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Johann Graf Lambsdorff ✉

Abstract

This study embeds transaction cost analysis into a Law and Economics model to produce general recommendations on how to deter bribery. Governments may deter bribery either by high penalties and risks of detection, potentially supported by leniency given to those who report their infraction (deterrence regime). Another local optimum is achieved if the government amplifies the risk of opportunism, aggravating the difficulties of enforcing a bribe transaction. This involves a low probability of detection and allowing offenders to keep their ill-gotten gains. If bribes are paid upfront bribe taking will face only mild punishment (constrained enforcement regime).

JEL Classification: K42, D73

Keywords: Bribery, Corruption, Leniency, Enforcement, Deterrence, Opportunism, Reporting, Whistle-blowing, Nullity.

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1 Introduction

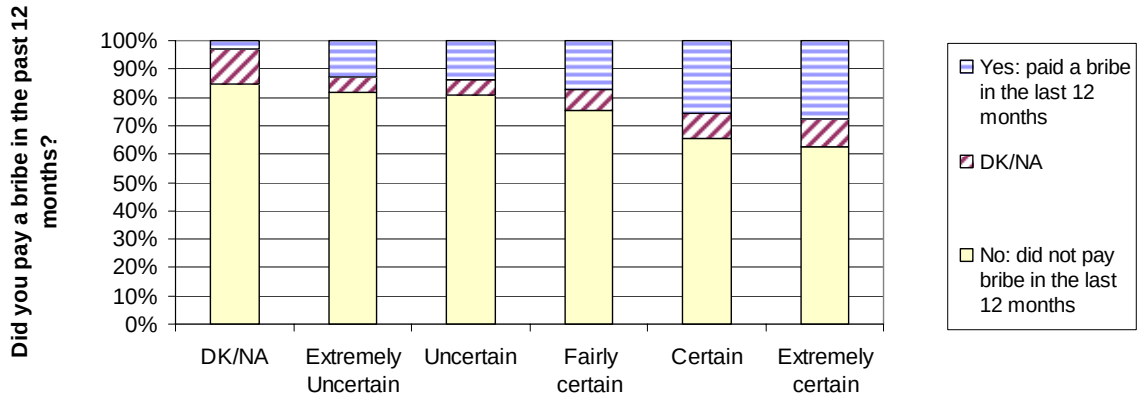
There is nowadays a widely held view that countries affected by high levels of corruption, such as the bribing of public officials, allocate resources inefficiently, deter investors, fail to protect the environment, exhibit an unequal distribution of incomes and low trust in politics. Contrary to this consensus there is little agreement on how best to confront these problems.

Building on the work of Becker [1968] and Becker and Stigler [1974] a Law and Economics perspective is often employed as a framework for analysis. In a nutshell, the adverse effect of bribery can be described as follows: Individuals can profit from acts that are harmful to society. The government seeks to maximize social welfare by employing law enforcers and imposing penalties on these offenders, balancing the costs of deterrence with the harm they would cause otherwise. But deterrence is less effective if law enforcers take bribes and collude with offenders. Bribery is thus seen to reduce the government's capacity to deter harmful behavior, [Becker and Stigler 1974; Polinsky and Shavell 2000: 73]. One may question whether all welfare implications of corruption are captured in such a model. But the model has been rich and clear to be widely accepted as a workhorse.

Another body of literature has taken a different approach to the study of corruption. A transaction costs viewpoint focuses on the difficulties of enforcing a corrupt transaction, [Husted 1994; della Porta and Vanucci 1999; Rose-Ackerman 1999: 91-110; Lambsdorff 2007]. The risk of being cheated upon is seen to render corrupt transactions troublesome. When public officials are paid with counterfeit money, as happened recently in India, or are compensated with fake antiques, as in China, they experience the risk of being cheated by bribers.[1] This risk may deter them from demanding or accepting bribes in the first place. By the same token, when corrupt public officials renege on their promises, businesspeople are discouraged from paying bribes.

[1] See Herald Tribune [8 March 2002: "One corrupt city shows the plague that afflicts all of China"]; The New Zealand Herald [28 March 2002: "It's hard graft when bribes are crooked"]; Asia Times [04 April 2002: "Rampant corruption threatened by corruption"].

Figure 1: Uncertain Reciprocity Reduces Bribery
Survey among 70110 Households in 66 Countries,
Own Research based on Transparency International Barometer 2009



If someone paid a bribe in order to obtain a service or to resolve a problem, how certain would be the delivery of the service or the resolution of the problem after the payment?

A 2009 worldwide survey of households provides evidence on the importance of transaction costs in bribe transactions, [Transparency International 2009]. Households in 66 countries have been asked, first, whether they paid a bribe in the last 12 months and, second, whether the delivery of the corrupt service is certain after making such payments. As shown in figure 1, the uncertainty of delivery is closely associated with the likelihood of paying bribes. Among households that are certain about the delivery 28% pay bribes. But only 13% of households pay bribes if they are uncertain whether a bribed public official will deliver the corrupt service.[2] Uncertain enforcement renders bribe transactions less attractive and thus less frequent.

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[2] The correlation of the data is highly significant in binary ordered probit regressions and remains robust when controlling for individual characteristics of respondents such as age, income, religious affiliation and country of residence. A note of caution must be raised with respect to causality. Assuming causality to run from perceptions of environmental constraints (such as the perceived certainty of delivery) to action (such as paying bribes) tends to be the standard assumption in models of corrupt behavior, [Rabl and Kühlmann 2008]. The countries included are Argentina, Armenia, Austria, Azerbaijan, Belarus, Bolivia, Bosnia & Herzegovina, Brunei, Bulgaria, Cambodia, Cameroon, Canada, Chile, Colombia, Croatia, Czech Republic, Denmark, El Salvador, Finland, Georgia, Ghana, Greece, Hong Kong, Hungary, Iceland, India, Indonesia, Iraq, Israel, Japan, Kenya, Korea, Kosovo, Kuwait, Lebanon, Lithuania, Luxembourg, Macedonia, Malaysia, Moldova, Mongolia, Morocco, Netherlands, Nigeria, Norway, Pakistan, Panama, Peru, Philippines, Poland, Portugal, Romania, Russia, Senegal, Serbia, Singapore, Spain, Switzerland, Thailand, Turkey, Uganda, UK, Ukraine , USA, Venezuela and Zambia.

The enforcement problem of corrupt transactions has been embedded in theoretical models, employing a rational choice perspective. Pechlivanos [2004] and Lambert-Mogiliansky et al. [2007] show that repetition of corrupt transactions renders them self-enforcing. Hasker and Okten [2008] focus on the operation of intermediaries and their capacity to enforce bribe transactions by establishing repeated contact with public servants. Kingston [2007] shows how opportunistic behavior can become unattractive when counterparts belong to a shared network or can threaten cancellation of legal deals.

This rational choice perspective has been complemented by behavioral evidence on the enforcement of corrupt transactions, [Abbink 2006; Cameron et al. 2009]. Rivas [2008], Krajčová and Ortmann [2008] as well as Lambsdorff and Frank [2010] report the experimental findings of a game closely related to the one investigated here. The authors find a significant number of (players allotted the role of) public servants who abstained from opportunism and reciprocated a bribe although this reduced their payoffs. Also there was substantial retaliation among (players taking the role of) bribers who were cheated, although this action was costly to bribers. Subjects' behavior was not only characterized by payoff maximization but involved considerations of reciprocity.

This study integrates insights from a Law and Economics perspective with transaction cost analysis. It shows how the two approaches produce disparate reform proposals and paves the avenue for a more general approach to reform. I develop a game-theoretic approach to show that, irrespective of whether a rational choice or a behavioral approach is employed, increasing penalties and the risks of detection is not always advisable. Penalties can have a perverse effect by helping corrupt actors create the bonds that are needed for enforcing their deal.

Since the work of Schelling [1960: 22; 195-196] it is recognized that a party can strengthen its position by overtly worsening its own options. Army generals burn bridges behind their troops, revealing to their enemies that they cannot retreat. Mafia novices commit a murder in order to provide their superiors with evidence against them, rendering themselves credible for higher-ranking positions, [Gambetta 2009: 61-62]. Kidnapped persons may commit a crime so as to enable their kidnapper to let them go while ensuring their silence, [Schelling 1960: 44].

People who attempt to exchange bribes and favors employ similar techniques to enforce their deal: A bribe-taking bureaucrat may either take cash without leaving any traces. Alternatively, he may receive a bribe in form of a wired transfer to his bank account, providing the briber with documents and incriminating evidence. The bureaucrat can be easily imagined to prefer the latter option. Handing over some evidence to his counterpart strengthens the bonds between the contracting parties. The bureaucrat becomes a credible partner because cheating would be risky. The evidence, alongside with the threat of punishment, lends credibility to the bureaucrat's promises. The more the government threatens to punishment offenders, the easier it gets to mutually ensure their complicity. These effects are investigated here in detail.

