The hidden impact of corruption

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Abstract

Many economic studies on corruption are dealing with their actual occurrence. This paper claims., on the other hand, that important economic effects arise even when corruption does not actually take place but remains a serious threat. Although corruption can be prevented through intensive monitoring and surveillance or by offering effective disincentives, these measures are costly and create distortions – a situation that may be described as "hidden corruption". This paper formalizes corruption as a special principal-agent-client relation. It identifies some fundamental economic characteristics of corruption and distinguishes three different types of equilibria that arise under different circumstances. Whereas corruption actually occurs in only one of these equilibria, some key effects persist, although reduced in magnitude, in the other two types. Significant differences occur instead when the possibility of corruption is removed. The paper addresses other topics related to corruption as well, such as why corruption is illegal, its effects on efficacy and distribution, and the possibility and implications of multiple equilibria.

1. Introduction

While corruption has several implications, one aspect that seems to have received comparatively little attention are the effects of the possibility that it may occur, rather than of its actual occurrence. These effects arise because the threat of corruption reduces the set of feasible contracts in a principal-agent relation, making it more difficult to adopt schemes that prevent collusion; as a result, the threat of corruption reduces the expected utility of the parties involved even when corruption is successfully prevented and not actually observed – a situation that may be described as "hidden corruption". This paper focuses on these aspects, and shows how the effects of hidden corruption are generally comparable, and sometimes equivalent, to the effects of corruption actually occurring.

Following Rose-Ackerman (1978) and Klitgaard (1988), we analyse corruption within the framework of a principal-agent-client relation. In our model, corruption arises from the perturbation of a pre-existing principal-agent relation, where the principal is obliged to pay an exogenous basic salary to the agent in all situations, and can only apply non-negative variations to this reward, like awarding efficiency-related bonuses. While this is by no means the only type of restrictions that could generate corruption (other restrictions may derive from laws, regulations and other sources, or may be inherent to the particular relation that exists between the parties), this type of constraints may be frequently found whenever a minimum-salary legislation, professional rules, or collective bargaining agreements, impose a lower bound on the reward that is paid to civil service employees or other types of agents. In the presence of such constraints, collusion between the client and the agent cannot generally be prevented without reducing the utility of the principal, and the adoption of a legal norm prohibiting this collusion can be seen as a means used by the latter to reduce this loss in utility. In her 1978 book

on the subject, Rose-Ackerman described corruption as a particular agency relation where "some third person, who can benefit from the agent's action, seeks to influence the agent's decision by offering him a monetary payment which is not passed to the principal" (Rose-Ackerman, 1978, p. 6).[1] While basically accepting this definition, we agree with the prevalent opinion in considering corruption as essentially illegal, and we therefore impose the additional requirement that the payment offered by the third party to the agent should contravene an existing norm.[2] Specifically, we characterise corruption as a particular type of

principal-agent-client relation with the following characteristics: the principal delegates some discretionary power to the agent, requiring him to perform a particular task; the agent makes a contract with the client, whereby he agrees to deviate from the instructions of the principal to the benefit of the client, in exchange for some reward; but this contract is illegal, in the sense that it violates an existing norm. This norm may derive from a variety of sources, but is economically relevant insofar as its violation involves a positive risk of punishment for the parties who commit it; following Becker (1968), we assume that this punishment can be quantified in terms of an equivalent monetary fine.

Four economic relations thus characterise corruption and distinguish it from other types of action: (i) an agency relation between the principal and the agent; (ii) a contractual relation between the agent and the client; (iii) an obligation (resulting from some norm) on the part of the agent, of the client, or both, not to undertake such a contract; and (iv) a conflict of interests between the client and the principal. A direct contractual relation between the principal and the client is not an essential element of corruption and for this reason it will not be considered here, although this relation can be found in a variety of particular cases, like, for instance, when corruption is related to tax evasion or the control of crime.[3]

In comparisons with other types of action, the first of the above relations is absent when two partners collude to commit a theft, the second relation is absent in the case of mere abuse of power or nepotism, the third in the case of legal collusion (of the type discussed, for instance, by Kofman and Lawarree, 1996); the fourth relation finally, draws the distinction between corruption and extortion;

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[1] Along the same line, Barthan (1997) wrote that "in a majority of cases […] corruption ordinarily refers to the use of public office for private gains, where the official (the agent) entrusted with carrying out a task by the public (the principal) engages in some sort of malfeasance for private enrichment which is difficult to monitor by the principal" (p. 1321). Similar definitions were provided by Friedrich (1989) and by Lowenstein (1989). Friedrich identified "a corruption pattern […] whenever […] a responsible functionary or office holder, is by monetary or other rewards… induced to take actions which favour whoever provides the reward and thereby damage the group or organisation to which the functionary belongs, more specifically the Government" (Friedrich, 1989, p. 15); for Lowenstein, corruption implies the involvement of a "public official", a "corrupt intent" by the parties involved, the transfer to the official of something of value, and the existence of a relationship between this thing of value and an official act; moreover, this relationship must include an intent to influence the act (Lowenstein, 1989, pp. 30-31).

[2] Andvig and Moene (1990) claim that "[a] member of a public organisation acts in a corrupt way if he […] deals with a non-member and uses the organisation's resources […]to acquire payment that is against the rules of the organisation or against the law" (Andvig and Moene, 1990, p.65). In our opinion, however, corruption derives not so much from the improper use of some organisation's resources, as from the improper use of discretionary power; moreover, corruption is not confined to public organisations, and can be found also in the private sector (on this point see Rose-Ackerman, 1989).

[3] This relation has in fact been frequently formalised in works which analysed corruption in relation to tax evasion and crime control: see for instance Virmani (1983); Chander and Wilde (1992); Besley and McLaren (1993); Mookherjee and Png (1995).

remarkably, this distinction has not always been acknowledged by authors who analysed these topics, who often used a different terminology and adopted a different perspective (for instance, Beenstock, 1979; Cadet, 1987).[4] The concept of corruption is however different from the concept of extortion; corruption stems from a bilateral agreement between the agent and the client, who illegally collude to obtain a benefit at the expense of the principal, while extortion derives from a unilateral abuse of discretion on the part of the agent, who threatens to deviate from the principal's instruction in order to obtain an undue benefit at the expense of the client. Even when it is the client who makes an offer to the agent, the situation is one of extortion whenever the offer is made in response to an implicit, but evident, threat. In a wider sense, the word "corruption" has been more or less explicitly used by some authors to include extortion as a particular case (Klitgaard, 1988; Hindricks et al., 1996; Bliss and Di Tella, 1997); in this paper,

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[4] A clear illustration of the distinction between corruption and extortion can be found in Bardhan (1997): "I am told that in Russia there is a clear terminological distinction between mzdoimstvo, taking a remuneration to do what you are supposed to do, and likhoimstvo, taking a remuneration for what you are not supposed to do" (p.1323). Shleifer and Vishny (1993) distinguished between corruption "with theft", where an official who sells a good provided by the Government hides the sale and keeps the whole price of the good, and corruption "without theft", where the official illegally increases the price of the goods and keeps for himself the difference between the actual and the official price. Corruption with theft is similar to our narrower definition of corruption, since the official illegally provides the good to somebody who is not entitled to it, in exchange for an undue reward which he does not transfer to the principal; corruption without theft, instead, is similar to extortion, since the official provides the good to someone who is entitled to have it, and illegally demands a bribe on top of the price decided by the principal.

however, we use it in a stricter sense and we limit our attention to our narrower definition of corruption.

