Then, if $e_M = 0$, $\tilde{h}(0) = \min\{v - g_2, 1\}$. From (8) $\tilde{h}(e_M)$ is decreasing and convex for $e_M \in [0, \tilde{e}_M)$, at $\tilde{e}_M$ there is a discontinuity, so that $\tilde{h}(e_M)$ jumps to 0. Conversely, the manager's reaction function, $\phi(e_M)$ is always increasing and convex in e_M. Therefore, the two schedules will cross at a point $(e_M^*, \tilde{h}^*)$, with $e_M^* \in [0, \tilde{e}_M)$ and $\tilde{h}^* \in [0, \min\{v - g_2, 1\}]$.

□

A.0.5 Proof of Lemma 4

By the implicit function theorem, the impact of a change in s on equilibrium e_M^* is

$$\frac{de_M^*}{ds} = \frac{\partial e_M^*}{\partial s} + \frac{\partial e_M^*}{\partial \tilde{h}} \frac{d\tilde{h}^*}{ds} \tag{18}$$

whereas the impact on equilibrium corruption is

$$\frac{d\tilde{h}^*}{ds} = \frac{\partial \tilde{h}^*}{\partial e_M} \frac{de_M^*}{ds} \tag{19}$$

as the direct effect $\frac{\partial \tilde{h}^*}{\partial s} = 0$. If there is corruption in the system (*i.e.* $e_M^* < \tilde{e}_M$) then, by Lemma 2, $\frac{\partial \tilde{h}^*}{\partial e_M} < 0$. Therefore (19) reveals that $\frac{d\tilde{h}^*}{ds} \gtreqless 0$ iff $\frac{de_M^*}{ds} \lesseqgtr 0$.

The sign of $\frac{de_M^*}{ds}$ depends entirely on the sign of $\frac{\partial e_M^*}{\partial s}$. To show this, substitute (19) into (18) and solve out for $\frac{de_M^*}{ds}$

$$\frac{de_M^*}{ds} = \frac{\frac{\partial e_M^*}{\partial s}}{1 - \frac{\partial e_M^*}{\partial \tilde{h}} \frac{\partial \tilde{h}^*}{\partial e_M}} \tag{20}$$

Notice that $1 - \frac{\partial e_M^*}{\partial \tilde{h}} \frac{\partial \tilde{h}^*}{\partial e_M} > 0$, as $\frac{\partial e_M^*}{\partial \tilde{h}} > 0$ by Lemma 3 and $\frac{\partial \tilde{h}^*}{\partial e_M} < 0$. Therefore $sign\left[\frac{de_M^*}{ds}\right] = sign\left[\frac{\partial e_M^*}{\partial s}\right]$. Then we have proved that $\frac{d\tilde{h}^*}{ds} < 0$, given that $\frac{\partial e_M^*}{\partial s} > 0$ by (10). $\square$

A.0.6 Proof of Lemma 5

Straightforward, by differentiation of (10) with respect to z.

$\square$

A.0.7 Proof of Proposition 2

By the implicit function theorem, the effect of a change in z on equilibrium effort can be written

$$\frac{de_M^*}{dz} = \frac{\partial e_M^*}{\partial z} + \frac{\partial e_M^*}{\partial \tilde{h}} \frac{d\tilde{h}^*}{dz} \tag{21}$$

where $\frac{\partial e_M^*}{\partial z}$ is the direct effect and is negative when $\tilde{h} < \tilde{h}_G$, positive otherwise, by Lemma 5 and $\frac{\partial e_M^*}{\partial \tilde{h}}$ is the reaction of the manager to an increase in the expected level of corruption in the organisation and is positive by Lemma 3.

The effect of a change in z on equilibrium corruption, always by the implicit function theorem, is

$$\frac{d\tilde{h}^*}{dz} = \frac{\partial \tilde{h}^*}{\partial z} + \frac{\partial \tilde{h}^*}{\partial e_M} \frac{de_M^*}{dz} \tag{22}$$

where $\frac{\partial\tilde{h}^*}{\partial z} > 0$ by Lemma 1 and $\frac{\partial\tilde{h}^*}{\partial e_M} < 0$ if $e_M < \tilde{e}_M$.