Section 2 develops the basic model for welfare maximizing penalties and an optimal probability of detection, assuming that a bribe transaction is enforceable. Section 3 addresses the problem of enforcement by help of collateral, rooted in a rational choice tradition. It shows that a high probability of detection improves the capacity to enforce a bribe transaction. Section 4 models reciprocity as an enforcement device and shows how penalizing bureaucrats may backfire. Section 5 provides some first policy recommendations, suggesting that countries should either choose a deterrence regime with high penalties and a substantial probability of detection. Alternatively, a "constrained enforcement regime" can be optimal where attempts to privately order corrupt transactions are impaired. Section 6 tests for the robustness of the assumptions and derives further recommendations on the design of penalties. Section 7 concludes.

2 A Benchmark Model with Enforcement

In a benchmark model corruption functions as efficiently as any perfect market. An entrepreneur E considers a new investment, producing the individual payoff g, with g being distributed according to the density function $s(g)$, which is positive on $[0, \infty)$. The size of g is private knowledge to E and cannot be verified by others. There is a fixed cost of the investment to society, h, for example due to pollution and congestion of public roads. If the investment is carried out, E is liable to pay taxes amounting to v to the government. The payment v is collected by the bureaucrat B.

Whether E is liable to pay the tax is private knowledge to E and B. E may pay a bribe to B of size b to avoid the tax. When agreeing to take the bribe B will use his discretion and falsify

documents such that the investment is misclassified, reducing the tax to zero. This transaction, however, is risky and subject to a penalty when randomly detected. Denote the probability of detection by p in which case B can keep the bribe b and is fined by the amount F_B and E by the amount F_E. Given that both actors are assumed to be risk-neutral, B will take the bribe if

$$b > pF_B .$$

Likewise, E will offer the bribe rather than paying v if

$$b + pF_E < v .$$

Observe here that the tax v is not additionally collected in case of detection. The penalty F_E can thus be regarded as including also the payment v. This assumption is without loss of generality. A bribe is feasible and exchanged among both actors if

$$pF_B < b < v - pF_E .$$

The joint surplus from bribing amounts to $v - pF_E - pF_B$. Let us assume B to have the fixed bargaining power λ, $0<\lambda<1$. He will therefore request $\lambda\left(v - pF_E - pF_B\right)$ in addition to a compensation of his risk, pF_B. The bribe must therefore satisfy:

$$b = \lambda\left(v - pF_E - pF_B\right) + pF_B \qquad (1)$$

As we noted above, the size of g is private knowledge to E. In particular it cannot be verified by the government or the bureaucrat. The bureaucrat cannot raise the bribe when g is high.[3] The government cannot set fines contingent on g. It is also unable to let the fine be contingent on the size of the bribe b, which is nonverifiable.

First-best would be that all investments with $g<h$ are cancelled. Without bribery this can be achieved by setting $v=h$. But this condition may be violated by help of bribery. Being a bribe-paying risk-neutral investor, E will carry out the investment if it promises her a positive payoff,

$$g > b + pF_E = \lambda v + \left(1-\lambda\right) p\left(F_E + F_B\right) = \hat{g} \qquad (2)$$

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[3] This assumption is also implemented by Polinsky and Shavell (2001: 4-5). One may consider B to design a mechanism that induces E to truthfully reveal g, this way increasing his share with a larger g. But E's advantage from bribery is independent of g. This implies that discriminating with bribes cannot be an equilibrium outcome. B is thus forced to stick to a going rate when taking bribes.

By $\hat{g}$ I denote the critical level, below which the investment will not be carried out. Whenever $\hat{g} \leq g \leq h$ it is profitable to carry out an investment whose payoff to the investor falls short of its harm to society. Bribery results in a welfare loss due to this net harm.

An easy approach to avoiding the harm would be to increase v such that $v>h$. But there may be legal limitations or public pressure that limit taxation. Other investment projects where taxes cannot be evaded would suffer from an increase in v. I thus assume that the government is impeded from increasing v. At the same time, it is trivial to observe that setting $v<h$ is never optimal. We can thus simplify and assume that the government will always set $v=h$.

As is standard in the literature, there are no welfare consequences from imposing fines because these are mere transfers. Let us denote enforcement expenditures to detect offenders by $c(p)$ with $c'(p)>0$. Social welfare is:

$$W = \int_{\hat{g}}^{\infty} (g-h)s(g)dg - c(p) \qquad (3)$$

Figure 1 shows the sequence of actions. Nature first selects the individual payoff of the investment, g. Whenever g is small, the investment will not be carried out. When it is above the critical value, $g > \hat{g}$, E will decide in E_0 whether to pay a bribe, b, or not, nb. If paying a bribe, this was determined to be advantageous to both, so that in B_0 B will award the tax break (action a).

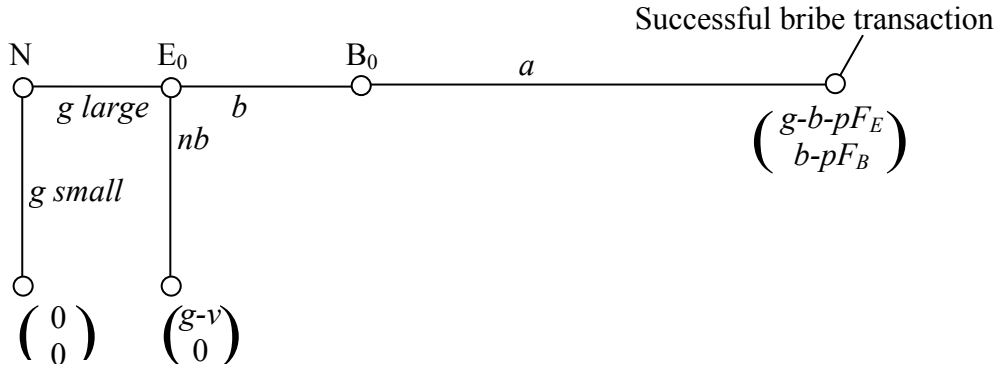

Figure 1: Timeline for Bribery with Deterrence and Enforcement

To illustrate, let $s(g)$ be uniformly distributed between 0 and 3000, with h=2000. The government sets $v=h$; without bribery the investment would be carried if g>2000, which arises with probability 33% and yields an individual gross payoff between 2000 and 3000, on average 2500. The first best solution would thus yield social welfare of 33%·(3000-

2000)=500/3. With bribery, however, the critical $\hat{g}$ would drop. Let us assume F_B=F_E=4000 and λ=0.2. If enforcement were costless, $c(p)$=0, p should be set at least to 0.25 in order to achieve first best, which yields $\hat{g} = \lambda v + (1-\lambda)\, p\,(F_E + F_B) = 0.2 \cdot 2000 + 0.8 \cdot 0.25 \cdot (4000 + 4000) = 2000$. But with costly enforcement, $c(p)$=1000$\cdot p^2$, the probability of detection in optimum will be reduced to p=0.218. This brings about $\hat{g}$ = 1796, suggesting that investments with 1796<g<2000 are carried out. These depict the social harm that is accepted in order to optimize on enforcement costs.

A first conclusion relates to the size of fines. Let B and E face financial constraints due to their official wealth w_0, which for the sake of simplicity we assume to be identical for both actors. We assume that bribes are arranged by help of foreign bank accounts. These accounts are hidden from the government and cannot be confiscated. Any values deposited there do not add to the official wealth and have no impact on the liability constraint. The fines are thus bound above by the official wealth, $F_B = F_E = w_0$. Observe that E's income from the investment, g, does not add to her official wealth. This is due to the fact that it cannot be verified by prosecutors and arises in the future only. Both fines, F_E and F_B, should be maximal, which is the standard result in Becker [1968] and Polinsky and Shavell [2001:7]. To see this, assume instead that a fine is lower than w_0. In this case, the fine could be increased while lowering p and maintaining the same critical level $\hat{g}$ according to (2). But this change would increase social welfare due to the savings of enforcement costs, suggesting that a fine below w_0 cannot be optimal.

Second, the government will always set p such that bribing is preferable, that is, $\hat{g} < h \Leftrightarrow v - p\,(F_E + F_B) > 0$. This can be seen from observing that the first derivative of social welfare, W, according to p, must equal zero in an optimum: $-(1-\lambda)(F_E + F_B)(\hat{g}(p) - h)\, s(\hat{g}(p)) - c'(p) = 0$. Since $c'(p) > 0$ it follows that $\hat{g}(p) - h < 0$. This implies that bribing is the optimal behavior.

A third conclusion refers to the type of penalties to be imposed on E. Rather than imposing a fine E may be debarred from future public contracts. This is a widely discussed penalty, often recommended and practiced. The debate on debarment shows some similarity to the old debate on fines versus imprisonment, [Becker 1968: 179-180; 196-197]. Just like prisoners

cannot continue committing crimes, debarred firms cannot continue with bribery. But this advantage is minor if potential offenders do not differ in the morality and base their decision to offend purely on a cost-benefit analysis. Those inside and outside prison would exhibit an equal inclination to commit an infraction. Debarment then does not exclude those who are most likely to bribe in the future. This limits debarment to a punitive effect. But if the benefit of debarment is limited to this effect it is straightforward to observe that it performs worse than fines.

