Darke Side of Social Capital Social Preferences and Corruption

Jellal, Mohamed

Al Makrîzî Institut d'Economie

8 September 2009

Al Makrizi Institut D'économie

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Mohamed Jellal

Jellal2009@yahoo.fr

Abstract

Using the principal-agent- supervisor paradigm, this paper examines the occurrence of collusion in a setting where the principal has no information about the supervisor and the agent does not necessarily know the supervisor's preferences. We formally prove the occurrence of collusion is more likely when the agent has information about the supervisor. This result suggests that corruption, which is likely to emerge in long term reciprocal relationships between public officials and potential bribery, may be reduced by the means of staff rotation. Evidence from an experimental study supports this proposition.

1. Introduction

Corruption has long been recognized as an important and pervasive phenomenon, which strongly affects the creation and the distribution of wealth. This topic is of main interest for the international economic community, as shown by the numerous efforts from international organizations to propose solutions for this problem. Among the most important initiatives, one can mention ongoing international projects to fight corruption financed by the United Nations, the World Trade Organization and also the Council of Europe. For example among OCDE countries, a recent convention has been approved in order to combat bribery of foreign officials in international business transactions. The negative impact of corruption on economic development has been well documented (see the survey of Bardhan, 1997). Corruption affects the redistribution of surplus and creates distortions in the production of wealth owing to its illegal nature.

Many theoretical studies have paid an increased attention to this problem. The purpose of the economic research is to provide a better understanding of illegal activities and their organizations, in order to lessen the level of corrupt behavior. When studying how the magnitude of corruption can be reduced, two main initiatives can be identified[1].

A first set of instruments deals with a direct influence of public decisions upon individual behavior, for example with the help of moral campaigns and codes of conduct against bribery. A second set of instruments concerns a reforms of the organizational structure in which transactions take place and indirect arrangements to curb the development of corrupt activities. By analyzing how corruption is organized ranging from centralized structures to more decentralized systems in numerous countries, economic literature suggested that there may exist more favorable grounds for the emergence and the extension of corruption. Shleifer and Vishny (1993) argue that corrupt transactions are lower when they are organized that when they are competitive. The negative externalities that bureaucrats impose on each other are internalized to maximize corruption rent when bureaucrats collude in bribe setting. With centralization of bribery, the efficient cost of corruption is also minimized by the possibility of lump sum corruption (Bardhan ,1997).

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[1] In this debate, an important element is the distribution between external corruption which involves an individual violation of duty and internal corruption which is likely to take the form of collusion.

As one focuses on the environment in which bribery is more likely to emerge, we have to pay attention to the characterization of the relationships between public officials and potential bribers. In particular, it turns out that corruption is usually part of a long-term connection between the two parties, since bribery is built on strong reciprocity and trust. Even, if the context is different from corruption, it is usually found in experiments on public goods games that the level of cooperation is stronger with fixed partners than with random partners (Croson, 1996, Keser and Van Winden, 2000).This argues in favor of reinforcing effects of long-term relationships on the level of degree of collusion. Thus, this suggests a simple way to modify the occurrence of corruption. An incentive system which promotes rotation mechanisms of supervisory personnel is likely to prevent corrupt behavior at the individual level. To date, this potential impact of staff rotation on corrupt transactions has been largely neglected by the economic literature, with exception of Abbink (1999).

From an empirical viewpoint, Abbink (1999) attempts to test the effectiveness of this instrument using an experimental bribery game in which pairs of potential bribers and public officials are randomly matched in every round, a scenario which is compared with the analogous treatment with fixed partners. The results show that the introduction of staff rotation leads to a significant reduction in the level of corruption. But to the best to our knowledge, there exists no previous theoretical study on this valuable issue. While Bac (1996) suggests that rotation is an effective means to improve monitoring mechanisms, there is no formal proof in the literature that an official institution has an incentive to implement rotation of supervisory personnel as a measure against corruption. Therefore, the purpose of our paper is to consider this problem by studying the occurrence of collusion in a three-layer hierarchical structure, following the recent strand of literature that explores the principal-supervisor-agent paradigm.