Solving (21) and (22) $\frac{de_M^*}{dz}$ is

$$\frac{de_M^*}{dz} = \frac{\frac{\partial e_M^*}{\partial z} + \frac{\partial e_M^*}{\partial \tilde{h}}\frac{\partial\tilde{h}^*}{\partial z}}{1 - \frac{\partial e_M^*}{\partial \tilde{h}}\frac{\partial\tilde{h}^*}{\partial e_M}} \tag{23}$$

and

$$\frac{d\tilde{h}^*}{dz} = \frac{\frac{\partial\tilde{h}^*}{\partial z} + \frac{\partial\tilde{h}^*}{\partial e_M}\frac{\partial e_M^*}{\partial z}}{1 - \frac{\partial e_M^*}{\partial \tilde{h}}\frac{\partial\tilde{h}^*}{\partial e_M}} \tag{24}$$

Notice that $1 - \frac{\partial e_M^*}{\partial \tilde{h}}\frac{\partial\tilde{h}^*}{\partial e_M} > 0$ always. From (24), if $\frac{\partial e_M^*}{\partial z} < 0$, then $\frac{\partial\tilde{h}^*}{\partial e_M}\frac{\partial e_M^*}{\partial z} > 0$. Thus, if $\frac{\partial e_M^*}{\partial z} < 0$, $\frac{d\tilde{h}^*}{dz} > 0$ always. Equilibrium corruption increases with decentralisation.

In (23), $\frac{\partial e_M^*}{\partial \tilde{h}}\frac{\partial\tilde{h}^*}{\partial z} > 0$. Therefore, if $\tilde{h} < \tilde{h}_G$, so that $\frac{\partial e_M^*}{\partial z} < 0$ (the basic trade off dominates), $sign\left[\frac{de_M^*}{dz}\right]$ is ambiguous, positive if $\left|\frac{\partial e_M^*}{\partial z}\right|$ is small, negative if $\left|\frac{\partial e_M^*}{\partial z}\right|$ is large enough. This proves part *(i)* of Proposition 2.

Conversely, if $\tilde{h} > \tilde{h}_G$, then $\frac{\partial e_M^*}{\partial z} > 0$ (the bribe-confiscation effect dominates). In that case, $sign\left[\frac{de_M^*}{dz}\right] > 0$ always. According to (24), this leads to a decrease in equilibrium corruption iff $\left|\frac{\partial\tilde{h}^*}{\partial e_M}\frac{de_M^*}{dz}\right| > \left|\frac{\partial\tilde{h}^*}{\partial z}\right|$. This proves part *(ii)*.

□

A.0.8 Proof of Lemma 6

(i) The agent accepts (hence $\tilde{h}^{CM} > 0$), iff $b(z)(1 - e_M) > g_2$. Substituting the value for $b(z)$ from (12) and rearranging terms, the above equation becomes $(1-z))\,pe_M^2 - (1+(1-z)p)\,e_M + \left(1 - \frac{g_2}{v}\right) > 0$. If this equation admits real solutions e_{M1}, e_{M2}, $\forall e_M \in (e_{M1}, e_{M2})$ the equation is negative. The existence of real solutions is assessed by checking whether $(1-(1-z)p)^2 + 4(1-z)\,p\frac{g_2}{v}) > 0$, which is always true, given that $z < 1$. The two solutions are $e_{M1,2}^{CM} = \frac{(1+(1-z)p) \pm \sqrt{(1-(1-z)p)^2 + 4\frac{g_2}{v}(1-z)p}}{2P(1-z)}$. It can be easily checked that both roots are positive and that one is always greater than 1 whereas the other is always < 1. Then $\hat{e}_M^{CM} = \frac{(1+(1-z)p) - \sqrt{(1-(1-z)p)^2 + 4\frac{g_2}{v}(1-z)}}{2p(1-z)}$. *(ii)* It can be checked that $\frac{\partial\tilde{h}}{\partial e_M} < 0 \Leftrightarrow$

$e_M < \frac{1+(1-z)p}{2p(1-z)}$, but $\tilde{h}^{CM} > 0$ if and only if $e_M < \hat{e}_M < \frac{1+(1-z)p}{2p(1-z)}$. Finally $\frac{\partial^2 \tilde{h}}{\partial e_M^2} = 2p(1-z) > 0$ everywhere.