This consequence arises because the costs of debarment, just like those of imprisonment, are higher than those of fines. Imprisonment requires expenditures on guards and supervisory personnel. Debarment has similar administrative costs and limits the public from giving contracts to a firm that may be best qualified. Debarment thus hurts both the company and the public by limiting competition. Fines are a mere transfer of resources. For this reason, they did not enter the social welfare function (3). It should thus be apparent that debarment may at best be imposed on top of fines. They may be considered if fines are substantially limited by wealth constraints and thus insufficient to obtain an adequate deterring effect. As long as it is possible to increase deterrence by increasing fines, debarment should not be taken into consideration.

Fourth, leniency programs can be considered when penalizing bribery. Penalties can be reduced for those who report their infraction.[4] The advantages of such programs involve

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[4] Leniency is often exercised if existence of an adequate compliance system can be proven. Laufer [2006: 100] argues that this type of leniency reduces the repressive pressure of the legal code and, even more worrisome, it induces firms to invest in potentially useless compliance systems. A related problem arises if an organization, after being suspected of malfeasance, accepts an outside monitor to impose internal reforms in exchange for a milder punishment. This approach is currently taken by the World Bank within its voluntary disclosure program and has gained prominence in the U.S. Justice Department. Such an approach is alleged to lower the deterrent effect of corporate liability, while producing verifiable compliance systems. Leniency in exchange for proven compliance, however, results in an unusual game: firms are given incentives to produce evidence on compliance but these compliance systems are at odds with reduced deterrence and thus increased incentives to misbehave, [Krawiec 2005]. Granting leniency only in exchange for reporting would not run into such problems. A related concern is raised by Arlen [1994]. She notes that corporations that are facing liability may lose the incentive to monitor their employees: they fear that knowledge of misconduct may deem them liable. But lenient treatment in cases of self-reporting would strengthen incentives to monitor employees. Firms

lower enforcement costs, reduced uncertainty faced by offenders (which is not the case here with risk-neutral actors) and discontinuing of infractions which are otherwise carried out in sequence, [Kaplow and Shavell 1994; Shavell 2004: 523-524]. But these advantages must be weighed against the reduced deterrence. When two actors are involved, B and E, a leniency program becomes particularly attractive because it takes advantage of the strategic interdependence of the two, driving them into a prisoners' dilemma, [Feess and Walzl 2004; Yadlin 2006]. To see this, assume that leniency involves the payment of a bonus L_E to E, leaving out bonuses to B without loss of generality. The endnode in figure 1 then turns out to be another decision node of the game where E must decide on whether to report. In case of E reporting her payoff amounts to g-b+L_E-F_E, if she stays silent the payoff remains at g-b-pF_E. B will be penalized with certainty in case of reporting and will thus take the bribe only if $L_E < (1-p)F_E$. The government would effectively deter bribery by setting $L_E = (1-p)F_E$ (or slightly above to render this option strictly dominant). Leniency thus offers costless deterrence.[5]

But the government may tremble in its attempt to set the right $L_E = (1-p)F_E$, for example because it may err in guessing E's official wealth w_0 and the maximum penalty, F_E, it can impose. If the incentive is set too low it remains ineffective. If it is set too high there emerges a risk of collusion. If $L_E > F_E + F_B$ it becomes attractive for B and E to collude at the reporting stage with E reimbursing B. The leniency program then serves as an invitation for B and E to commit the infraction and report, [Feess and Walzl 2004]. Faced with this risk, governments may favor only mild bonuses, preferring a leniency program that might be ineffective to one that might invite for criminal behavior. If leniency is high enough to be effective B observes the risk that E might report. He will demand a compensation, increasing the costs of bribery for E and thus the critical value $\hat{g}$. A leniency program will thus increase

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would have an advantage from being the first to know about their employees' misconduct, providing them with the opportunity to self-report.

[5] There are some caveats to a leniency program that should not go unnoticed. E may commit an even worse crime for which no leniency exists, such as a murder, in order to assure B of her silence, [Gambetta 2009: 61-62]. The government will also dislike the potential unfairness of a leniency program. Imagine a bureaucrat was forced by threat of physical violence to provide the tax break without obtaining a bribe, which is depicted by λ=0. Granting leniency to E suggests that B as the victim suffers twice.

welfare. We will address the pros and cons of a leniency program again in subsection 6.2 when discussing issues of enforcement.

3 The Problem of Enforcement

There is a major challenge faced by B and E: After paying a bribe B may fail to deliver the tax break. Rather than giving the tax break to E, B may just sack the bribe and do nothing.

Courts do not enforce corrupt agreements. They follow the principle that those who operate outside the law cannot claim the law's protection. The risk of opportunism by B can only be countered by attempts to privately enforce a corrupt transaction, [Lambsdorff 2007]. E must have recourse to some mechanism that hurts B and compensates herself for the bribe that cannot be recovered. For example, B may hand over some collateral which E can keep in case she was cheated. In personal correspondence it was reported that bureaucrats in Kuwait hand over signed cheques which bribers try to cash in if they were cheated. If the promised favor was delivered by the bureaucrat the entrepreneur obliterates the cheque, then preferring to annihilate any evidence. A similar enforcement mechanism arises if E can withhold future contracts from B and allocate them to someone else, [Pechlivanos 2004]. This hurts B and compensates E by shifting her business to more reliable partners. Buchirossi and Spagnolo [2006: 1294] make a related argument by suggesting that criminal enforcement services can be purchased and that suppliers are credibly committed to recover the bribe or transfer some valuable assets if B cheats.

When having been cheated E is provided with the capacity to keep B's collateral, the amount being denoted by $R>0$. We assume that the amount lost by B is completely gained by E. Consideration of transfer costs may appear reasonable but would not enrich the conclusions of the model. But keeping the collateral induces a higher probability of detection. Prosecutors are alerted if a bureaucrat's bank account reveals unusual transactions, if he is subject to physical violence or a loss of reputation. They start investigating these suspicions and may detect the infraction. To simplify the analysis, we assume that whenever E was cheated and employs a method for compensating herself (retaliate) the bribe transaction is detected with certainty.

We further assume that R is not part of B's or E's official wealth. It is a piece of wealth that cannot be forfeited by the prosecutor, for example because it is held in foreign countries or,

say, officially belongs to B's or E's wife. Transfer of R thus does not impact the wealth restriction and thus the maximum value of penalties.[6]

There are likely to be limits on the amount of R. Credible enforcement mechanisms such as collateral are likely to be scarce. We consider this by letting R be distributed according to the density function $q(R)$, which is positive on $[0, R_{max}]$ and independent of $s(g)$.

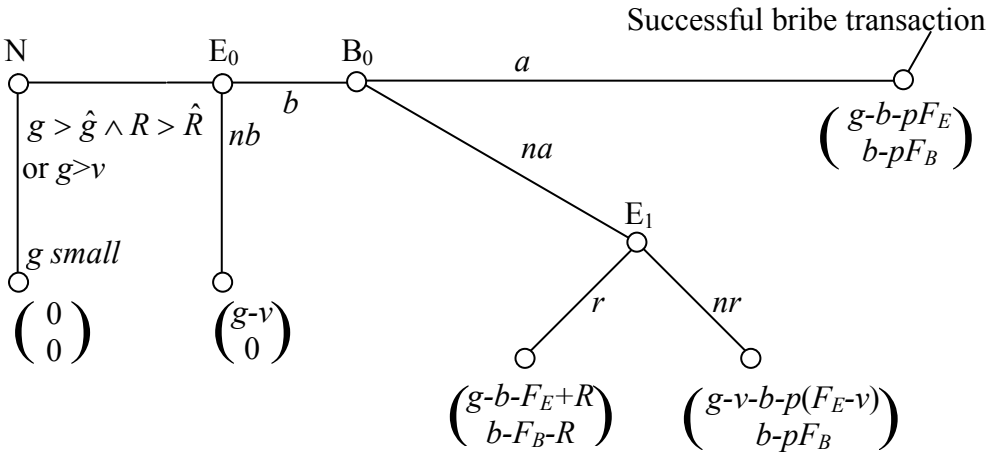

Figure 2: Bribery with Deterrence and Opportunism

As shown in figure 2 nature (N) moves first and determines the size of g and R. A small value for g suggests that E would not carry out the investment, not becoming liable of paying the tax v. With g sufficiently large E will carry out the investment. The actual cut-off point for g is either v (if a bribe cannot be enforced) or $\hat{g} < v$ (if a bribe can be paid to avoid the tax). E then decides at node E_0 whether to give a bribe (action "*b*") or pay no bribe but rather the tax (action "*nb*").