We thus develop a model where all the above relations are present; we start with a basic principal-agent relation, and analyse how it is perturbed by the intervention of a client who offers a bribe to the agent; we analyse the utility implications of the new equilibria, and we examine how they are altered by the imposition of a norm banning corruption, supported by a non-negative probability of punishment in case of violation. We characterise the equilibria that arise in two different cases, when the implementation of the norm is monitored without costs at an exogenous rate, and when monitoring is costly to the principal who decides, in return, the probability of detection. This framework will also be used to analyse other features of corruption, like the attitudes of the parties towards the introduction of the above norm, and the implications of corruption in terms of efficiency and distribution. Moreover, we use this model to show that multiple equilibria are possible even in a static context (their existence in a dynamic context was proved by Lui, 1986, Cadot, 1987, and Andvig and Moene, 1990); finally, we discuss some empirical and normative implications of our results.

The results that we obtain confirm the basic idea that most effects of corruption arise from its threat rather than from its actual occurrence. While corruption reduces aggregate utility and the expected utility of the principal, these effects generally persist – although reduced in magnitude – when corruption is prevented, but remains a real possibility. Indeed, while corruption actually takes place only in one type of equilibria, the expected utility of the parties in the other types of equilibria may not be too different, and, in particular circumstances, may even be the same. Relevant differences in utility appear instead between the equilibria that arise when corruption is possible and those that exist when corruption is not a feasible option (for instance, because the

client does not exist at all).[5]

The introduction of a legal norm banning corruption allows in some cases to reduce the magnitude of these effects and leads in other cases to a different type of equilibrium; in general, however, it fails to restore the initial utility distribution. The adoption of this norm, moreover, is met with different attitudes in different circumstances; sometimes, it is unanimously supported, other times it is rejected without objections, while in other cases it becomes an item of conflict over the distribution of rent. The fact that certain types of behaviour (like Parliamentary lobbying) are legally allowed in some countries and constitute an offence of corruption in others may thus be interpreted as the result of a perfectly rational choice.

An a priori evaluation of the social effects of hidden corruption is also rather problematic; in some cases, the threat of corruption leads to a Pareto-inferior outcome and is thus a source of inefficiency, but in other cases it generates a redistribution of rent which benefits some parties at the expense of others, leading to a new equilibrium along the Pareto-efficient frontier.

On the empirical side, our results imply that a proper evaluation of the impact of corruption cannot merely rely on statistics of its observed occurrence; further information is required, in order to obtain a proper evaluation of the impact of the unobservable threat of corruption. Useful indicators in this sense might be provided by data concerning the reward structure of the agents, the probability of detection and the costs of monitoring, and some estimates of the amount that might be paid on bribes if corruption actually occurs. On the normative side, the design of effective anti-corruption strategies should extend beyond the adoption

[5] Throughout the paper, we shall ignore the expected utility of the client (a discussion of the reasons is provided in Section 3). Our results only apply to the effects of actual or hidden corruption on the particular subset of parties which does not include the client – namely, the principal and the agent.

of merely repressive measures (like intensive monitoring and severe punishment), to include other types of intervention aimed at reducing the opportunities for corruption, including educational campaigns to increase the degree of honesty.

Our work builds on previous studies on corruption, particularly on the literature which analysed corruption in the framework of the theory of agency (Virmani, 1983; Chander and Wilde, 1992; Besley and McLaren, 1993; Mookherjee and Png, 1995; Hindricks et al., 1996). Our model also bears some similarities with the work of Spiller (1990), who analysed a trilateral agency relation very similar to the principal-agent-client relation discussed here.

The effects of the threat of corruption, however, do not appear to have received much attention in this literature, and the role played by restrictions on the set of feasible contracts has also been ignored. Our approach is somehow more general because we consider corruption in its essential structure rather than in relation with tax evasion or other specific situations; for this reason, we do not apply the principal-supervisor-agent model, that is generally used, preferring the more encompassing principal-agent-client formalisation, which does not require a direct contractual relation between the principal and the client.

The paper is organised as follows: Section 2 presents an outline of the model, where corruption is not legally prohibited; Section 3 analyses the causes and effects of the introduction of a legal prohibition, in the case when the probability of detecting its violations is exogenous (Subsection 3.1) and when it is endogenous and costly for the principal (Subsection 3.2). Section 4 draws some final remarks and conclusions.

2 The model

A principal hires an agent to perform some task e, which can be carried out in two ways, e and e; e requires hard work and a high effort on the part of the agent, while e requires a lower effort and can be carried out working

"lazily". Obviously, the agent prefers e, while the principal prefers e, because it implies, for instance, a more efficient organisation of some productive activity, bearing higher output at lower costs.[6] The principal cannot perfectly observe how the agent works, thus he cannot condition payment on the actual performance of the high effort. The principal only receives a random message m, whose probability distribution is correlated with the agent's work performance; when the agent works hard, the message is equal to 1 with probability p > 1/2 and to 0 otherwise; when the agent works lazily, the message is equal to 1 with probability (1 − p), otherwise it is equal to 0; in other words, the message is 'true' with probability p and 'false' with probability (1 − p). The principal thus conditions the amount of the payment on the realisation of this random binary message. If the message is. 0, the principal pays the agent a minimum amount, which we assume to be exogenously given and normalised to 0; this amount may derive, for instance, from a legal provision binding all employers to pay in all situations a minimum basic salary to their employees, irrespective of their actual work performance. If the message is. 1, the principal pays, in addition to the minimum salary, a performance-related bonus, which we shall simply call "the bonus" (or sometimes the "incentives"), whose amount t he declares in advance. A contract of this type is generally known as an incentive scheme, and under general conditions can induce the agent to work hard even if the principal cannot perfectly ob-

serve him.[7] Both principal and agent have quasi-linear utility functions, that depend on the work effort of the agent, e, and on the amount that is paid to him at the end. The utility of the principal is equal to $W(e, x) \equiv w(e) - x$, where x is the amount of the payment (equal to t when the bonus is paid and to 0 otherwise), while the utility of the agent is $U(e,x) \equiv u(e) + x$. The principal's preference for a high work effort is equal to $\Delta w \equiv w(e) - w(e)$ while the agent's preference for a low work effort is equal to $\Delta u \equiv u(e) - u(e)$.

Both parties are risk-neutral and take their decisions in order to maximise their expected utility.[8] The principal offers an incentive scheme that specifies the amount t of the bonus; the agent accepts the scheme and decides how to work. Once the work is done, a realisation of the random message m reaches the principal and is also observed by the agent; the bonus t is then paid, conditional on m being equal to 1.