□

A.0.9 Proof of Proposition 3

The proof of this proposition follows the same guidelines in Proposition 2. Again, $\frac{de_M^*}{dz}$ is $\frac{de_M^*}{dz} = \frac{\frac{\partial e_M^*}{\partial z} + \frac{\partial e_M^*}{\partial \tilde{h}} \frac{\partial \tilde{h}^*}{\partial z}}{1 - \frac{\partial e_M^*}{\partial \tilde{h}} \frac{\partial \tilde{h}^*}{\partial e_M}}$ and $\frac{d\tilde{h}^*}{dz}$ is $\frac{d\tilde{h}^*}{dz} = \frac{\frac{\partial \tilde{h}^*}{\partial z} + \frac{\partial \tilde{h}^*}{\partial e_M} \frac{\partial e_M^*}{\partial z}}{1 - \frac{\partial e_M^*}{\partial \tilde{h}} \frac{\partial \tilde{h}^*}{\partial e_M}}$. Given that $\frac{\partial e_M^*}{\partial z}$, $\frac{d\tilde{h}^*}{dz}$ and $\frac{\partial e_M^*}{\partial \tilde{h}} > 0$, then the denominator of both expressions is always positive and $\frac{de_M^*}{dz} > 0$. In the expression for $\frac{d\tilde{h}^*}{dz}$, if $\left| \frac{\partial \tilde{h}^*}{\partial e_M} \frac{\partial e_M^*}{\partial z} \right| > \frac{\partial \tilde{h}^*}{\partial z}$, then $\frac{d\tilde{h}^*}{dz} < 0$.

□

A.0.10 Proof of Proposition 4

First of all we establish under which conditions, given $\tilde{h}$, a corruptible manager exerts more effort that an honest one.

Case with $p = 1$. Comparing (14) and (10) with $p = 1$, it can be seen that $e_M\left(\tilde{h}\right) < e_M^{CM}\left(\tilde{h}\right)$ if and only if $v\tilde{h}G_2 z^2 - \left[\left(1+\tilde{h}\right) + 2\tilde{h}v\right] G_2 z - \left[\left(v\left(1-s\right) - G_2\right)\left(1+\tilde{h}\right) - v\tilde{h}G_2\right] < 0$. If solved with respect to z as strict equality, this equation admits two real roots $z_{1,2} = \frac{\left(1+\tilde{h}\right)G_2 + 2G_2\tilde{h}v \pm \sqrt{\left(1+\tilde{h}\right)G_2\left[\left(1+\tilde{h}\right)G_2 + 4\tilde{h}(1-s)v\right]}}{2G_2\tilde{h}v}$. It is immediate to see that one root is > 1. If $s < \bar{s} = 1 - \frac{G_2\left(1+\tilde{h}(1+v)\right)}{v\left(1+\tilde{h}\right)}$, then the other root is < 0. In that case, $\forall z \in [0,1]$, $e_M\left(\tilde{h}\right) < e_M^{CM}\left(\tilde{h}\right)$ for any given $\tilde{h}$. Conversely, if $s > \bar{s}$, then

$$0 < \bar{z} = \frac{\left(1+\tilde{h}\right)G_2 + 2G_2\tilde{h}v - \sqrt{\left(1+\tilde{h}\right)G_2\left[\left(1+\tilde{h}\right)G_2 + 4\tilde{h}\left(1-s\right)v\right]}}{2G_2\tilde{h}v} < 1$$

and $e_M\left(\tilde{h}\right) < e_M^{CM}\left(\tilde{h}\right)$ $\forall \tilde{h} \in [0, \min\{v - g_2, 1\}]$ and $\forall z \in (\bar{z}, 1]$, whereas $e_M\left(\tilde{h}\right) < e_M^{CM}\left(\tilde{h}\right) \forall z \in [0, \bar{z}]$.

Case with $p = 0$. Comparing (14) and (10) with $p = 0$, it can be seen that $e_M\left(\tilde{h}\right) < e_M^{CM}\left(\tilde{h}\right)$ if and only if $(1-s)\,v\left(1+\tilde{h}\right)+(1-z)\left[sv^2\tilde{h} - G_2\left(1+\tilde{h}\right)\right] > 0$. A sufficient condition is $v > \bar{v} = \left[\frac{G_2\left(1+\tilde{h}\right)}{s\tilde{h}}\right]^{\frac{1}{2}}$. If $v < \bar{v}$, then $e_M\left(\tilde{h}\right) < e_M^{CM}\left(\tilde{h}\right)$ iff $z > \bar{\bar{z}} = 1 - \frac{(1-s)v\left(1+\tilde{h}\right)}{G_2\left(1+\tilde{h}\right)-sv^2\tilde{h}}$.