Indeed, since the seminal contribution of Tirole(1986) and Laffont (1990), economists have extended the standard principal-agent model by including a third party, the supervisor. This situation, in which the principal is able to acquire information about the agent from the supervisor's report at lower cost, gives rise to the possibility of collusion between the supervisor and the agent in order to manipulate the information sent to the principal. In this context, it may be shown that a direct mechanism will be optimal and the supervisor will reveal his information truthfully to the principal, so that collusion does not arise in

equilibrium (see Kofman and Lawarrée, 1993, Tirole, 1986)[2]. However, this collusion-proofness principle is not expected to hold as one accounts for renegotiation between the agent and the principal after the latter has received information from the supervisor (Strausz,1997).Collusive behavior may also arise in equilibrium when there exists different types of supervisors with different levels of scruple (Tirole, 1992).

To study the theoretical impact of staff rotation on the level of corruption, this paper describes a principal-agent relationship with a supervisor in which we focus on the role of information structure between the agent and the supervisor upon the occurrence of collusion. In particular, we extend the previous literature to a setting where the principal has no information about the supervisor and the agent does not necessarily know the supervisor's preferences. The type of supervisor is given by a psychic cost entailed by the participation in corrupt transactions. Then we show this information structure affects the probability of collusion in a hierarchical organization. The main result of our paper is to provide a formal argument proof that rotation of supervisory personnel is indeed an effective measure in the combat against bribery.

The remainder of the paper is organized as follows. In section 2, we develop a basic model with a three-tier hierarchy: a principal, an agent and a supervisor. There exists a possibility of collusion between the supervisor and the agent. In section 3, we characterize the optimal side contract and the probability of collusion respectively when the agent does not know the supervisor and when the agent has information about the supervisor. In section 4, we formally prove that the occurrence of collusion is more likely in the latter case, suggesting that corruption may be reduced by the means of staff rotation. We also include evidence from an experimental study that argues in favor of this proposition. Concluding comments are in section 5.

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[2] In Kofman and Lawarrée (1993), the optimal incentive system is affected by the possibility of collusion with an external supervisor. Sometimes, the external/internal supervisor will not be used as a response to possible collusion.

2. The Model

We consider a three-tier hierarchy which involves a principal , an agent and a supervisor. For our presentation, we consider that the principal is the head of the tax collection agency, the supervisor is the tax collector, and the agent is the tax payer. There are two key assumptions in our model. On the one hand, the principal has never the supervisor's information structure. On the other hand, the agent may have information about the supervisor's preferences. Let us describe the structure of the model.

The principal, who is intended in controlling the agent's activity, want to get information about the exact level of income earned by the agent. The principal hires a supervisor to monitor the action of the agent and the principal offers a contract to the supervisor to discipline the agent. Before contracting takes place, the supervisor learns the agent's level of income. The role of the supervisor is to make a report to the principal, whose content is valuable source of information for the principal; then, the supervisor receives a payment from the principal depending on the report that he makes. This report, which specifies the agent's level of income, may be untruthful if the supervisor and the agent agree to collude. The report can only be untruthful if the tax collector and the taxpayer agree on sending a falsified report to the principal[3]. When collusion occurs, it is accompanied by a covert transfer from the agent to the supervisor. This transfer is part of an enforceable side-contract between the supervisor and the agent, which specifies the amount of covert transfer from the agent to the supervisor.

Let σ be the state if information obtained by the supervisor about the tax payer's economic situation. The type of agent is characterized by the parameter ω, which corresponds to his level of income. There are two cases. With probability $p \in [0,1]$, the supervisor observes the true value ω and $\sigma = \omega$. With probability $(1-p) \in [0,1]$, the supervisor learns nothing about the type of agent and $\sigma = \varnothing$. Thus, for a given ω, the supervisor's signal is defined by $\sigma \in \{\omega, \varnothing\}$. Now, let r be the supervisor's report to the principal. This report is also $r \in \{\omega, \varnothing\}$ (see Tirole, 1986, Laffont and Tirole, 1993). While the tax collector can only report $r = \varnothing$ if he has learned nothing about the agent, he can either tell the truth $r = \omega$ or send a falsified report $r = \varnothing$ otherwise. Hence, the knowledge of the type of agent ω may give rise to a rent for the supervisor.

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[3] As noted by Kofman and Lawarrée (1993), this means that the agent is unable to force the supervisor to send a falsified report and the supervisor cannot falsify the report without the help of the agent.