The optimal choice for each party in equilibrium can be derived by backward induction. The agent responds to the offer of the principal, working hard if and only if the incentive scheme meets the incentive compatibility constraint (ICC):

$$t \geq \frac{\Delta u}{2p - 1} \equiv t_a \qquad (1)$$

and working lazily otherwise.[9] The princi-

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[7] The conditions required for an incentive scheme to be effective are the "participation constraint" and the "incentive compatibility" (or "individual rationality") constraint. The participation constraint ensures that the agent accepts to work for the principal at the agreed conditions and does not seek employment elsewhere; in this paper, we assume that the participation constraint is always satisfied, as a result of the legal requirement of a minimum salary. The incentive compatibility constraint is discussed in the text.

[8] Since the only random variable in the utility function is t, and since the utility function is linear in t, risk neutrality is here equivalent to a von Neumann-Morgenstern utility maximising behaviour.

[9] When the agent works hard, his expected utility is $U(H) \equiv (e)+pt$, since he receives the bonus t

pal knows this constraint and the agent's response, and offers a bonus equal to t if and only if

$$\Delta w \geq pt \qquad (2)$$

otherwise, he offers no bonus at all, and the agent only receives his basic salary, deciding, in turn, to work lazily.[10] Substituting (1) into (2) yields

$$\Delta w \geq \frac{p}{2p-1}\Delta u \qquad (3)$$

which is the condition under which the agent works hard in equilibrium. We assume hereafter that this condition is always satisfied.

At this point a third party intervenes, whom, in Klitgaard's terminology, we shall initially call "the client", and whom we shall later call "the corruptor" (the word "corruptor" is not appropriate at this stage, because no norm exists which forbids the client's intervention). Like the principal, the client is affected by the work effort of the agent, but, unlike him, he strictly prefers the low effort. Moreover, the client has perfect information about the way

the agent works (unlike the principal),[11] and offers a payment to the agent conditional on his performance of the low effort. We shall refer to this payment as "the gift", and, at a later stage, as "the bribe".[12]

For instance, consider the case of an industry that wants to dispose illegally of its polluting waste. The industry is subject to controls by the Environmental Protection Agency, and these controls are carried out by inspectors whose actual effort the Agency cannot perfectly observe.[13] If the inspectors work hard, they pay frequent and accurate visits to the plants to check how the waste is being treated; if they work lazily, their visits are rare and inaccurate. The firm obviously prefers the inspectors to work lazily, and offers them a payment conditional on their visits being rare and superficia1.[14] Alternatively, consider a taxpayer submitting false reports to the Tax

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whenever the message is 'true', which occurs with probability p (otherwise, he just receives his basic salary, equal to 0); when he works lazily, his expected utility is U(L) ≡ u(e) + (1 — p)t, since this time he obtains the bonus only when the message is 'false', which occurs with probability (1 — p). The agent thus decides to work hard if and only if U(H) > U(L), which implies (1).

[10] The principal never sets t> to since he can obtain the same behaviour from the agent at a lower cost – by setting t = t; similarly, he never sets t > t > 0 since this would induce the agent to work lazily, in which case it would be more convenient to set t = 0. When the principal offers t = t, the agent works hard by (1) and the principal's expected utility is equal to W(H) ≡ w(e) — pt, since with probability p the message will be equal to 1 and the principal will have to pay the bonus t. When the principal sets t = 0, the agent works lazily and the principal only pays the basic salary irrespective of the realisation of the message, obtaining an expected utility equal to W (L) ≡ w(e). The principal thus offers t = t if and only if W(H) > W(L), whence (2).

[11] The assumption that the client can perfectly observe the work effort of the agent is not essential; the client may for instance receive a second random message, S, correlated with the work effort of the agent, and may condition the payment of the gift on a particular realisation of this random message. In our model, however, this assumption allows to simplify the analysis, without loss of generality.

[12] Like the word "corruptor", also the word "bribe" is not yet appropriate, since no norm exists forbid di the gift.

[13] A similar case is described in Mookherjee and Png (1995).

[14] This payment needs not necessarily consist of a sum of money in a sealed envelope. The industry, for instance, may promise the inspectors well rewarded jobs once they leave the Agency. Moreover, we abstract from the fact that the firm could bribe the inspectors after their visit in order to obtain false and favourable reports; this possibility may in some cases be easily prevented, for instance, by including newly appointed junior members in the inspecting teams; while these members may be unable to decide the timing and number of the inspections, they may be able to inform higher authorities about the alteration of the reports, rendering ex-post corruption prohibitively risky.

Collecting Agency of the Exchequer.[15] The reports are examined by auditors on behalf of the Agency but the Agency cannot control how the auditors carry out their work. The auditors may examine the reports carefully, cross-checking all declarations and matching them with additional information at their disposal, or they may merely perform a formal, quick check of the consistency of the declarations. The Agency obviously prefers the first option, but the taxpayer strongly prefers the second, and offers a payment to the auditors to convince them to adopt it.

The gift enters the agent's utility function in the same way as the payment given by the principal; the utility of the principal, on the contrary, is not directly affected by the gift. We assume that the value of the gift is decided by the client and is known by all parties; the client ignores how the agent is going to act if he does not offer the gift, and ignores both the agent's utility function and the incentives offered by the principal. As a result, the client offers a gift of fixed amount b, equal to his willingness to pay to have the agent work lazily rather than hard.[16] These assumptions greatly simplify the analysis, allowing to abstract from the client's maximisation problem and from a discussion of the bargaining process between the agent and the client, in order to focus on the effects of the client's intervention on the relation between the principal and the agent. While the preferences of the client may play a major role with respect to a number of aspects related to corruption,

they are not essential to the purposes of this paper.[17] One implication of these assumptions

is that the utility of the client is the same when the agent accepts the gift and works lazily as when he rejects it and works hard. A further assumption that we make is that the client has an established reputation for honouring his promises, which allows to abstract from any problems of enforcement that normally arise with illegal contracts.[18]

The offer of the gift increases the agent's preference for working lazily; this in turn alters the incentives compatibility constraint, which becomes:[19]

$$t_b \equiv \frac{\Delta u + b}{2p - 1} > t_a \qquad (4)$$

The principal must now decide whether or not he should increase the bonus to meet the new constraint: if he does not, the agent will be lazy and the best choice will be to pay no bonus at all, irrespective of the message. In absence of restrictions on the set of contracts, the principal could offer an incentive scheme that satisfies the new incentive compatibility constraint yielding the same expected utility to the principal as he had before; for instance, he may raise the bonus to t and reduce the salary to -p(t — t); in alternative, he could continue to over the same salary as before, pay a bonus still equal to t when the message is. 1, and convince the agent to work hard by paying a negative bonus equal to -p(t — t) whenever the message is. 0; or, finally, he could resort bargaining solution.

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[15] For a similar case see Chander and Wilde (1992).

[16] In other words, when the agent accepts the gift, he extracts all the client's rent from e.