The proof to parts *(i)* and *(iii)* of the Proposition is the same. The manager's reaction function in (14) is continuous and monotonic in $\tilde{h}$. It can then be inverted. Define the inverse of the manager's reaction function as $\tilde{h} = \Phi(e_M)$, with $\Phi' > 0$ and $\Phi'' > 0$. Define instead the relationship between $\tilde{h}$ and e_M as $\tilde{h} = \Psi(e_M)$, with $\Psi' < 0$.

If $s < \bar{s}$, the presence of a corrupt manager rotates the manager's reaction function downwards, keeping the same vertical intercept. Assuming, for the moment, that $\tilde{h} = \Psi(e_M)$ does not move, the set of possible new equilibria is $S_\Phi = \left\{\left(e_M, \tilde{h}\right) : \tilde{h} < \Phi(e_M)\right\}$. The presence of a corrupt manager moves $\Psi(e_M)$ also downwards around the same vertical intercept. If $\Phi(e_B)$ does not move, the set of new possible equilibria is $S_\Psi = \left\{\left(e_M, \tilde{h}\right) : \tilde{h} < \Psi(e_M)\right\}$.

When we introduce the possibility that the manager is corruptible, both schedules shift and the set of possible new equilibria is given by the intersection of the two sets above: $S_\Phi \cap S_\Psi = \left\{\left(e_M, \tilde{h}\right) : \tilde{h} < \Phi(e_M); \tilde{h} < \Psi(e_M)\right\}$, the area below the curves $\Phi(e_M)$ and $\Psi(e_M)$ in Figure 3.

At the initial equilibrium with honest manager we have $\tilde{h}^* = \Psi(e_M^*) = \Phi(e_M^*)$. Then, given that $\Phi' > 0$ and $\Psi' < 0$, the only couples $\left(e_M, \tilde{h}\right)$ with $\tilde{h} < \Phi(e_M)$ and $\tilde{h} < \Psi(e_M)$ must have $\tilde{h} < \tilde{h}^*$. Viceversa, $e_M \in \left[0, \tilde{e}_M^{CM}\right]$, and, according to the magnitude of the shift in $\Psi(e_M)$ (and therefore the position of $\tilde{e}_M^{CM}$), we can either have $e_M^{CM*} > e_M^*$ or, vice-versa, $e_M^{CM*} < e_M^*$. Figure 3 depicts a case where $\tilde{e}_M^{CM} > e_M^*$ and $e_M^{CM*} > e_M^*$.

Parts *(ii)* and *(iv)* of the proposition follow the same guidelines. If If $s > \bar{s}$, but $z > \bar{z}$, then again $\Phi(e_M)$ and $\Psi(e_M)$ both move downwards and we are in the same case described in part *(i)*.

If $z < \bar{z}$ then $\Phi(e_M)$ moves upwards and $\Psi(e_M)$ downwards.

Assuming, for the moment, that $\tilde{h} = \Psi(e_M)$ does not move, the set of possible new equilibria is $S'_\Phi = \left\{\left(e_M, \tilde{h}\right) : \tilde{h} > \Phi(e_M)\right\}$. If instead $\Phi(e_B)$

does not move and $\Psi(e_M)$ does, the set of new possible equilibria is $S'_\Psi = \left\{\left(e_M, \tilde{h}\right) : \tilde{h} < \Psi(e_M)\right\}$. When both schedules shift, the set of possible new equilibria is given by $S'_\Phi \cap S'_\Psi = \left\{\left(e_M, \tilde{h}\right) : \Phi(e_M) < \tilde{h} < \Psi(e_M)\right\}$, the area between $\Phi(e_M)$ and $\Psi(e_M)$ in Figure 4.

In the correspondence of e^*_M, the equilibrium effort by a honest manager, by definition $\Psi(e^*_M) = \Phi(e^*_M) = \tilde{h}^*$. Given that $\Phi' > 0$ and $\Psi' < 0$, $\Phi(e_M) < \Psi(e_M) \iff e_M < e^*_M$. Hence, an equilibrium that belongs to $S'_\Phi \cap S'_\Psi$ can only have $e_M < e^*_M$.