Indeed, when the tax collector's search for information has been fruitful, the supervisor is in a position to manipulate the information transmitted to the principal. Thus, the supervisor has a strategic role in the implementation of the tax policy decided by the fiscal authority. When the tax collector observes the income parameter of the taxpayer $\sigma = \omega$, the agent has then an incentive to collude with the supervisor, in exchange of the dissimulation of his true parameter ω (Tirole, 1986). The agent simply bribes the tax collector to prevent him from revealing the level of income ω. To suppress reporting, the side contract specifies an amount of covert transfers $b(\omega)$ from the agent to the supervisor as function of the type ω. The aim of bribery is to prevent the rent value $v(\omega)$ for the agent which is involved by the asymmetric information between the parties.

Let us examine in greater detail the possibility of collusion. A key assumption in our framework is that the preferences of the supervisor are never observed by the principal. In this incomplete information setting, the principal knows that the supervisor is expected to choose one the following issue. The tax collector may either i) refuse the side contract proposed by the agent and reveal the true information to the tax collection agency or ii) accept the side contract with a covert transfer which depends on the agent's level of income ω. If the supervisor when monitoring may either report the agent's type or accept bribe, there is still a probability that the supervisor detect the collusion between the tax collector and the taxpayer (see Mookherjee and Png ,1995). Hence, this threat of punishment if caught, for example by paying a financial penalty, may lead the supervisor not to accept the side-contract with the agent.

To account for this possibility of rejection of the side contract, we consider that the supervisor faces a psychic cost ψ when he agrees on collusion with the agent. This hypothesis clearly deals with the place of moral obligation in preference systems. In economic theory, a standard approach is to assume that the agents fee moral disutility when they attempt to infringe social convention[4]. For example, the supervisor may be morally reluctant to accept a bribe from the agent, as in the model of Besley and McLaren (1993) in which honest agents never take bribe and regard their integrity as priceless. In the context of the literature of

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[4] Qizilbash (1994) notes that the two approaches have to be distinguished concerning morals ans preferences. On the one hand, morality can directly enter into the individual's utility function through negative feelings. On other hand, moral considerations can be incorporated by the use of lexical preferences.

corruption, many studies have taken into account the existence of a psychic cost in terms of guilt or moral disgust when acting against the moral convention (see among other Block and Heineke, 1975, Andvig and Moene, 1990). Some agents may have higher psychic costs than others and more honest people are expected to get more disutility from bribery, since they attach a greater weight to the cost associated with collusion and the possibility of personal disgrace or shame if caught.

We make the following assumptions concerning this level of psychic cost ψ. It is defined on the state space $\Omega = [0,1]$ and it is characterized by the density function $h(\psi)$ and by the distribution function $H(\psi)$. In order to get closed forms solutions (without loss of generality), we further assume that this distribution function which is given $H(\psi) = \int_0^\psi h(c)dc$ can be written as

$$H(\psi) = \psi^\varepsilon,$$ (1)

where the parameter ψ and ε are such that $\psi \in \Omega = [0,1]$ and $\varepsilon \in [0,1]$

The tax collection agency rewards the tax collector for his report on the agent's income. Let $s(\omega)$ be the wage offered by the principal to the supervisor when the latter reports the observed signal $r = \sigma = \omega$. In that case, the supervisor which is characterized by the level of psychic cost ψ accepts the side contract offered by the agent if and only if the net benefit expected from collusion is greater than the level of wage proposed by the principal. Thus , the following condition must hold for the covert transfer $b(\omega)$:

$$b(\omega) - \psi \geq s(\omega) \qquad \forall \omega$$ (2)

Given the definition of the distribution function $H(\psi)$, the probability of collusion which is given by : $\Pr ob(b(\omega) - \psi \geq s(\omega))$ may be written as :

$$\Pr ob(b(\omega) - s(\omega) \geq \psi) = H(b(\omega) - s(\omega))$$ (3)

This probability indicates the frequency of collusive behavior among supervisors. The occurrence of collusion has a standard form. One can note that a tax collector is more likely to accept a side contract from the agent when the latter offers a high value for the covert transfer. Conversely, the probability of collusion is a decreasing function of the level of wage paid by the principal to the agent.

Our aim in this setting is to examine how the information structure about the psychic cost between the supervisor and the agent may influence the frequency of collusion between theses two parties. In the next section, we characterize the optimal side contract whether the agent has or no information about the supervisor's preferences.