If E gives the bribe, B has two options (at node B_0). B may choose to comply with the illicit agreement and **a**ward the tax break (action "*a*"). B may instead decide to renege on his promises and **n**ot **a**ward the tax break (action "*na*"). E has the choice of **r**etaliating (action "*r*") or **n**on-**r**etaliating (action "*nr*"), at node E_1. If she decides to retaliate the bribe

[6] Assume instead that a transfer of R can be observed by prosecutors. This increases the maximum penalty that can be imposed on E and reduces the one that can be imposed on B. Prosecutors would observe that B cannot be well penalized because his accounts were already plundered by E. Confiscating R on top of imposing the fine F_E would be a first-best advice because it reduces E's incentive to retaliate, this way further undermining the enforcement of the bribe transaction.

transaction is discovered with certainty, imposing the penalty F_E. But E's wealth is diminished relative to the successful bribe transaction by the amount *v*. While E had to pay the tax *v* at this node, her penalty when detected also falls by this amount, because the maximum penalty is now limited by the reduced wealth. E transfers the amount R from B to herself. Altogether, her payoff turns out to be $g\text{-}b\text{-}v\text{-}(F_E\text{-}v)+R=g\text{-}b\text{-}F_E+R$. If she does not retaliate, her payoff drops to *g-v-b* and due to bribery being randomly detected this payoff is reduced by $p(F_E\text{-}v)$. I assume that $F_E\text{-}v$ is positive, because otherwise the tax payment exceeds E's wealth, which is difficult to imagine.

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Key to determining the social welfare is whether the successful bribe transaction is a subgame perfect Nash-equilibrium. If instead B prefers to cheat E, the bribe transaction breaks down and E will prefer action *nb*, producing the first best solution.

$$\text{If} \qquad g-b-F_E+R>g-v-b-p\left(F_E-v\right)\Leftrightarrow R>\left(1-p\right)\left(F_E-v\right)=\hat{R}\,, \quad (4)$$

E retaliates in E_1 (action "*r*"). I denote the critical value of *R* by $\hat{R}$. B will then prefer to award the tax break because the respective payoff, $b-pF_B$, is higher than the payoff from cheating, which is $b-F_B-R$. If, to the contrary, $R<\hat{R}$, E will not retaliate and B will no longer strictly prefer awarding the tax break to cheating, as both yield the payoff $b-pF_B$.[7] Figure 3 depicts the outcome for different realizations of R.

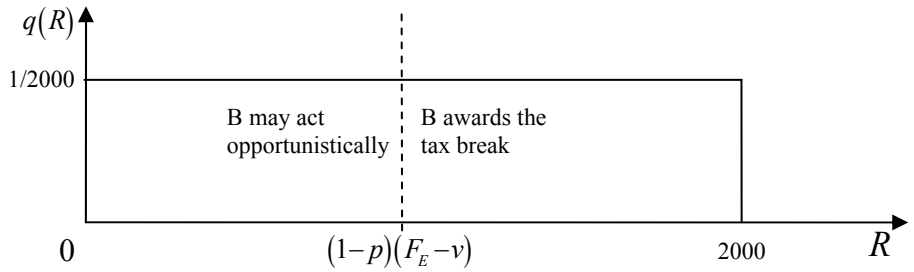

Figure 3: Retaliation

Raising the fine on E, F_E, up to its maximum is advisable as this increases $\hat{R}$. A higher $\hat{R}$ implies that retaliation is less often attractive and cheating will more often be preferred.

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[7] We assume here that being indifferent between the two options induces B to cheat. This strategy choice would become strictly dominant if granting the tax break increases the risk of detection or involves effort for B. We disregard these issues without loss of generality.

Imposing a high penalty on E for paying bribes is therefore advisable, because it also increases deterrence. A high penalty on B, F_B, has no impact on $\hat{R}$. The government will prefer to impose the maximum penalty on B due to its deterring effect.

But there is a downside effect of a high probability of detection, p. A larger p will decrease $\hat{R}$. Consider an extreme case with certain discovery, p=1. In this case, E will always retaliate. Such retaliation increases E's payoff by the amount R while leaving the probability of detection unaltered at 100%. Reporting by E would be motivated by her observation that the infraction is discovered anyways. A lower p, to the contrary, renders retaliation less attractive. E benefits from the low probability of detection. This advantage would be given up if she retaliates and exposes herself to the certain penalty F_E.

An optimum value for p can be determined by a social welfare function, which obtains the following form:

$$W = \int_{\hat{R}}^{\infty} \int_{\hat{g}}^{v} (g-h)\, s(g)\, q(R)\, dg dR + \int_{v}^{\infty} (g-h)\, s(g)\, dg - c(p) \qquad (5)$$

If $R \leq \hat{R}$ the bribe transaction fails to be enforceable and no welfare loss occurs. If instead $R > \hat{R}$ the bribe transaction is enforceable and E will carry out a socially harmful investment if $\hat{g} < g < h$. This is depicted by the first double integral, which is negative. The welfare enhancing investments are depicted by the second integral, which is independent of p. An increase in p provides the advantage of increasing $\hat{g}$, thus limiting the harm. There are now two downside effects of an increase in p. The rising costs of detection, $c(p)$, is the first one. The second one relates to $\hat{R}$ being reduced. This lowers the lower bound of the first integral, where negative net social welfare can arise with $g<h$.

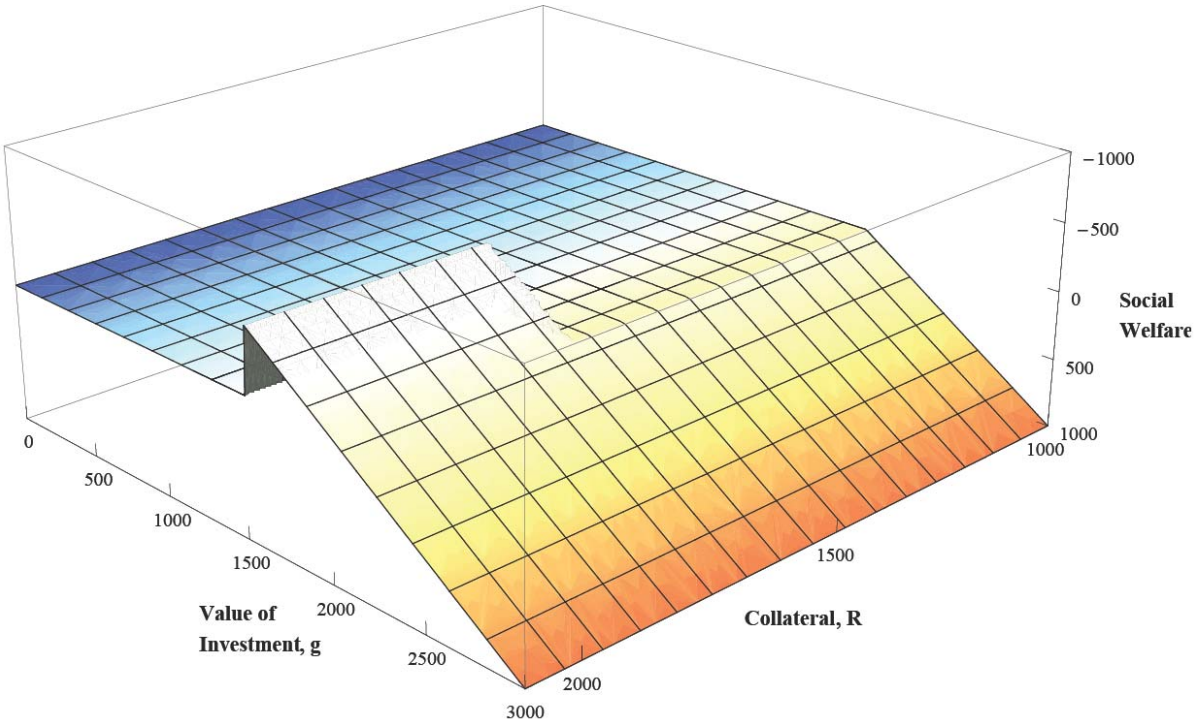

Figure 4: Net social gains in a *g*/*R*-diagram

This calculus can be illustrated by amending the example used in section 2. We assume $q(R)$ to be distributed similar to (but independent of) $s(g)$, that is, uniformly between 1000 and 2100. Tax is equal to harm, v=h=2000. We set F_B=F_E=4000, λ=0.2 and $c(p)$=1000$\cdot p^2$. The bribe transaction is enforceable if $R < \hat{R} = (1-p)(F_E - v) = 2000 - 2000p$. Observe that in section 2 the optimum level of detection, p, was 0.218. Now the optimum level of detection p drops to 0.175. This drop captures the effect of a lower p making retaliation less likely.

The results for p=0.175 can be depicted in figure 4, which denotes on the vertical axis the net social losses for different values for R (shown horizontally) and g (shown vertically) ranging between 1000 and 2100 and respectively 0 and 3000. The probability of detection p=0.175 implies $\hat{R} = 1650$, suggesting that for smaller values of R no harmful project is carried out. E will find that bribery is enforceable if R is above this threshold. She will carry out the investment if g is above the critical value, which is $\hat{g} = 1518$. Some projects whose individual payoff is below 2000 will be carried out, producing a net social loss. This loss is depicted by the "hill" in figure 4. The welfare loss relative to first best is depicted by the average height of this hill multiplied by the probability that a random draw selects the required values for R and g. Changing p would now result in a different hill (apart from changes in enforcement costs, which we leave out for a moment). A lower value for p increases $\hat{R}$ but decreases $\hat{g}$. The hills upper right corner will move upward to the left. The

hill becomes higher and thinner.