To show that the effect on equilibrium corruption is ambiguous, first wee need to show that, given $\tilde{h} = \Psi^{CM}(e_M)$, where Ψ^{CM} is the manager's reaction function when she is corruptible, there exists e'_M such that $\Psi^{CM}(e'_M) = \tilde{h}^*$, where $\tilde{h}^*$ is equilibrium corruption with a honest manager and Ψ^{CM} is the relationship between the agent's propensity to corruption and monitoring with a corruptible manager.

Given that $\Phi' > 0$, Ψ^{CM} crosses $\Phi(e_M)$ at $e_{M1} < e^*_M$, where $\Phi(e_{M1}) = \Psi^{CM}(e_{M1}) = \tilde{h}_1 < \tilde{h}^*$, because $\Psi^{CM}(e_M) < \Psi(e_M)$. Since $\Psi' < 0$, introducing a corruptible manager, moving $\Phi(e_M)$ to $\Phi^{CM}(e_M)$, leads to a new equilibrium, $\left(e_{M2}, \tilde{h}_2\right)$, where $\Phi^{CM}(e_{M2}) = \Psi^{CM}(e_{M2}) = \tilde{h}_2 > \tilde{h}_1$.

$\Psi^{CM}(e_M)$ is continuous. Shifting $\Phi^{CM}(e_M)$ continuously, a schedule $\tilde{\Phi}^{CM}(e_M)$ can be found, such that it crosses $\Psi^{CM}(e_M)$ at $\left(e'_B, \tilde{h}^*\right)$, where $\Psi^{CM}(e'_M) = \Phi^{CM}(e'_M) = \tilde{h}^*$ and $e'_M < e^*_M$, as shown above.

Because $\Psi' < 0$, any schedule $\Phi^{CM}(e_M) < \tilde{\Phi}^{CM}(e_M)$ crosses $\Psi^{CM}(e_M)$ at a point $\left(e_{M3}, \tilde{h}_3\right)$, where $e_{M3} > e'_M$ and $\tilde{h}_3 < \tilde{h}^*$. Similarly,any schedule $\Phi^{CM}(e_M) > \tilde{\Phi}^{CM}(e_M)$ crosses $\Psi^{CM}(e_M)$ at a point $\left(e_{M4}, \tilde{h}_4\right)$, where $e_{M4} < e'_M$ and $\tilde{h}_4 > \tilde{h}^*$. □

References

[1] Acemoglu, D. and T. Verdier (1997), The Choice between Market Failures and Corruption, *Document de travail n°* 97-06, Delta, Paris.

[2] Aghion, P. and P. Bolton (1992), An Incomplete Contract Approach to Financial Contracting, *RES*, 59(3), 473-494.

[3] Aghion, P. and J.Tirole (1997), Formal and Real Authority in organisations, *JPE,* 105(1), 1-29.

[4] Bac, M. (1996), Corruption, and the Structure of Hierarchies, *J. of Law, Econ. and Org,* 12(2), 277-98.

[5] Banerjee, A.V. (1997), A Theory of Misgovernance, *QJE,* 112, 1289-1332.

[6] Bardhan, P. (1997), Corruption and Development:a Review of Issues, *JEL,* vol. *XXXV* (September), 1320-1346.

[7] Baron, D.P. and D. Besanko (1984), "Regulation, Asymmetric Information and Auditing", *Rand J. of Econ.,* 15(4): 447-470.

[8] Basu, K., S. Bhattacharya and A.Mishra (1992), Notes on Bribery and the Control of Corruption, *J. Public Econ.,* 48, 349-359.

[9] Becker, G. S. and G.J. Stigler (1974), Law Enforcement, Malfeasance, and the Compensation of Enforcers, *J. Legal Stud.*, vol. *III*, 1-19.

[10] Burkart, M., D.Gromb and F.Panunzi (1997), Large Shareholders, Monitoring and the Value of the Firm, *QJE,* 112, 693-728.

[11] Cadot, O. (1987), Corruption as a Gamble, *J. Public Econ.,* 33(2), 223-244.

[12] Carbonara, E. (1999), High Level Corruption and Institutions, *mimeo*, Dept. of Econ. Sciences, Bologna.

[13] Carrillo, J.D. (1995), Corruption in Hierarchies, *mimeo,* GREMAQ, Toulouse.

[14] Klitgaard (1988), *Controlling Corruption*, Berkeley, University of California Press.