[17] An exogenous value of the gift is also assumed by Bac (1996); Chander and Wilde (1992) assume instead that the gift is equal to a fixed, exogenous share of the client's rent, equal to a fraction γ of the tax evaded by the client. Other authors (for instance, Viiniani, 1983; Basu et al., 1992; Besley and McLaren, 1993; Mookherjee and Png, 1995) assume that the rent is divided according to a Nash

[18] For a discussion see Paul and Wilhite (1994), and Kofman and Lawarree's remarks about self-enforcing collusion agreements (Kofman and Lawarree, 1996, p. 390). Bardhan (1997), in his survey of economic studies on corruption and development, writes that this problem has also been discussed in: Boycko, M.; Shleifer, A.; and Vishny, R.W. (1995), Privatizing Russia, Cambridge MA: MIT Press.

[19] The expected utility of the agent if he works hard is unaffected by the gift, which is not paid in this case; his expected utility if he works lazily accepting the gift becomes U(Lb) □ u(e) + pt + b; the agent thus works hard if and only if U(H) ≥ U(Lb), which implies t ≥ t.

to an appropriate mix of salary reductions and negative bonuses. All these arrangements are however prevented by the legal requirement of a minimum salary, which forbids both salary reductions and the imposition of a negative bonus; as a result, the principal can only choose between raising the bonus to t and paying no bonus at all, knowing that in this case the agent would work lazily. He chooses the first option if and only if[20]

$$\Delta w \geq pt > pt \qquad (5)$$

Since (5) is more restrictive than (3), the intervention of the client may induce the principal to withdraw the bonus rather than increase it, leading from an equilibrium where the agent works hard to one where the agent works lazily. By (3), (4) and (5), this occurs whenever

$$\frac{p}{2p-1}(\Delta u + b) > \Delta u \geq \frac{p}{2p-1}(\Delta u) \qquad (6)$$

When (6) holds instead, the expected utility of the principal is lower in the new equilibrium. In the following sections of this paper we shall assume that (6) always holds.

When (5) holds, the principal raises the bonus to t, and the agent rejects the gift and continues to work hard. The intervention of the client does not affect the observable work performance of the agent, but it induces a reduction in the expected utility of the 'principal (who has to pay a higher bonus if the message is. 1) which is exactly matched by an increase in the expected utility of the agent (who receives that bonus). Although no payment takes place between the client and the agent, the mere threat of it enables the agent to extract rent from the principal, inducing a redistribution in expected utility between those parties – a situation which we describe as "hidden cor-

[20] If the principal offers a bonus equal to t, the agent works hard and the principal's expected utility is equal to $W(H) \equiv w(e) - pt$; if the principal offers no bonus at all, the agent works lazily and the expected utility of the principal is equal to $W(L) \equiv w(e)$. The principal thus sets t = t if and only if $W(e) - ptb \geq w(e)$, whence (5).

ruption":

Proposition 1 (Hidden corruption) When (5) holds, the agent rejects the client's offer but the mere possibility of accepting it enables him to extract rent from the principal. The intervention of the client thus induces a redistribution of expected utility between the principal and the agent, without affecting the work performance of the latter.

When (5) fails, the principal offers no bonus, the agent works lazily and the gift is actually paid. The effects of the intervention of the client are observable and evident. Since $w(eL) < w(e) - pt$, the expected utility of the principal is lower in the new equilibrium. Remarkably, the expected utility of the agent may also be lower; this occurs under the following condition.

Condition 1 Inequality (6) holds; moreover,

$$b < \frac{1-p}{2p-1}(\Delta u) \qquad (7)$$

In this case, the benefit that the agent derives from working lazily accepting the gift does not offset the loss of the possibility of obtaining the bonus ta. This leads to the following Proposition:

Proposition 2 When Condition 1 holds, the intervention of the client reduces the expected utility of both principal and agent, leading to an equilibrium which is Pareto-inefficient from the point of view of those parties.

The initial, Pareto-efficient equilibrium remains a feasible outcome, but it is no longer an equilibrium because it is not subgame-perfect: should the principal agree to offers the original bonus t in order to maintain the previous outcome, the agent would strictly prefer to work lazily and accept the gift, and the initial outcome would not be reached all the same. Any promise on the part of the agent to act otherwise, working hard and rejecting the gift, would not be credible unless it were supported by some reliable means of enforcement (which might include moral concerns or a renown reputation for honesty). A legal norm obliging

the agent to reject the gift, involving some sort of punishment whenever he is caught accepting it, may thus be seen as a means to increase the credibility of this promise. Once this norm is introduced, accepting the gift constitutes a proper act of corruption, in line with the definition discussed in the previous section, and the gift itself can properly be called "a bribe".

As we shall see in the following section, the attitudes of the two parties towards the introduction of this norm vary under different circumstances. In general, we should expect the principal to support its introduction (since the intervention of the client always reduces his expected utility) while the agent would tend to support the introduction of the norm when Condition 1 holds, and to resist it in all other cases. In fact, the attitudes of both parties depend on how effective the norm would be to prevent corruption, and on the costs that are incurred to implement the norm and to detect its violations. What is remarkable is that even the introduction of this norm would generally fail to restore the initial equilibrium. More specifically, the introduction of the norm may successfully prevent the actual payment of the gift and may induce the agent to work hard, but the effects of hidden corruption on the expected utility of the parties would not generally be removed (although they may be reduced in magnitude).

3 Equilibria with corruption

In the previous section, the use of the words "corruptor" and "bribe" was not appropriate, because no legal norm existed forbidding the client to offer the gift or prohibiting the agent to accept it; the contract between these parties thus failed the essential requirement of illegality, -that. would qualify it as corruption.

In this section, we assume that this contract is forbidden, and we therefore use the words "corruptor" and "bribe" We discuss the reasons that justify the introduction of this provision, and we analyse the equilibria that are induced by its introduction and compare them with those that preceded both the interven-

tion of the client and its prohibition. A situation where the client does not intervene will hereafter be described as "a world without corruption", while any situation where the client is present and active will be described as "a world with corruption", even when corruption remains hidden and does not actually occur. As is shown below, most effects on expected utility depend on whether or not we live in a world with corruption.

This section is divided in two subsections, that consider two different cases. First, we assume that the implementation of the norm is randomly checked at zero costs, with an exogenous probability of detecting a violation when it occurs; in the second part, we assume that the costs of monitoring are positive and increase with the probability of detection.

When the agent is caught accepting a bribe, he has to pay a fine of exogenous amount F.[21] The fine enters the agent's utility function in the same way as all other payments, but with a negative sign. The fine, however, is not paid to the principal and does not figure as an argument of his utility function.[22] Assume, following Becker (1968), that the agent's decision on whether or not to violate the norm depends only on which alternative maximises his expected utility; in other words, the agent is not bound by moral or other non-utilitarian concerns.[23] Violations, however, are not detected

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[21] If no fine is imposed, the norm has no economic significance and corruption is not distinguishable from legal collusion. A similar case is analysed in Marjit's model on corruptible hierarchies (Marjit, 1996), where no penalties are imposed on either of the parties involved in corruption.