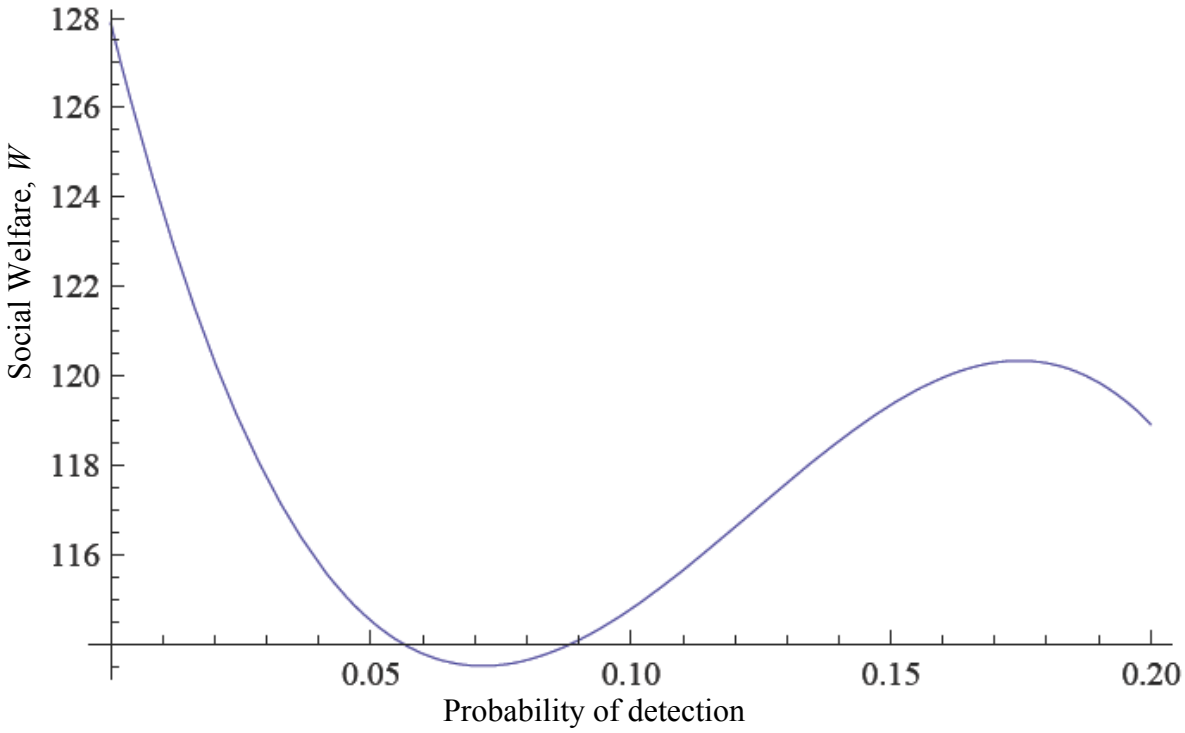

Figure 5: Welfare Effects of Detection

Figure 5 depicts social welfare as a function of the probability of detection. As one may have guessed already from figure 4, there are multiple local optima. Apart from a local optimum with p=0.175 there is another one with p=0. A government that sets p=0.175 may fail to observe the other optimum at p=0. This optimum may be better than the one chosen and the government finds itself trapped in an inferior local optimum. This is a surprising result. If p=0 retaliation is unattractive because it would uncover a bribe transaction that was certain to remain undetected. Only the few cases were R is sufficiently large will induce bribery. With only few bribe transactions taking place, there is less concern for reducing the net welfare loss that arises from these few transactions. Thus, increasing $\hat{g}$ is less important. The advantage from increasing p by increasing $\hat{g}$ is thus outbalanced by the additional transactions that would be rendered enforceable.

The idea that deterrence may be abandoned is not novel. Besley and McLaren [1993], for example, investigate whether deterrence is worth the costs or whether the government should rather capitulate, which they suggest in a high-corruption environment. But my finding differs from theirs because a low probability of detection is here recommended here as a tool for reducing bribery and not due to capitulation.

4 Enforcement by Negative Reciprocity

In section 3 we assumed that E can compensate losses if B cheats by transferring resources to herself. Given that courts are unavailable to enforce corrupt transactions, the capacity to take collateral but also the potential to withdraw future contracts or engage criminal organizations were regarded as acting as an enforcement device. Quite often, though, E may find no method for balancing her losses at node E_1. This still may not end her desire to retaliate. Such a desire would arise if she wants to harm B.

Punishing B for cheating is an action often observed in reality. The punishment may relate to destroying B's reputation, harass or physically hurt B. A simpler approach would be to report the infraction to prosecutors. The certain discovery of the infraction would no longer result as a side-effect of retaliation. It becomes the essence of retaliation. Indeed, various such cases are reported in the literature, [Lambsdorff 2007]. I assume that both B and E collect hard evidence on their joint misconduct which they can disclose to prosecutors. Harming those who imposed harm on oneself is a type of behavior widely observed in laboratory experiments and labeled "negative reciprocity", [Fehr and Gächter 2000]. The link between reciprocal behavior and contract enforcement has been investigated by Fehr, Gächter and Kirchsteiger [1997]. They argue that reciprocity brings about a broader set of enforceable actions, this way producing efficiency gains for the contracting parties.

In experiments involving bribery negative reciprocity by cheated entrepreneurs has been observed by Abbink and Hennig-Schmidt [2006], Lambsdorff and Frank [2007] and Krajčová and Ortmann [2008]. Cameron et al. [2009] find evidence of negative reciprocity among (players assigned the role of) citizens that fell victim to a bribe exchange among a firm and an official.

To illustrate the point, take a quotation from Holger Pfahls, who was charged with taking bribes during his time as state secretary for defense in Germany from 1989 to 1992. He was accused and found guilty of accepting the equivalent of almost €2 million from German-Canadian businessman Karlheinz Schreiber to push through a deal to deliver 36 Fuchs armored vehicles to Saudi Arabia that required support by the German government. In court Mr Pfahls is quoted as giving the following description of the alleged briber (own translation): "Schreiber told me that I was just one out of many who receives bribes. When Schreiber hates someone, his hatred is so profound that he wants to destroy him, even if that

involves his own demise. On the other hand, he is a real buddy, highly talented in creating a pleasant atmosphere."[8] Mr. Schreiber was credibly committed to retaliation. We may simply look at him as someone who obtains pleasure from negative reciprocity.

I follow Rabin [1993] and Dufwenberg and Kirchsteiger [2004] in regarding E as being motivated not only by material payoffs but also by reciprocity concerns.[9] She wants to be kind to a kind B, and unkind to an unkind B. We must define the extent of kind and unkind actions by B and how E forms beliefs about them. Apparently, when playing "*na*" B is unkind to E and E may derive utility from doing bad to an unkind person. We let ρ be E's respective parameter, the weight assigned to the consideration of reciprocity in the utility function. As shown in the appendix, E will strictly prefer "*r*" to "*nr*" iff:

$$\rho > \frac{(1-p)(F_E - v) - R}{(1-p)^2 vF_B + (1-p)vR} = \hat{\rho}. \qquad (6)$$

If E's weight assigned to reciprocity is sufficiently large, she will retaliate in E_1. I denote the critical value of ρ by $\hat{\rho}$. The valuation of reciprocity relative to material payoffs is likely to differ among entrepreneurs. We thus assume ρ to be distributed according to the density function $t(\rho)$ which is positive on [0, ∞). Its value is known a priori to B and E. If $\hat{\rho}$ is high, only the few entrepreneurs will retaliate for whom $\rho > \hat{\rho}$. Bribe transactions with the other entrepreneurs are not enforceable.

As can be seen easily, an increase in p decreases $\hat{\rho}$. This reinforces the finding from section 3. In addition to the arguments provided there, another reason should not go unnoticed here: If the probability of detection is high, cheating by B is less hurting E because her wealth is reduced and allows only for a reduced penalty. Cheating then is less unkind and goes along with a lower preference for retaliation.

The impact of F_B and F_E is even more intuitive. An increase in F_E increases $\hat{\rho}$. The optimum penalty F_E should always be the maximum possible penalty. A high F_E impedes bribery by,

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[8] Süddeutsche Zeitung, Germany, June 21, 2007, "Holgart und andere 'dumme Tarnnamen'" (translation and italics mine).

[9] A similar model is provided by Falk and Fischbacher (2006), who also consider reciprocity as impacting players utility. In addition, they assume players to consider equity considerations.

first, making retaliation less likely and thus hindering the enforcement of the bribe transaction and, second, by increasing the expected penalty from bribery.