[15] Kofman, F. and J. Lawarrée (1993), Collusion in Hierarchical Agency, *Econometrica,* 61, 629-656.

[16] Laffont, J-J. and T. N'Guessan (1999), Competition and Corruption in an Agency Relationship, *Journal of Development Economics*, 60: 271-295.

[17] Laffont, J-J. and J. Tirole (1993), *A Theory of Incentives in Procurement and Regulation,* The MIT Press, Cambridge, Massachusets.

[18] Leitzel, J. (1997), Corruption and Organized Crime in the Russian Transition, *mimeo*, University of Chicago.

[19] Manion, M. (1996), Corruption by Design: Bribery in Chinese Enterprise Licensing, *JLEO*, 12(1): 167-195.

[20] Mauro, P. (1995), Corruption and Growth, *QJE,* 110(3), 681-712.

[21] Mookherjee, D. and I.P. Png (1995), Corruptible Law Enforcers: How Should They be Compensated, *Econ. J.,* 105(428), 145-159.

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

[23] Sah, R. and J. Stiglitz (1986), The Architecture of Economic Systems: Hierarchies and Polyarchies, *AER*, 76, 716-727.

[24] Shleifer, A. and R.W. Vishny (1993), Corruption, *QJE,* 108(3), 599-617.

[25] Tanzi, V. (1998), Corruption Around the World: Causes, Consequences, Scope, and Cures, *IMF Working Paper,* no. WP/98/63, Washington, May.

[26] Tanzi, V. and H.Davoodi (1997), Corruption, Public Investment, and Growth, *IMF Working Paper,* no. WP/97/139, Washington, October.

[27] Tirole, J. (1986), Hierarchies and Bureaucracies: on the Role of Collusion in organisations, *J. Law, Econ. Org.,* 2, 181-214.

[28] Tirole, J. (1996), A Theory of Collective Reputation (with applications to the persistence of corruption and to firm quality), *RES,* 63(1), 1-22.