3. The Pattern of Collusion

3.1 Asymmetric Information

We begin the analysis by the situation in which the agent has no information about the type ψ of supervisor. Since the revelation of the truth by the supervisor to the principal lowers the agent's rent, the tax payer offers a lateral transfer $b(\omega)$ to the tax collector, whose amount is given by the following proposition.

Proposition 1: *Under asymmetric information, the optimal* covert transfer of the side *contract offered by the agent to the supervisor is* :

$$b(\omega) = \frac{\varepsilon}{1+\varepsilon} v(\omega) + \frac{1}{1+\varepsilon} s(\omega)$$

Proof :

Since the agent does not know the preferences of the supervisor, the optimal amount of transfer is given by the maximization of of the net expected rent derived by the agent and defined by : $\Pr ob(b(\omega) - s(\omega) \geq \psi)(v(\omega) - b(\omega))$ \hfill (4)

Let $b(\omega)$ be the solution of :

$$b(\omega) = ArgMax \ H(\tilde{b}(\omega) - s(\omega))(v(\omega) - \tilde{b}(\omega))$$ \hfill (5)

The first order condition is :

$$\left(v(\omega)-\tilde{b}(\omega)\right)h(.)-H(.)=0 \Rightarrow \tilde{b}(\omega)=v(\omega)-\frac{H(.)}{h(.)} \qquad (6)$$

Given the distribution function $H(\psi)=\psi^{\varepsilon}$, we get the following condition:

$$\varepsilon(b(\omega)-s(\omega))^{\varepsilon-1}(v(\omega)-b(\omega))-(b(\omega)-s(\omega))^{\varepsilon}=0 \qquad (7)$$

so that we finally deduce the optimal solution :

$$b(\omega)=\frac{\varepsilon}{1+\varepsilon}v(\omega)+\frac{1}{1+\varepsilon}s(\omega) \qquad \text{(Q.E.D).}$$

Let us interpret the previous result. With uncertainty about the type of the supervisor, the agent proposes a side contract which induces the supervisor to mispresent the signal to the principal . When tax collector accepts the lateral transaction with the agent, the optimal bribe corresponds to a weighted sum (convex combination) of the rent $v(\omega)$ obtained by the agent and the wage $s(\omega)$ offered by the principal .On can remark that the share of the agent's rent received by the supervisor is an increasing function of the fraction $\dfrac{\varepsilon}{1+\varepsilon}$. In fact, this latter value indicates the mean level of the psychic cost for the tax collector. For $\psi \in \Omega = [0,1]$, the mean psychic cost is defined by : $E(\psi)=\int_{0}^{1}cdH(c)=\int_{0}^{1}\varepsilon c^{\varepsilon}dc=\dfrac{\varepsilon}{1+\varepsilon}$. So, the agent has to propose a higher amount of bribe to compensate a supervisor characterized by an important average psychic cost.

Corollary 1 *Under asymmetric information, the optimal probability of collusion and corruption is* :

$$H(b(\omega)-s(\omega))=H\left(\frac{\varepsilon}{1+\varepsilon}(v(\omega)-s(\omega))\right)=\left(\frac{\varepsilon}{1+\varepsilon}\right)^{\varepsilon}(v(\omega)-s(\omega))^{\varepsilon} \qquad .$$

Proof:

The probability of collusion is given by: $\Pr ob(b(\omega)-s(\omega)\geq\psi)=H(b(\omega)-s(\omega))$

From the proposition 1 the optimal lateral transfer is : $b(\omega)=\dfrac{\varepsilon}{1+\varepsilon}v(\omega)+\dfrac{1}{1+\varepsilon}s(\omega)$ and

hence par simple substitution ,we get our announced result ; the probability of corruption is:

$$H(b(\omega) - s(\omega)) = H\left(\frac{\varepsilon}{1+\varepsilon}(v(\omega) - s(\omega))\right) = \left(\frac{\varepsilon}{1+\varepsilon}\right)^{\varepsilon}(v(\omega) - s(\omega))^{\varepsilon} \qquad \text{(Q.E.D)}$$