[22] For instance, the fine may be paid to some independent enforcement authority like the judiciary; in alternative, the fine may actually be paid to the principal but it could be entirely spent to cover the fixed costs of prosecution.

[23] Some authors (for instance, Tirole, 1986) describe this type of behaviour as "opportunistic", as opposed to "honest" (when the agent always decides to abide by the norm) and "dishonest" (when he always violates it). In this paper, the agent is always opportunistic, and is said to be "honest"

with certainty; when they occur, they are detected with probability $\pi < 1$, while when they do not occur they are never detected (innocents are never found guilty). No fine is ever imposed on the corruptor.

Prosecution and punishment are public events, so the principal is perfectly informed about their occurrence; since the agent is never punished when innocent, and since the bribe is never paid when the agent works hard, the principal knows that, when the agent is fined, he must have been both guilty and lazy; as a result, the principal can improve the incentive scheme in the following way: if the agent is not fined, the principal proceeds as usual, paying the bonus if and only if the message is equal to 1; if the agent is fined, instead, the principal presumes that the agent has worked lazily and pays no bonus, irrespective of the message; by legal requirement, however, he always has to pay the minimum salary.[24]

The agent now can choose between three actions: reject the bribe and work hard (H); reject the bribe and work lazily (L); or accept the bribe and work lazily (C). He cannot accept the bribe and work hard, because in this case the corruptor would not pay the bribe. When the agent rejects the bribe, we shall say that he is "honest", while when he accept it we shall say that he is "corrupt".

The probability of the agent obtaining the bonus depends on which of these alternatives he chooses; when he is honest, the probability is equal to p if he works hard and to $1 - p$ if he works lazily, but when the agent is corrupt the probability of obtaining the bonus is equal to $(1 - p)(1 - \pi)$, which is the joint probability of escaping detection and obtaining a false favourable message (two events that are as-

sumed to be independent). When the agent is corrupt, he obtains the bribe with certainty and he incurs the fine with probability π. The expected utility that he gains with each of these actions is thus equal to:

- U(H) u(e) + pt when he is honest and works hard,
- U(L)u(e) + (1 − p)t when he is honest and lazy, and
- U(C) u(e) + (1 − p)(1 − π)t + b − πF when he is corrupt.

The agent chooses the action which maximises his expected utility conditional on the values of it and t; therefore, he works hard if and only if t satisfies the new incentive compatibility constraint:

$$t > t^*(\pi) \equiv \max(t, t(\pi)), \qquad (8)$$

where[25]

$$t_c(\pi) \equiv \frac{\Delta u + b - \pi F}{2p - 1 + \pi(1 - p)} \qquad (9)$$

Since the agent rejects the bribe when he works hard, $t^*(\pi)$ is a corruption-proof incentive scheme.[26] It can be shown that $t(\pi)$ is a continuous, twice differentiable. strictly decreasing and convex function of π, and that $t^*(\pi) = t(\pi)$ if and only if it is not larger than some positive value π^*, which we assume to be lower than unity. Moreover, $t^*(\pi)$ is continuous, non-increasing and convex, and t(0) is equal to t.

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[24] Improvement in the quality of information occurs even when the agent could be found guilty when he is innocent, provided this occurs with lower probability than when he is indeed guilty. Without loss of generality, we rule out this possibility.

[25] The agent prefers (H) to (L) whenever U(H) > U(L), which occurs if and only if t > t (see the previous section); he prefers (H) to (C) whenever U(H) > U(C), which yields:
u(e) + pt ≥ u(e) + (1 − p)(1 − π)t + b − πF,
whence:
[p − (1 − p)(1 − π)]t ≥ u(e) − u(e)+b − πF,
which is equivalent to:

$$t \ge t_c(\pi) \equiv \frac{\Delta u + b - \pi F}{2p - 1 + \pi(1 - p)}$$

As a result, the agent prefers (H) to any other alternative if and only if t > max (t , t(π)). Q.E.D.

[26] Corruption-proof incentive schemes where the agent works lazily can be designed when it > 7T* , but the principal has no reason to adopt them, since he is only concerned with the work effort of the agent, and not directly affected by the bribe.

(footnote continued from left column:) when he maximises his expected utility by turning down the offer of the bribe.

Given the probability of detection, the agent works lazily whenever t < t*(π), and accepts the bribe only if t < (b — πF)/ [π(1 — p)].[27] If t > t*(π), the agent works hard and rejects the bribe. Since t*(π) is decreasing when π < π* and constant thereafter, the incentives required to induce the agent to work hard diminish down to a minimum as the probability of detection increases; intuitively, the more likely the agent is to be caught when he accepts the bribe, the more inclined he will be to be honest and work hard. The minimum incentive-compatible bonus is reached when π ≥ π* and is equal to t, which is the same bonus that is required to induce the agent to work hard in a world without corruption.

The optimal choice for the agent is illustrated in Figure 1. In Zone A, both π and t are too low, and the agent works lazily and takes the bribe (C); in Zone B, π is high enough to induce honesty but t is too low to induce hard work, and the agent chooses (L); in Zone C, finally, both π and t are sufficiently high to induce the agent to work hard and be honest (H).

3.1 Equilibria without monitoring costs

The optimal choice for the principal depends on which variables he controls and on which costs he has to pay. In this subsection, we assume that the principal can only decide the amount of the bonus, and has no control over monitoring. Monitoring is delegated to an independent authority like the judiciary, paid by the Government out of ordinary taxes. In the next subsection, we shall assume that the intensity of monitoring, and thus the probability of detection, are decided by the principal, who has to pay for their costs.

Since the utility of the principal does not directly depend on the bribe, the principal is only concerned with the quality of the agent's work, and with the amount of money- he has to pay to achieve it; the principal offer the incentive-compatible bonus if and only if $pt^*(π)$ < Δw, otherwise he offers no bonus and lets the agent work lazily and accept the bribe.[28]

When π ≥ π*, the incentive-compatible bonus t*(π) is equal to t, which is by assumption lower than Δw/p; therefore, the principal offers it; when π = 0, then t*(π) = t, which is higher than Δw by assumption (6); therefore, the principal offers no bonus. Continuity and monotonicity of t*(π) in the interval [0,π*] thus ensure that there is a unique value π' ≡ (0, π*) such that pt*(π') = Δw; the principal offers a positive bonus t = t*(π) if and only if π > π' and no bonus otherwise.