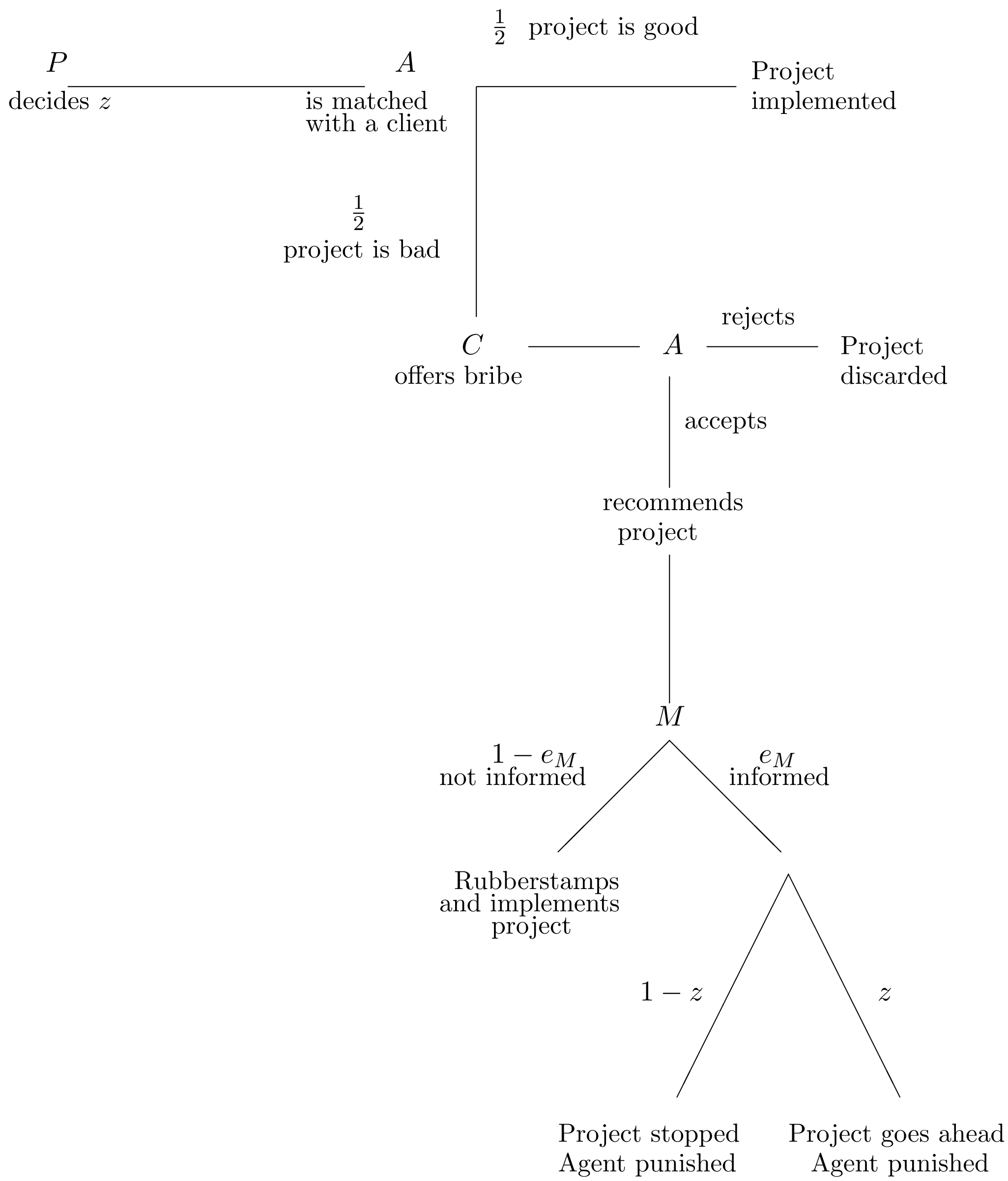

Figure 1:Timing of the game

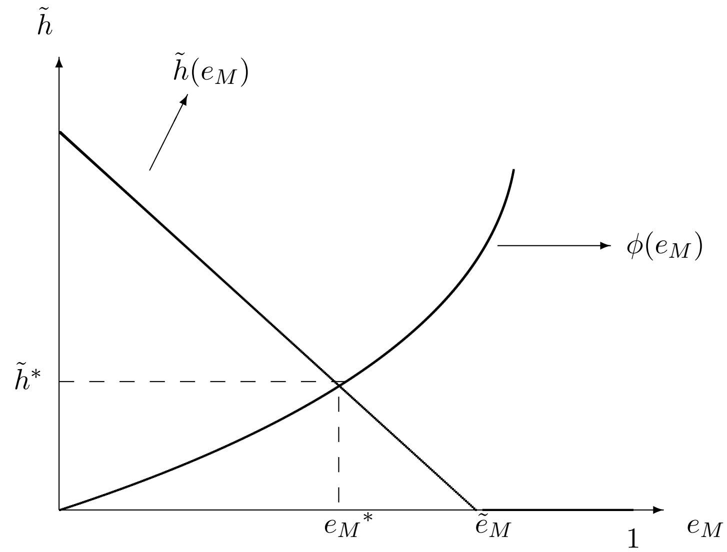

Figure 2:Equilibrium Corruption

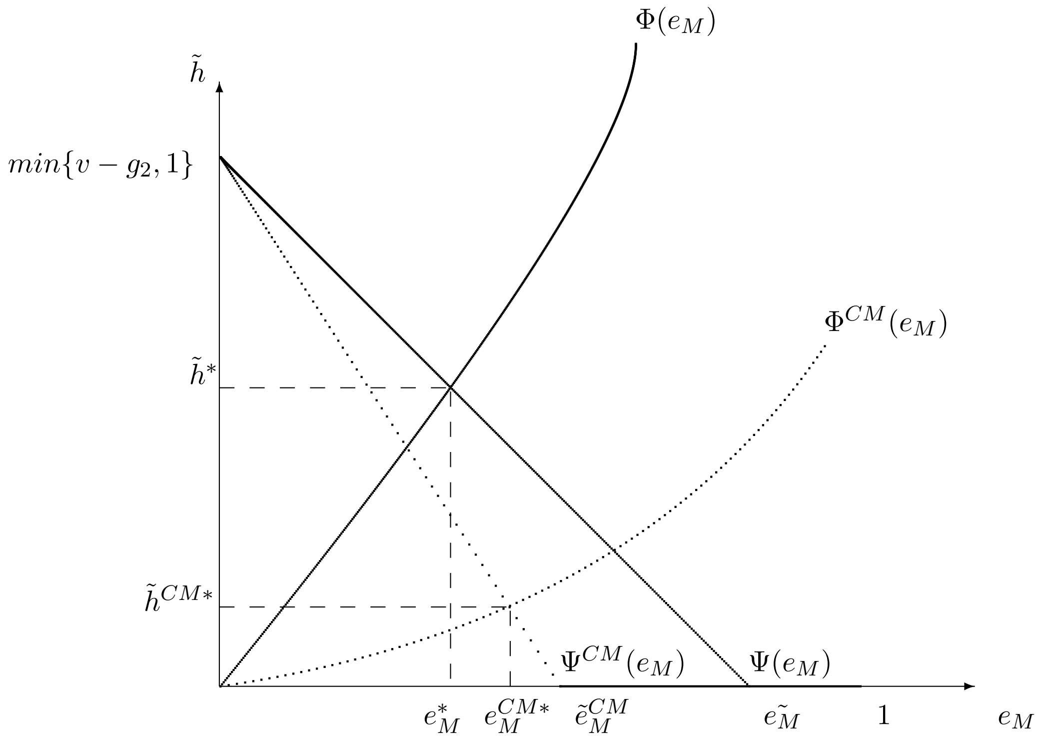