An increase in F_B reduces $\hat{\rho}$. A high value for F_B thus backfires. With F_B being large, E has an increased incentive to retaliate because B is strongly hurt by a large F_B. E is thus in a better position to do bad to an unkind bureaucrat. Imagine instead F_B=0. This would discourage E from reporting because she fails to inflict a harsh penalty on a cheating B.

To illustrate the findings, assume $t(\rho)$ to be distributed uniformly between 0 and 0.0005. Tax is equal to harm, v=h=2000. Collateral amounts only to R=1000. We set F_E=4000 and test for different values of F_B. As before, λ=0.2 and $c(p)$=1000$\cdot p^2$. The bribe transaction is enforceable only if $\rho > \dfrac{(1-p)2000 - R}{(1-p)^2 2000 \cdot F_B + (1-p)2000 \cdot R} = \hat{\rho}$. With F_B=4000 the optimum level of detection, p, is p=0.212. This implies $\hat{g} = 1758$ and a critical value $\hat{\rho} = 0.00009$.

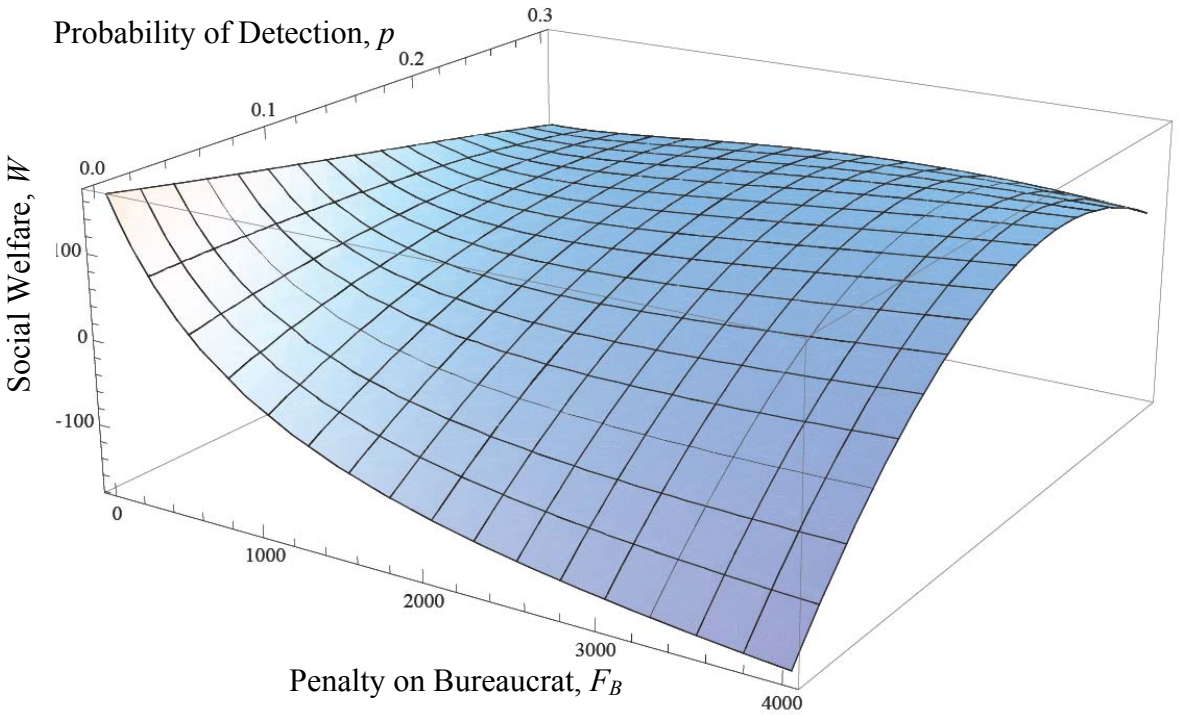

Figure 6: Welfare Effects of Varying Penalties on the Bureaucrat

As shown in figure 6, there are again multiple local optima. One of them has just been determined with p=0.212. Reducing F_B in this case would make no sense. Deterrence would be reduced and more harmful investments would be carried out, welfare would be (slightly) lower. But there exists is another local optimum with p=0. In this case F_B should be set to

zero. With a zero probability of detection B is not deterred to take bribes. A penalty on B then produces only a downside effect by providing E with an incentive to retaliate. Punishment on B only serves to enforce the bribe transaction.

The idea that increasing fines may backfire is not novel. Bowles and Garoupa [1997], Chang et al. [2000] and Kugler, Verdier and Zenou [2005] already suggest that maximum fines may not be optimal. Their finding relates to fines imposed on civilians who commit an infraction. Raising these fines backfires because it opens a larger room for collusion with law enforcers. The higher the fines, the more law enforcers have to sell. But their models maintain that fines on the bribe-taking of law enforcers should be maximal, which no longer holds when law enforcers have the option of acting opportunistically.

5 Some First Policy Advice

The potential multiplicity of equilibria is noteworthy. Rather than devoting resources to detection (deterrence regime) governments may avoid these costs and deter bribery by making sure that bribe transactions are not enforceable (constrained enforcement regime).

This challenges the conventional wisdom on maximum penalties. Rather than deterring bribery by maximum penalties an alternative policy would be to reduce the penalty on the bureaucrat substantially so as to impede the enforcement of the bribe transaction. Some transition countries have instead shifted to a policy that attempts to reduce corruption by help of strict anti-bribery laws. The model reveals that policies of increased penalties imposed on businesspeople are indeed effective, increasing deterrence and hindering enforcement at the same time. Reforms in this respect are likely to be successful. But increasing penalties on bureaucrats may not produce the desired outcome and risks increasing bribery and decreasing welfare.

Some countries have extremely low conviction rates with respect to bribery despite being well-known for their achievements in anticorruption, [United Nations 2007]. Take Chile and Costa Rica as an example. These countries are rather low-income countries relative to the moderately good performance with respect to anticorruption, such as evidenced in the Transparency International Corruption Perceptions Index, [Lambsdorff 2007: 25]. They have thus been repeatedly singled out for their good performance. But in both countries in 2004 (and before) less than 4 people out of 100,000 were convicted for bribery, embezzlement or

fraud. The two countries belong to those with the fewest convictions worldwide. Countries such as Denmark, Finland or Germany tend to convict 50 or more people and equally high conviction rates can be found in Canada and Central Europe.[10] Surprisingly, recommending higher conviction rates to legislators in Costa Rica and Chile might be counterproductive if these countries have found a local optimum with a constrained enforcement regime.

Chile's low conviction rates may contribute to a poor enforcement of bribe transactions. Indeed, there is evidence on this effect. In the worldwide survey among households shown in figure 1 evidence was also gathered on how well bribe transactions can be enforced. Households were asked how certain the delivery of a service is after payment of a bribe. As can be observed from figure 7, Chile belongs to the countries where the bribers are particularly uncertain (no data was collected in Costa Rica). More than 32% of the respondents regard the delivery of the promised service to be extremely uncertain. This is the second highest value among the 66 countries included, revealing that Chile stands out as a country where the enforcement of a bribe transaction is regarded to be highly uncertain. The lack of certain reciprocity is a strong deterrent to bribery in Chile, suggesting that the constrained enforcement regime well operates. Preserving bribers' uncertainty is likely to be the key to Chile's success in containing corruption.

[10] We should note that the data are not perfectly comparable across countries, owing for example to differences in the respective legal code and in counting convictions where multiple crimes were committed. But the huge differences we observe are unlikely to relate to such issues alone.

Figure 7: Corrupt Reciprocity is Uncertain in Chile
Survey among 1001 Chilean and 69109 households in another 65 Countries,
Own Research based on TI Barometer 2009