We briefly examine how the probability of collusion is affected by modification of the supervisor's wage and the agent's rent. On the one hand, collusion between the two parties is more likely when the retention of information by the supervisor benefits the agent. Therefore, it is an increasing function of the rent $v(\omega)$: $\frac{\partial H}{\partial v(\omega)} > 0$. On the other hand, the probability of collusion is lowered by the level of salary offered by the principal to the supervisor, since the bribe becomes less attractive for the tax collector : $\frac{\partial H}{\partial s(\omega)} < 0$. An additional comments deals with the interpretation of the parameter $\varepsilon \in [0,1]$. We argue that this parameter may be seen as the elasticity of corruption between the supervisor and the agent. Indeed, it is equivalent to the shadow cost λ of the side transfer for the agent as defined in Laffont and Tirole (1993, chapter 11), using the equivalence $\lambda = \frac{1}{\varepsilon}$. Thus, the probability of collusion can be rewritten as $H\left(\frac{1}{1+\lambda}(v(\omega) - s(\omega))\right)$. Clearly , we have :

$$Lim_{\lambda \to \infty} H\left(\frac{v(\omega) - s(\omega)}{1+\lambda}\right) = 0 \qquad (8)$$

meaning that an infinite value of shadow cost of the agent's bribe prevents from collusive behavior among three-tier hierarchy[5].

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[5] Laffont and Tirole (1993) do not discuss the issue of the supervisor's preferences in problems of regulation under possible collusive behaviors in three-tier hierarchies. In our framework, the monetary value of the agent's collusive activity may be seen as endogenous.

3.2 Full Information

Now, we examine the problem when the agent has perfect information about the supervisor's type preferences ψ. For the two parties, there is again the possibility to sign a side contract that induces the supervisor to mispresent the agent's level of income to the principal. The tax payer attempts to bribe the tax collector in order to prevent him from revealing that the income ω is favorable to the agent. Thus, the supervisor and the agent are in position to bargain over the amount of lateral transfer.

It is well known that the issue of how the tax payer and the tax collector want to split the surplus generated by the side contract is only a matter of bargain power. For convenience, we make the following assumption on the bargaining process. The supervisor and the agent choose a side payment resulting from a Nash equilibrium. When the two parties play such a Nash game, the optimal transfer is given in the following proposition.

Proposition 2 *Under full information the optimal side transfer is :*
$$b(\omega) = \delta v(\omega) + (1-\delta)(\psi + s(\omega))$$
where δ is the measure of supervisor's bargaining power.

Proof:

The supervisor and the agent play a Nash game to determine the side transfer $b(\omega)$. The Nash equilibrium is given by the product of the rents respectively for the supervisor $(b(\omega) - \psi - s(\omega))$ and for the agent $(v(\omega) - b(\omega))$, with bargaining weight δ and $(1-\delta)$. Thus the optimal side contract is solution of :

$$b(\omega) = Arg \ \underset{\tilde{b}}{Max} \left(\tilde{b}(\omega) - \psi - s(\omega)\right)^{\delta} \left(v(\omega) - b(\omega)\right)^{1-\delta} \qquad (9)$$

The rent extracted by the supervisor depends on the psychic cost. From the first order condition, by simple derivation, we get the announced result:

$$b(\omega) = \delta v(\omega) + (1-\delta)(\psi + s(\omega)) \qquad \text{(Q.E.D)}$$

The characterization of the optimal side contract under full information is very close to the one under asymmetric information, but with an additional variable which is the psychic cost resulting from collusion. The covert transfer is now a weighted sum of the rent $v(\omega)$ obtained

by the agent and both the wage $s(\omega)$ and the moral cost ψ for the supervisor. When the tax collector accepts a bribe , he receives a full compensation which is an increasing function of these two variables , $s(\omega)$ and ψ. Finally, the transfer varies in accordance with the bargaining powers of the two parties. The share of the agent's rent received by the supervisor is increasing in his own index of bargaining power δ.

Corollary 2 *Under full information, the optimal probability of corruption is given by:*

$$H(b(\omega) - s(\omega)) = H((v(\omega) - s(\omega))) = (v(\omega) - s(\omega))^{\varepsilon} \qquad .$$

Proof:

From the definition of the occurrence of corruption and by substitutions we obtain :

$\Pr(\psi \leq b(\omega) - s(\omega)) = \Pr(\psi \leq \delta v(\omega) + (1 - \delta)(\psi + s(\omega)) - s(\omega))$, hence we can write : $\Pr(\psi \leq b(\omega) - s(\omega)) = \Pr(\psi \leq v(\omega) - s(\omega)) = (v(\omega) - s(\omega))^{\varepsilon}$ which is the announced result. (Q.E.D)

Two comments are in order. Firstly as in the asymmetric information case, collusion is more likely to occur for a greater value of the agent's rent and for a lower wage offered by the principal. Secondly , the probability of corruption occurrence is absolutely not affected by the bargaining powers of the parties involved in the side contract when one considers a Nash equilibrium solution.