The interval [0,1] of feasible values of the probability of detection can thus be divided into three areas, corresponding to three different strategies and equilibria (see Figure When the probability of detection is lower than π' (Area 1), the cost of inducing the agent to work hard is too high, and the principal prefers to offer no bonus and let him work lazily; following the suggestion of Besley and McLaren (1993), we may call this a "capitulation equilibrium", because the principal gives up all attempts to induce the agent to work hard: in this equilibrium corruption actually occurs. When the probability of detection lies between π' and π* (Area 2), the cost of obtaining hard work from the agent is sufficiently low and the principal accepts to bear it; the bonus, however, is higher than t, which enables the agent to extract rent from the principal; we shall call this the "stick-and-carrot equilibrium", since the agent is induced to work hard by a mix of threat of punishment and increases in the bonus; corruption does not occur, but its effect is to enrich the agent at the expense of the principal; in this case, we say that corruption

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[27] The agent prefers (C) to (L) if and only if U(C) < U(L), which yields:

u(e) + (1 — p)t < u(e) + (1 — p)(1 — π)t + b — πF (10)

whence: π(1 — p)t < b — πF, which yields: t < (b — πF) / [π (1 — p)]. Q.E.D.

[28] The expected utility of the principal if he offers t = t* is equal to $W^o(π) ≡ w(e) — pt^*(π)$, while his expected utility if he offers t = 0 is equal to $W(L) ≡ w(e)$. The principal thus offers t = t* if and only if $W^o(π) > W(L)$, which implies $pt^*(π) ≤ Δw$.

is "hidden". When π is not lower than π*, finally, a bonus equal to t is sufficient to induce the agent to work hard; we call this the "deterrence equilibrium", because the threat of punishment is sufficiently high to convince the agent to reject the bribe without obtaining any rent. Corruption is "repressed" because its theoretical possibility does not enable the agent to obtain a higher utility.

In the discussion that follows, we qualify these equilibria in terms of the expected utility of the principal and the agent. We ignore the expected utility of the corruptor, for three different reasons. First of all, our purpose is to examine the effects of corruption (actual or hidden) on the initial relation between the principal and the agent; we are only marginally interested in the role played by the corruptor, and we are only concerned about whether or not he intervenes in the relation. Furthermore, in our model the bribe is equal to the corruptor's willingness to pay, which leaves the latter indifferent about whether or not the agent works lazily and accepts the bribe. The corruptor would enjoy a higher utility only if the agent worked lazily rejecting the bribe, but this outcome does not occur in equilibrium. In addition, the benefits that the corruptor receives as a result of the bribe may be considered unworthy of social protection; for instance, if corruption increases the opportunities for illegal pollution, the benefit of the company which pays the bribe and pollutes could hardly be considered as a positive component of social welfare.

Figure 3 shows the expected utility of the principal and the agent (hereafter "the parties") in the three areas of π. The Diagram (a) shows the expected utility of the principal, when he offers no bonus (t = 0: straight horizontal line) and when he offers a bonus equal to t*(π) (curve); as the diagram shows, the principal maximises his expected utility by setting t = 0 when π. < π' (capitulation equilibrium) and t = t*(π) otherwise. Diagrams (b.1), (b.2) and (b.3) show the expected utility of the agent, respectively, when Condition 1 holds,

when Condition 2 holds and when both Conditions fail, Condition 2 being as follows:

Condition 2 Inequality (6) holds; moreover, Condition 1 fails and

$$b > (\pi' F) \frac{p}{(1-p)(1-\pi')} - \Delta u \qquad (11)$$

The meaning of these Conditions is evident from the diagrams, where the straight, downward-sloping line shows the expected utility of the agent when t = 0, while the curve and horizontal line represent his expected utility when t = t*(π). When Condition 1 holds, the agent strictly prefers a situation with hidden or repressed corruption (π > 0 and t = t*(π)) to a capitulation equilibrium where corruption occurs but is not monitored and no bonus is offered (π = t = 0); when Condition 2 holds, the agent prefers hidden or repressed corruption if and only if π is sufficiently low, otherwise he prefers the capitulation equilibrium: when both conditions fail, the agent strictly prefers the capitulation equilibrium.

Since the expected utility of the parties in a capitulation equilibrium is the same as when corruption is legally allowed (corruption is neither monitored nor punished, therefore the norm forbidding it is economically irrelevant), one result is immediately evident: while the principal weakly prefers to ban corruption, and strictly prefers to ban it whenever π > π', the agent may agree or disagree with him depending on the two above conditions and on the exogenous value of the probability of detection; in particular, the agent will always support the ban when Condition 1 holds, and will continue to do so under Condition 2 provided that π is lower than some positive value π** > π', such that u(e) +b = u(e) + pt(π**). In all other cases, the agent will oppose the ban, strictly preferring a capitulation equilibrium.

These results prove the following Proposition:

Proposition 3 The introduction of a norm prohibiting corruption is opposed by the agent and is not supported by the principal when 0 < π < π', while it is unanimously supported un-

der Condition 1 when $\pi \geq \pi'$, and under Condition 2 when $\pi' \leq \pi \leq \pi^{**}$. In all other cases, the principal supports the norm and the agent opposes it.

The case when principal and agent agree to reject a norm against corruption is shown by the dotted areas in Figure 3; the case when they agree to introduce the norm is shown by the shaded areas. In both cases, the adoption of a ban can be decided on efficiency considerations; the parties agree to introduce or reject it according to which alternative yields a Pareto-efficient outcome. In the remaining areas, an agreement cannot be reached on mere efficiency grounds, since the introduction of the norm induces a movement along the Pareto-efficient frontier, benefitting one party at the expense of the other; the norm banning corruption thus becomes a political issue, involving a conflict over the distribution of rent between different members of society; its resolution depends on the relative bargaining power of the two parties, or on their comparative influence over the decision-making authority.

Figure 3 also allows a comparison between the equilibria that arise when corruption is possible (and detected with positive probability), and the equilibrium that arises in a world without corruption, which was discussed in Section 3 and is equivalent to the deterrence equilibrium in a world with corruption.

As Figure 3 shows, when $\pi < \pi^*$ the principal is always worse off in a world with corruption. If he offers a bonus equal to $t^*(\pi)$, he obtains the same work effort at a higher expected cost; if he offers no bonus at all, he obtains a lower work effort; in both cases, his expected utility is lower than in a world without corruption. The agent, on his part, is always better off in a situation of hidden corruption ($\pi' \leq \pi < \pi^*$), where he performs the same work effort and obtains a higher bonus than in a world without corruption. In this case the agent gains what the principal loses, and aggregate utility is the same as in a world without corruption; hidden corruption induces a redistribution of ex-pected utility between the two parties, which is decreasing with the probability of detection:

Proposition 4 Compared to the equilibrium in a world without corruption, hidden corruption with costless monitoring enables the agent to extract rent form the principal, without affecting the agent's work effort or the aggregate utility of the two parties; moreover, the extent of the redistribution in expected utility is decreasing in the probability of detection.

PROOF:

Hidden corruption occurs if and only if $\pi' \leq \pi < \pi^*$, in which case the principal offers a bonus equal to $t(\pi)$ and the agent works hard and obtains a rent equal to $p(t - t) > 0$; the agent's expected utility is equal to $u(e) + pt$, which is higher than his expected utility in a world without corruption; the principal's expected utility, in turn, is equal to $w(e) - pt$, which is lower that his expected utility in a world without corruption. The agent thus increases his expected utility at the expense of the principal, while the sum of their expected utility remains equal to $w(e) + u(e)$, the same as in a world without corruption. The extent of the redistribution of expected utility from the principal to the agent is equal to $p[t(\pi) - t]$, which is a decreasing function of π.