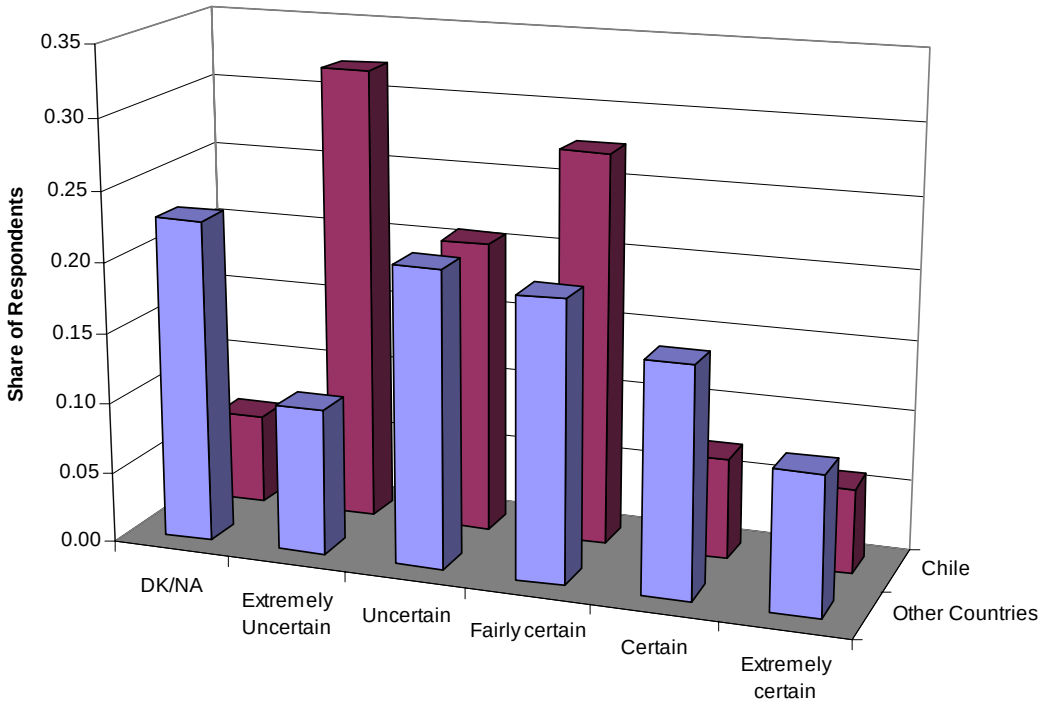

Figure 6 has been generated assuming λ=0.2. But testing different values for λ does not produce novel insights. The choice between deterrence and constrained enforcement remains unaltered. What would render the constrained enforcement regime preferable are higher detection costs $c(p)$ and less collateral among B and E, R. With substantial collateral, such as in a countries with a high per capita income, the government may fail in hindering the enforcement of corrupt deals and will be better off with deterrence.

Certainly, the government may dislike the unfairness of letting go B unpunished while punishing E. In particular where E was extorted and $\lambda = 1$. To ease this problem it may exempt only the taking of small bribes by B from punishment. The giving of small bribes by E would continue to be punished, just as the taking and giving of large bribes.

6 On the Design of Penalties

The policy advice just derived rests on the common observation that bribes are paid first and favors are promised to be delivered thereafter. This is the standard sequence, evidenced in many cases of bribery. Still, sometimes the sequence may be reversed. Rather than letting E pay the bribe upfront, she may promise a future payment. B would then deliver the tax break first and hope for E to stick to her promise rather than cheat. The recommendation to set F_B low and F_E high would then be counterproductive. E may not dare to cheat B when facing a high penalty while B would go largely unpunished if he was cheated and reports. In the reverse sequence, this design of penalties would invite for retaliation and thus help enforce a bribe transaction. The first best policy advice for this reverse game would be exactly the opposite of the previous recommendation: F_B should be large while F_E should be reduced substantially.

But how may legislators draft a law that produces so different outcomes, depending on the sequence of the game? Is it feasible to reduce the penalty on the party that was supposed to move last? In reality it will be arduous to prove the sequence of a bribe transaction. Both B and E will then claim to be the second mover and request the reduced penalty. They may also endogenize the sequence of the bribe transaction, choosing the sequence that is best for enforcement. Robust policy advice must recognize the possibility of the sequence being private knowledge to B and E and nonverifiable in court. How may a legislator draft laws in this case?

6.1 Mild Punishment for Cheaters

Legislators may consider milder punishment for B if he failed to reciprocate after taking a bribe. Such a provision would be a first-best recommendation. B would face a mild punishment for taking the bribe. This retains his incentive to cheat E for two reasons. First, E gains little from retaliating, because the reduced penalty on B little satisfies E's desire to take revenge. Second, delivery of the promised service increases the expected penalty for B, who would no longer qualify for the mild punishment. This punishment scheme would split up F_B into two separate penalties, a first one for taking a bribe, a second one for acting against one's official duties by delivering the tax break. At node E_1, the punishment on B would be less severe, making it less attractive for E to retaliate. The same logic arises in the reverse sequence. E should obtain mild punishment if she fails to pay a promised bribe. This makes it

unattractive for B to retaliate. Since E knows that retaliation is unlikely and the payment of the bribe bars her from obtaining the mild punishment, she will prefer to renege on her promise.

Mild punishment for cheaters reveals some similarity to the concept of "marginal deterrence", [Shavell 2004: 518]. If B is subject to maximal penalty when taking a bribe, he faces no additional penalty for delivering the tax break. If the first penalty in a sequence of infractions is already high subjects find themselves entrapped in a criminal career. Already a superficial glance at corporate and criminal codes reveals widespread violations of the concept of marginal deterrence. Many codes exercise zero tolerance towards those who take minor gifts without reference to whether these gifts were reciprocated.[11]

What makes this recommendation more troublesome is the difficulty of implementing it. It may just be too easy for B to claim that nothing was reciprocated. Proving reciprocity in court is demanding. Prosecutors do not only have to prove a payment by E and received by B and a favor given by B to E, they must also prove the link between the two, the quid pro quo. In reality this quid pro quo might be private knowledge to B and E and information on it would be revealed only in case of reporting (action "*r*"). Reducing the penalty F_B in node E_1 would be problematic because prosecutors might not know the node of the game, giving the reduced penalty by accident also when B reciprocated.

One solution would be to reverse the onus of proof, [Pope 2000: 275]. A reduced penalty might be offered to B if he can prove to have cheated E. Likewise, E would face a lower penalty if she is able to prove that a promised bribe was not paid. Acceptance of an illegal tax break in exchange for money and other valuables would then qualify for full punishment unless E can prove that B did not receive anything of value in exchange.

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[11] Already the promising or offering of a bribe is a punishable act in most jurisdictions, owing to its potential to influence B's decision. Likewise, it is standard to penalize B for demanding a bribe or signaling the willingness to accept a bribe. Some penal codes go as far as considering it irrelevant whether a bribe was actually paid and a favor actually returned; the mere promising and demanding being sufficient. The concept of marginal deterrence suggests that punishment for offering or promising a bribe must be less harsh than punishment for actually giving bribes. Likewise, bureaucrats must face a milder punishment for promising favorable treatment than for the actual delivery of a favor.

6.2 Leniency in Exchange for Reporting

Section 2 discussed the pros and cons of a leniency program. It argued that a government that trembles in setting the right incentive will opt for mild incentives to those who report. These incentives would risk to be ineffective but hardly ever to make criminal behavior and collusion at the reporting stage a feasible strategy. Whenever the government trembles such that $L_E \geq (1-p)F_E$ leniency given to E thus turns out to be a costless type of strengthening deterrence. Bribery becomes more risky to B and he will demand a higher bribe as a compensation, thus increasing the critical value $\hat{g}$. This goes along with increased welfare.

But the attractiveness of such an incentive is further impaired once considering the problem with enforcement. This is the concern raised by Buccirossi and Spagnolo [2006]. A leniency program provides incentives to report, which renders the threat of retaliation credible. These credible threats then help avoid opportunism. At node E_1 in figure 2 leniency given to E would act like an invitation to retaliate, helping the enforcement of the bribe transaction. As can be seen easily, enforcement of the bribe transaction in the model with collateral is achieved already with $R > (1-p)(F_E - v) - L_E = \hat{R}$. Enforcement is already possible with a reduced critical value for R.

A leniency program thus increases $\hat{g}$ and reduces $\hat{R}$. Whether this is advisable depends on the type of regime. As revealed in figure 4, when deterrence is strong (deterrence regime) a further increase in $\hat{g}$ leaves only few infractions undeterred. The ease of their enforcement is less salient. Constraining enforcement is then the less important policy goal. The opposite arises if the biggest risk of bribery is opportunism (constrained enforcement regime). The downside effect of a leniency program in helping enforcement becomes strong; the reduction of $\hat{R}$ impairs the best working impediment to bribery. [12] Recommendations on whether to

[12] A first best approach would be to assign the bonus only to those who were not cheated. One such contingency was introduced in the Article 215 (2) of the Turkish Penal Code. This code granted leniency only if the public official had not yet reciprocated on the bribe, [Tellenbach 1997: 642]. This condition for leniency, unfortunately, was the opposite of what is advisable. The wording only strengthens the briber in requesting illegal reciprocity, but does not induce reporting where a bribe transaction has been successful. Subject to this legislation, E could credibly threaten B who failed to reciprocate. The design of the former Turkish Penal Code may have thus implicitly forced public servants to deliver on their corrupt promises. An advisable wording for

implement a leniency program must thus be tailored to the specific circumstances faced by a country.

6.3 Confiscate Favors?

If B reciprocated the bribe, he gave E a legal title that taxes do not have to be paid. The government faces a dilemma whether to uphold the validity of this title when detecting the bribery. The tax exemption was given contrary to the government's laws but by an agent authorized to decide on the government's behalf.

We assumed that in case of detection the fine on E, F_E, includes the tax owed to the government. The fine thus comprises two separate fines, the actual net penalty, $F'_E = F_E - v$, and in addition the payment of the tax, v. The legislator may now consider whether or not E should pay the tax when the bribery is uncovered, this way confiscating the favor that B awarded to E. Bowles, Faure and Garoupa [2000; 2005] argue in favor of confiscating illegal gains. They propose a mix of fines and confiscating of illegal gains as yielding the best deterrence effect.