4. Bureaucratic Staff Rotation and Corruption

4.1 Lessening the occurrence of corruption

Using the previous framework, we are now in a position to propose an additional instrument against the extension of bribery. It has been previously suggested that long term relationships between potential bribers and public officials were favorable to the emergence of corrupt transactions. The model that we have described before allows us to provide a formal argument of the preventive effect of rotation mechanisms on corruption.

Corollary 3 *Collusion between the supervisor and the agent is more likely to occur under symmetric information than under asymmetric information.*

Proof:

Using corollary 1 and Corollary 2, we know that the probabilities of collusion are respectively defined by :

$$H\left(\frac{\varepsilon}{1+\varepsilon}\left(v(\omega)-s(\omega)\right)\right)=\left(\frac{\varepsilon}{1+\varepsilon}\right)^{\varepsilon}\left(v(\omega)-s(\omega)\right)^{\varepsilon}$$

under asymmetric information and :

$$H\left(\left(v(\omega)-s(\omega)\right)\right)=\left(v(\omega)-s(\omega)\right)^{\varepsilon}$$

under symmetric information between the two parties. Therefore , when $s(\omega)<v(\omega),\forall\omega$, we arrive to the following result:

$$\left(v(\omega)-s(\omega)\right)^{\varepsilon} > \left(\frac{\varepsilon}{1+\varepsilon}\right)^{\varepsilon}\left(v(\omega)-s(\omega)\right)^{\varepsilon} \qquad (10)$$

This formally proves that the likelihood of corruption is higher when the agent has full information about the supervisor's preferences in the three-tier hierarchal model. (Q.E.D)

This result is able to explain why a tax collection agency is induced to implement rotation of its supervisory personnel against bribery temptation. Indeed, when the agent has a perfect information about the type of supervisor (given by the moral or psychic cost), one expects a greater tendency for the tax payer to offer bribes. Conversely, the behavior of the supervisory staff seems more difficult to predict when the tax payer does not know the preferences of the tax collector. This latter situation clearly increases the weight of uncertainty attached to corrupt transactions, thereby reducing the offers of covert transfers. Thus, our framework points out that corruption depends on information structure between public officials ans the users of these services.

An additional feature that we have not taken ino account in our presentation deals with reciprocity between the two parties. Indeed, in this paper, we have restricted our attention to a static hierarchical model which corresponds to one-shot environment. However, it is often argued that bribery is also built on trust and reciprocity. Clearly, this neglected effect is expected to reinforce the effectiveness of staff rotation as a measure against corruption. As

detailed in Abbink (1999) , two main arguments suggest that long term relationships create a favorable environment for the extension of bribery. On the one hand, the tax collector would be more tempted to participate in side contracts since he is more likely to be rewarded for cooperation by receiving additional side transfers at later encounters. On the other hand, the tax payer would be more trustful in the reciprocation of the tax collector, the latter being probably more cooperative[6] .

While staff rotation is a suitable instrument to reduce corruption, we have neglected in the previous the existence losses entailed by job rotation. In our simple model, we are not able to account for both the cost and the benefits of staff rotation[7]. Clearly , a rotation mechanism remains a costly instrument for organizational structures despite of its bribery-reducing impact. Some examples of rotation costs are linked to the settlement into a new supervisory function in a different place, with additional expenditures to finance the change of location, and also to training costs. Indeed, public officials have to be better educated with the implementation of job mobility since a broader scope of capabilities and responsibilities are expected from them (see Abbink, 1999). These additional training costs are likely to increase the level of personnel salaries. At least, public officials will have a lower acquaintance with current affairs, thus reducing the effectiveness of their supervisory function against corruption.