Figure 3: Corrupt manager with $s < \bar{s}$

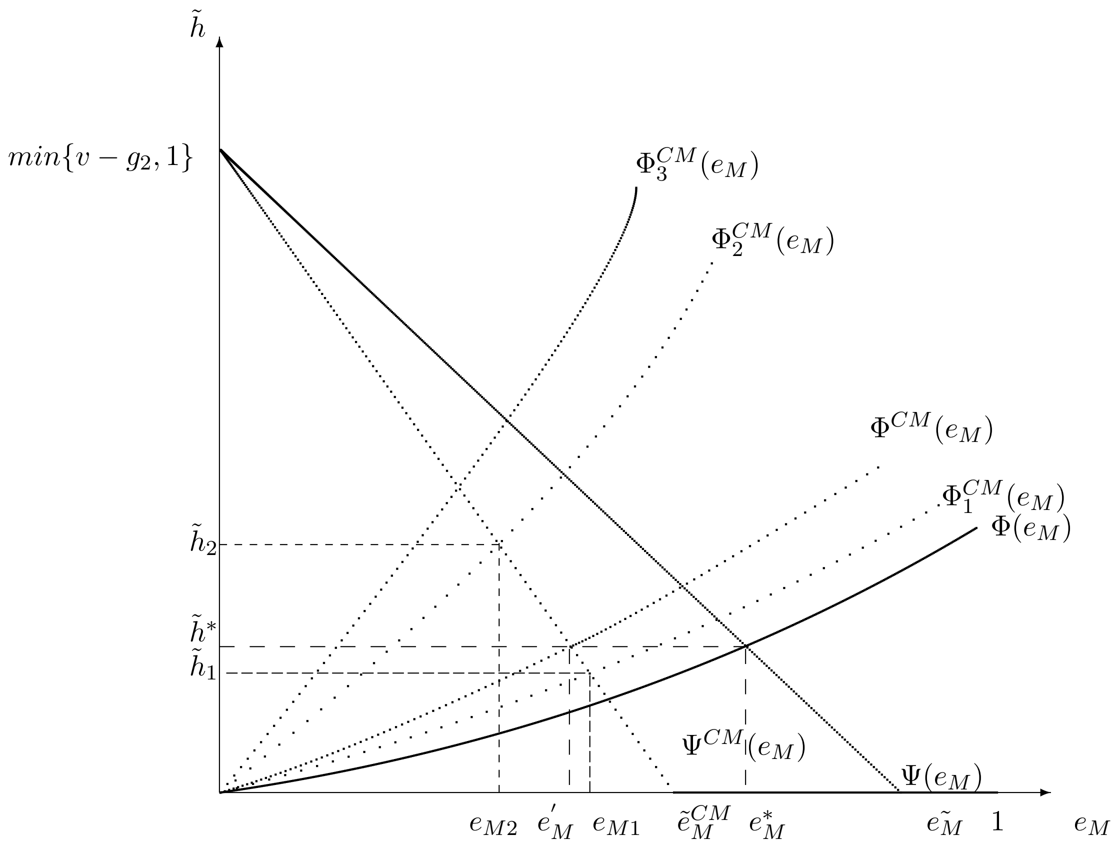

Figure 4: Corrupt manager with $s > \bar{s}$ and $z > \bar{z}$