A similar problem is sometimes raised with respect to government contracts. The question is whether a government contract should be declared null if E obtained this contract by help of a bribe, for example to a tender official. Pope [2000: 276-277] argues that governments should have the right to declare such contracts void. The government may instead allow E to keep a contract, just as it may allow her to keep the legal title of a tax exemption.

In the model the sole reason for B to award the tax exemption was due to bribery. The tax exemption was given to investors even though their investment produced the harm h. But in reality there exist legitimate reasons for giving tax exemptions. Assume that investments exist that do not impose any harm on society such that h=0. This provides motivation for the government to assign discretionary power to B to pick the deserving investments. Knowledge on whether the investment involves harm is commonly private knowledge to E and B.

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the legal code should grant leniency only to those who did obtain the promised service and exclude those who were cheated. Whether such a legal code would be effective, certainly, depends highly on whether prosecutors and judges can verify whether a bribe was reciprocated.

Quite often an investor does not only carry out harmful investments. He may be engaged in both types of investments, obtaining a legal tax break where no harm exists and an illegal tax break when B observes harm and requests a bribe. If the bribe is detected the government cannot judge which of the tax breaks was well reasoned. In fact, the government may find more solid records on the completely legal transaction, while the harmful investment may be completely unknown to the government, [Bowles, Faure and Garoupa 2005: 286]. Sacking B's decision will then induce an erroneous collection of some taxes. This will be counterproductive, rendering unprofitable some of the good investments with h=0. Confiscation induces uncertainty among investors who may observe that good investments become unprofitable. In order to avoid this a government may prefer to regard any administrative decision by B to be valid, irrespective of how the decision was achieved.[13]

Allowing E to keep the tax exemption reduces the penalty and the associated deterrent effect. The penalty in the successful bribe transaction would be lower. In particular in a deterrence regime the government will dislike such provisions. The government will then prefer to confiscate any favor achieved by help of bribery. To the contrary, in a constrained enforcement regime the reduced deterrence is less salient. The desire to avoid uncertainty among investors may become stronger and the government may then prefer to allow offenders to keep their ill-gotten gain.

Observe that if E can keep her ill-gotten tax break this does not impact her incentive to retaliate. Failure to confiscate illegal gains has not impact on the enforcement of bribe transactions. If B cheated, the outlook of keeping the tax break is immaterial because it was never awarded. Confiscation of illegal gains is a penalty that is contingent on the nodes of the

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[13] There are disadvantages from declaring contracts void, which are outside the scope of the model. For example, if a random shock renders a contract unfavorable to the government, the government may act opportunistically and profit from declaring it null. The government would suddenly profit from B's bribe taking and may encourage rather than deter B's bribe taking, [Nell 2009; Raeschke-Kessler and Gottwald 2008]. A similar problem arises if an investor carries out transaction-specific investments and the government renegotiates the contract afterwards, allowing it to skim-off part of E's profit. The government would again have an incentive to allow B to take some bribes and even to cook proof of bribery so as to threaten nullity afterwards. Investors would end up with considerable uncertainty with respect to the legal status of their contract, knowing that government promises to honor their investments may not be credible, [Murphy, Shleifer and Vishny 1993: 413]. In such an environment, investors' incentives to commit resources are impaired.

game. It increases deterrence but does not support retaliation. Due to this it is less effective as compared to fines on E and may thus be abandoned where issues of investor uncertainty become salient.[14]

7 Conclusions

Two models for the enforcement of bribe transactions have been investigated. A first model built on a rational choice tradition where collateral is employed to render a bribe transaction self-enforcing. In a second model players have preferences for reciprocity in addition to the monetary payoffs. Both models revealed multiple local optima. One optimum involves maximum fines, a substantial probability of detection, lenient treatment to those who report and confiscation of ill-gotten gains (deterrence regime).

Another optimum fosters the opportunism that bribed public servants and favored entrepreneurs may exercise (constrained enforcement regime). In this regime entrepreneurs and public servants are dissuaded from entering corrupt arrangements less by harsh and prompt expected sanctions, but because they fail to assure each other of their trustworthiness. Leniency programs and confiscation of ill-gotten gains are less attractive and may be abandoned. If bribes are paid first and favors promised to be delivered afterwards, which tends to be the standard sequence, the government will find it attractive to confront bureaucrats with less severe penalties. It will seek to exempt the taking of small bribes from punishment, while continuing to penalize the giving of such bribes.

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[14] There is a first best recommendation that should not be overlooked: E may be allowed to keep the tax break if she reports. This would be similar to provisions on leniency. The advantage would be that an incentive would be given automatically to those who obtained the tax break. No incentive would be given if E was cheated. No ill-gotten advantage is collected in this case, suggesting that the total penalty imposed on E remains high and unaffected by the incentive. This incentive program thus does not support the enforcement of the bribe transaction while at the same time providing an incentive to report. The problem, however, relates to difficulties of implementing such a proposal. Reporting a bribe transaction is commonly embedded in criminal (procedural) law. But the validity of contracts is determined by civil law. A plaintiff will request justice from a civil court, which must seek compensation for damage. The recommendation suggests that the plaintiff's case would have to be dismissed by a civil court if the defendant had reported in a criminal procedure. This is difficult to implement. But the government may consider such incentives for the bureaucrat. It may allow B to keep the bribe if he reports. This provides an incentive to reporting if B was successful in obtaining the bribe, but not if B was only promised a bribe and just threatens reporting to make sure the bribe is delivered.

Advice on anticorruption often rests on best-practice experienced in North America, Western Europe, Hong Kong and Singapore. This advice lately tended to involve substantial penalties and a strengthening of the judiciary in order to increase the risk of detection. But best practice from western countries may be inappropriate in less developed countries, those where penalties on bureaucrats tended to be minor and risks of detection low. These countries, in particular, are well advised to explore the advantages of a constrained enforcement regime.

Appendix

To what extent does E have an incentive to retaliate when she was cheated by B? This can be formally derived by reference to Dufwenberg and Kirchsteiger [2004], using the model in extensive form as depicted by figure 2. Let us assume R to be small such that $R < \hat{R} = (1-p)(F_E - v)$ for all reasonable levels of p (in the numerical example between 0 and 0.25). When focusing only on material payoffs, cheating by B would be optimal, as E never has an incentive to retaliate.

When E plays "*b*" and B plays "*a*" E obtains the payoff $g\text{-}b\text{-}pF_E$ and B obtains $b\text{-}pF_B$. Any other outcome is inefficient in the sense of Dufwenberg and Kirchsteiger [2004]. If, for example, E plays *nb* instead her payoff would drop to $g\text{-}v$ (which is smaller due to $v\text{-}pF_E\text{-}pF_B \geq 0$) and *B* gets nothing. Equally, if B plays "*na*" the best payoff for both players is achieved if E plays "*nr*", resulting in an equal payoff for B and a lower payoff for E. Having deleted all inefficient payoffs the "equitable" payoff to E is thus

$$\pi^e_E = g\text{-}b\text{-}pF_E$$

This payoff to E depicts an action by B which is neutral, that is, neither kind nor unkind to E. When B plays "*na"* E's payoff drops from π^e_E to $g\text{-}v\text{-}b\text{-}p(F_E\text{-}v)$. Observe that we again disregard the inefficient strategy "*r*". Playing "*na*" thus reduces E's payoff by $(1\text{-}p)v$. At node E_1 the unkindness of B thus amounts to $(1\text{-}p)v$.

E will value actions "*r*" and "*nr*" with respect to the material payoff and the concern for reciprocity, the desire to act unkindly to B's experienced unkindness in E_1. B expects the payoff $b\text{-}pF_B$ in E_1. This is also B's equitable payoff, because it also results when B plays "*a*". If E plays "*nr*", her action is thus regarded neutral. If instead E plays "*r*", B's payoff drops to $b–F_B–R$, which is a drop by $b\text{-}pF_B\text{-}(b\text{-}F_B\text{-}R)=(1\text{-}p)F_B+R$. This decrease represents the extent of unkindness of E towards B.

In line with Dufwenberg and Kirchsteiger [2004], E's utility in E_1 is a function of her payoff and the product of B's kindness to her and her own kindness towards B. We let ρ be E's respective parameter, the weight assigned to the consideration of reciprocity in the utility function. E's utility at node E_1 is thus:

$$U_{E|E1} = \begin{cases} g - b - F_E + R + \rho(1-p)[-v]\left[-(1-p)F_B + R\right] & \text{if E plays "}r\text{"} \\ g - v - b - p(F_E - v) & \text{if E plays "}nr\text{"} \end{cases}$$

E will strictly prefer "*r*" to "*nr*" iff:

$$-F_E + R + \rho(1-p)[-v]\left[-(1-p)F_B + R\right] > -v - p(F_E - v)$$

$$\Leftrightarrow \rho > \frac{(1-p)(F_E - v) - R}{(1-p)^2 vF_B + (1-p)vR}$$

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