Because of these efficiency losses, the benefits of staff rotation have to be substantial in order to promote this instrument in the combat against bribery. Knowing the effectiveness of the staff rotation regime is the concern of empirical considerations. However, the influence of rotation on corruption sets two main problems from an empirical perspective (Abbink, 1999). On the hand, there exist serious difficulties when one attempts to get a reliable measure of the level of corruption between public officials and potential bribers, even before the introduction of rotation mechanisms. On the other hand, instruments against bribery are usually implemented only after the occurrence of corrupt transactions. Thus, interpretation of empirical evidence may be misleading since observed behaviors are likely to be the result of a

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[6] Corruption is mainly characterized by reciprocal relationships between bribers and public officials, negative welfare effects and penalties in case of discovery: corruption remains a risky activity both for the bribers and the bribees (see Abbink et al.,1999).
[7] For an overview on the costs and the benefits of job rotation, see Gosgel and Miceli (2001); In a different setting related to the firm's choice, some firms promote high degrees of specialization in their organization of work, but the rotation of jobs also produces certain benefits that outweigh lost productivity from reduced specialization.

fait accompli. Fortunately, the relevance of staff rotation ma y be examined using an experimental corrupt game.

4.2 Empirical Evidence

The experimental study conducted by Abbink (1999) can be used for the purpose at hand. It draws on the two-player two-stage bribery game developed by Abbink et al.(1999), which is the first experimental game explicitly modeling a bribery situation. Focusing on three essential characteristics of corruption, namely reciprocity, negative externalities and high penalties when discovered, these authors show that reciprocity may establish bribery relationships and reciprocal behavior is exhibited by both public officials and potential bribers Occurrence of collusion is not affected by the presence of negative externalities, while the magnitude of corruption is significantly reduced by a penalty threat.

However , in Abbink et al.(1999), corruption is analyzed as a long term relationship in which the same potential briber meets the same public official many times. Such an hypothesis is relaxed in Abbink (1999); rather that relying on a super game of numerous repetition with fixed pairs, a new experiment is conducted to account for the effect of supervisory staff rotation, by allowing random assignments between the agents. Thus , two games are considered for the test. In the first experiment, one considers a bribery game played by fixed pairs of potential briber and a public official. In the second experiment, the various pairs of potential bribers and public officials are randomly assigned to one another on every round. A comparison between these two experiments shed light on the influence of staff rotation on corruption.

The main results of the experiments are as follows. On the one hand, significantly lower bribes are observed in the staff rotation treatment than in the treatment with fixed pairs. On average, transfers are reduced by almost one half. On the other hand, the frequency of inefficient decisions resulting from bribery is significantly reduced under rotation mechanisms. Besides, reciprocal behavior by public officials is less likely to occur under staff rotation. This systematic tendency is not explained by lower level of bribes that supervisory officials are offered. Indeed, one of the main differences between the two treatments is due to the impossibility for both potential bribers and public officials to reciprocate on favorable decisions. Clearly, this leads to a lower magnitude of collusion. Hence, these various

experiments results argue in favor of supervisory rotation mechanism as a suitable instrument in the combat against bribery.

5. Conclusion

In this paper, we prove formally insights about the role of organizational measures to combat corruption. Using the principal-supervisor-agent paradigm, we study the pattern of corrupt collusion in a setting where the principal has no information about the supervisor. The latter is characterized by a psychic or moral cost entailed by guilt and other moral considerations when participating in corrupt transactions, and this cost is not necessarily know by the agent. We show that a static model is sufficient to analyze the impact of staff rotation on corruption. The main result of our paper is that the occurrence of collusion is more likely when the agent has perfect information about supervisor's preferences. Thus , by committing himself to a probability of rotating supervisor staff among various locations, the principal can significantly affect the magnitude of corruption.

According to our model, staff rotation is not the sole mechanism that can be used to curd corruption. Indeed, instruments aimed at stopping excessive friendship and covert transfers between potential bribers and public officials are expected to have bribery reducing impact. An example is the use of an external auditor who always reports his truthful signal (Kofman and Lawarée, 1993). In hierarchical organization, personnel rotation mechanisms may be seen as an effective device to limit the magnitude of covert transfers among the members. However, there exists substantial cost dealing with the rotation of supervisory staff, in particular owing the loss of beneficial cooperation. These costs of occupational mobility are not included in our analysis. Thus , an extension of our model would be to develop a dynamic framework with both the costs and benefits of staff rotation in order to study the optimal pattern of rotation mechanisms in the deserving combat against corruption.

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