Q.E.D.

When $\pi < \pi'$, corruption actually occurs, but the agent and the principal would be both weakly better off if the norm banning corruption were abolished. In this situation, the agent might in some cases prefer to be living in a world without corruption; in other cases, however, he prefers the existing corrupt world (the alternative depending on Conditions. 1 and 2 as well as on the actual value of π, as shown in Figure 3). Aggregate utility, however, is lower when corruption actually occurs, being equal to $w(e) + u(e)$, which is by assumption lower than $w(e) + u(e)$.[29]

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[29] Assumption (3), given that $p/(2p - 1) < 1$, implies that $\Delta W > \Delta U$, which in turn implies $w(e) + u(e) > w(e) + u(e)$.

3.2 Equilibria with positive monitoring costs

Assume, now, that monitoring corruption is costly, and that its costs are related to the probability of detection by a positive, continuous, twice differentiable function $c(\pi)$, with the following properties: $c(0) = 0$ (no fixed costs); $c'(\pi) > 0$ (positive marginal costs), $c''(\pi) > 0$ (diminishing returns). These costs are borne by the principal, and enter his utility function in the same way as the payment he makes to the agent; on the other hand, the principal can now choose the intensity of monitoring, and thus the probability of detection.

The principal is now confronted with two decisions, concerning the optimal probability of detection and the optimal amount of the bonus. While a higher probability of detection involves higher monitoring costs, it also reduces the incentive-compatible bonus that induces the agent to work hard.

Let $W^*(\pi) \equiv w(e) - pt^*(\pi) - c(\pi)$ be the expected utility of the principal when he agrees to pay this bonus and let $W(\pi) \equiv w(e) - c(\pi)$ be his expected utility when he pays no bonus at all. It can be shown that $W^*(\pi)$ is continuous and concave, and that $W^*(\pi) > W(\pi)$ if and only if $\pi > \pi'$.

Concavity of $W^*(\pi)$ in the interval $[\pi', 1]$ ensures that it is maximised by a unique value $\pi o \equiv [\pi', 1]$; moreover, πo cannot be larger than π^*, since $W^*(\pi)$ is strictly decreasing in the interval $[\pi^*, 1]$ (a higher probability of detection in this interval only involves higher monitoring costs without allowing any reductions in the incentive-compatible bonus).30 πo therefore lies within the interval $[\pi', \pi^*]$; if it is an internal point, it is implicitly identified by the FOC:

$$c'(\pi) = -p\frac{dt_c}{d\pi} \equiv \frac{p}{2p-1+\pi(1-p)}\left[F+(1-p)t_c(\pi)\right] \quad (12)$$

$W(\pi)$ is instead strictly decreasing in π because when the agent works lazily an increase in the probability of detection involves higher

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30 In this interval, $t^*(\pi)$ is constant and equal to t, while $c(\pi)$ is increasing in π.

monitoring costs without any benefits for the principal; the maximum of $W(\pi)$ thus lies at $\pi = 0$. The expected utility of the principal is therefore maximised either at $\pi = \pi°$, or at $\pi = 0$, or at both values. These three possibilities are shown in Figure 4. The top diagram shows the first, when the principal sets π equal to $\pi°$ and offers a bonus equal to $t(\pi°)$, while the agent works hard and corruption remains hidden; the middle diagram shows the second possibility, when the principal sets $\pi = 0$ and offers no bonus, while the agent works lazily and corruption occurs; the bottom diagram, finally, shows the third possibility, when $W(0) = W^*(\pi°)$ and the principal is indifferent between the two alternatives, choosing either with equal probability although they involve a completely different work effort and corruption pattern; in this case, the system exhibits multiple equilibria (namely, two), as is described by the following Proposition:

Proposition 5 (Multiple equilibria) When

$$\Delta w = \left(\Delta u + b - \pi^0 F\right)\frac{p}{2p-1+\pi(1-p)} + c\left(\pi^0\right)$$

the system exhibits two equilibria, one of which involves hard work and hidden or repressed corruption while the other involves a lazy work effort while corruption actually occurs.

PROOF:

By equation (9), the equality in Proposition (5) is equivalent to: $\Delta w = pt(\pi°) + c(\pi°)$, which implies: $W^*(\pi°) \equiv w(e) - pt(\pi°) - c(\pi°) = w(e) \equiv W(0)$. In this case, therefore, the expected utility of the principal is the same if he sets $\pi = \pi°$ as if he sets $\pi = t = 0$; the principal may choose either of these alternatives, and two equilibria thus exist. In one of these equilibria, the principal pays the incentive-compatible bonus and the agent works hard and rejects the bribe, while in the other the principal pays no bonus and the agent works lazily and accepts the bribe.

Q.E.D.

Using the terminology adopted in the previous subsection, these equilibria can be dis-

tinguished into three types: a deterrence equilibrium (when $\pi = \pi^o = \pi^*$), stick-and-carrot equilibria (when $\pi' \leq \pi = \pi^o < \pi^*$) and a capitulation equilibrium (when $\pi = 0$). The deterrence equilibrium occurs when $\pi^o = \pi^*$ and $W^*(\pi^*) \geq w(e)$, since the principal sets it equal to π^* and t equal to t. In this equilibrium, corruption does not actually occur (since the threat of punishment is too high), and is repressed rather than hidden because its threat does not allow the agent to extract rent from the principal; the principal, however, still suffers from the mere possibility of corruption, because this possibility induces him to pay for a high level of monitoring. The stick-and-carrot equilibria occur when $\pi^o < \pi^*$ and $W^*(\pi^*) \geq w(e)$, since the principal sets it below π^* and t equal to t, greater than t; in these equilibria, corruption is hidden and the agent is able to extract rent. The capitulation equilibrium finally occurs $W^*(\pi^*) \leq w(e)$; in this case, the principal sets $\pi = t = 0$ whatever the value of π^o, the agent works lazily and corruption occurs. Notice that the expected utility of the principal is always maximised in equilibrium, since it is the principal who chooses the type of equilibrium by deciding the level of monitoring.

The expected utility of the agent, instead, is always higher in a stick-and-carrot equilibrium than in a deterrence equilibrium, while a comparison with the capitulation equilibrium depends on Conditions. 1 and 2. When Condition 1 holds, the capitulation equilibrium is the worse for the agent; when Conditions. 1 and 2 both fail, the capitulation equilibrium is the best; while when Condition 2 holds the capitulation equilibrium is preferred to the deterrence equilibrium, and it is also preferred to the stick-and-carrot equilibrium if and only if $\pi^o > \pi^{**}$ (see Figure 5).

Under particular conditions, the agent may be indifferent between a stick-and-carrot and a capitulation equilibrium; if the principal is also indifferent between them, two equilibria exist which yield the same expected utility to both parties but involve a completely different

behaviour on the part of the agent:

Proposition 6 When $W^*(\pi^o) = w(e)$ and $\Delta u + b = pt(\pi^o)$, two equilibria exist which are equivalent for both the principal and the agent; one of these equilibria involves a lazy work effort and the actual occurrence of corruption, while in the other equilibrium co hidden or repressed and the agent works hard.

Some of the implications of this proposition will be discussed in the following section. Consider now the attitudes of the two parties towards the introduction of the legal noim prohibiting corruption. Like in the previous subsection, we shall ignore the expected utility of the corruptor. Once corruption is legally prohibited, the level of monitoring is unilaterally decided by the principal, but at an earlier stage the agent may have some power in influencing the decision on whether or not corruption should be legally banned. A in the case where monitoring is costless, the equilibrium that is reached without a prohibiting corruption is equivalent to the capitulation equilibrium.

Four different cases are thus possible:

when $w(e) > W^*(\pi^o)$, the introduction of the norm leads to a capitulation equilibrium and therefore produces no effects (since its violations are not monitored); both parties are thus indifferent towards it,

when $w(e) < W^*(\pi^o)$ and Conditions. 1 and 2 fail, the introduction of the norm induces a stick-and-carrot or a deterrence equilibrium but the agent prefers a capitulation equilibrium; the principal is in favour of the norm and the agent is against it,

when $w(e) < W^*(\pi^o)$ and Condition 1 holds (or Condition 2 holds and $\pi^o \leq \pi^{**}$ the norm leads to a stick-and-carrot or a deterrence equilibrium which both parties prefer to a capitulation equilibrium; both parties are thus in favour of the norm,

when $w(e) < W^*(\pi^o)$, Condition 2 holds and $\pi^o > \pi^{**}$, the norm leads to a stick-and-carrot or a deterrence equilibrium which, from the point of view of the agent, is worse than a capitulation equilibrium; the agent opposes

the norm and the principal supports it. In this case, however, if π were to be set at or below π**, the agent would be better off with the norm than without it (in other words, stick-and-carrot equilibria exist which are preferred by the agent to a capitulation equilibrium); as a result, the two parties may agree to introduce the norm, provided that the principal commits to set π ≤ π**.

A legal norm prohibiting corruption would be ineffective in case (i) while in case (iii) it induces a Pareto-improvement; in cases (ii) and (iv), the introduction of the norm benefits the principal and reduces the expected utility of the agent, becoming an issue of distribution. Case (iv) however is rather peculiar, because it involves the possibility of Pareto-improvements by compromise. The parties may thus engage in bargaining over the appropriate value of π in order to reach an agreement that would improve the expected utility of both, where it would be set equal to or below π**, in the shaded area in Diagram (b.2) of Figure 5.

Compare, now, the three types of equilibria that arise in a world with corruption and costly monitoring, with the equilibrium that is reached in a world without corruption. Unlike when monitoring is costless, this equilibrium is no longer equivalent to a deterrence equilibrium, because the latter involves positive monitoring costs which reduce the expected utility of the principal and is, therefore, weakly Pareto-inferior. In a stick-and-carrot equilibrium, the agent perceives a higher expected utility than in a world without corruption while the expected utility of the principal is lower, as a result both of positive monitoring costs and of a higher level of the bonus; aggregate utility is also lower, due to the presence of positive monitoring costs. In the capitulation equilibrium monitoring costs are nil but the expected utility of the principal is lower than in a world without corruption; the agent's utility may be higher or lower depending on Condition 1, and aggregate utility is lower, as shown in the previous subsection.

This yields the following Proposition:

Proposition 7 When monitoring is costly, the possibility of corruption always reduces aggregate utility even when corruption is hidden or repressed. When corruption is hidden, the agent is able to extract rent from the principal and his expected utility is higher than in a world without corruption, but his gain is lower than the loss incurred by the principal.

PROOF:

In a world without corruption aggregate utility is equal to $w(e) + u(e)$. In a capitulation equilibrium, aggregate utility is equal to $w(e) + u(e)$, which is lower than $w(e) + u(e)$ by assumption (see (3)). In all other equilibria, aggregate utility is equal to $w(e) + u(e) - c(\pi)$, which is also lower than $w(e) + u(e)$. Hidden corruption occurs in a stick-and-carrot equilibrium, where the agent works hard and rejects the bribe but receives a higher bonus than in a world without corruption, perceiving a rent equal to $pt(\pi^o) - pt$ and thus enjoying a higher expected utility than in a world without corruption; the principal's loss however is larger than the agent's gain, because, on top of paying the bonus, the principal has to pay for the cost of monitoring.

Q .E.D.

4 Conclusions

In this paper, we modelled corruption as a particular type of principal-agent-client relation. We showed that the potential for corruption arises when the client alters a pre-existing relation between the principal and the agent, leading to a Pareto-inefficient outcome or to a redistribution of rent in favour of the agent. Most economic effects arise from this perturbation, and persist even when the parties respond by banning the contract between the agent and the client. Although different types of equilibria arise in this case and only one of these types involves the actual performance of corruption, all these equilibria generally involve a different level of expected utility for each party with respect to the situation that preceded the intervention of the client.

In particular, although with a sufficiently

high probability of detection corruption can be successfully prevented by a mix of incentives and punishment, the possibility of corruption enables the agent to extract rent from the principal, unless the risk of detection is particularly high. Even in this case, while the agent fails to extract rent, the principal incurs a loss if he has to pay for the cost of monitoring.

This bears relevant implications both on the normative and on the empirical side. On the normative side, repressive interventions aimed at discouraging corruption by increasing the threat of punishment appear to be less effective in reducing its economic impact, than preventive interventions aimed at reducing the opportunities for corruption, including educational programmes aimed at increasing loyalty and honesty. On the empirical side, cross-section or cross-country comparisons based on statistical data about the actual occurrence of corruption may yield inaccurate results, unless these data are properly interpreted and integrated by additional information.

This paper also shows how the introduction of a legal norm prohibiting corruption is sometimes supported by both principal and agent, while in other cases it involves a conflict on the distribution of rent and a confrontation of bargaining power and political influence; in terms of efficiency and distribution, an evaluation of corruption cannot be decided a priori, since corruption leads, in alternative situations, to Pareto-dominated outcomes or to a redistribution of rent between different parties.

The model shows that multiple equilibria may arise even in a static context, if monitoring corruption is costly for the principal. These equilibria always yield the same expected utility to the principal, and under certain conditions they yield the same expected utility also to the agent. These results provide interesting suggestions in the interpretations of the historical record of some countries. On one side, countries which have experienced remarkable reductions in corruption may have rationally decided to switch from an equilibrium with actual corruption to one where corruption is hidden or repressed, enjoying only minor increases in utility and social welfare; on the other side, countries with remarkable observable differences in the levels of corruption may in fact be enjoying similar levels of welfare, while countries with similar low levels of corruption may be affected by substantial differences in welfare, if corruption is completely absent in one country and costly prevented (hidden or repressed) in another.

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