CERGE-EI

Charles University
Center for Economic Research and Graduate Education
Academy of Sciences of the Czech Republic
Economics Institute

Discussion Paper Series

IN SEARCH OF MICROECONOMIC MODELS OF ANTI-CORRUPTION MEASURES - A REVIEW

Jana RICHMANOVÁ

Discussion Paper No. 2006 – 157

January 2006

P.O. Box 882, Politických vězňů 7, 111 21 Praha 1, Czech Republic
http://www.cerge-ei.cz

In Search of Microeconomic Models of Anti-Corruption Measures - A Review*

Jana Richmanová
CERGE–EI†

January 2006

Abstract

This paper discusses differences between the Czech and Slovak anti-corruption laws and their likely (in)effectiveness. We also review the relevant literature on procurement corruption and examine to what extent existing theoretical models can be extended to study the impact of anti-corruption measures. We find that microeconomic models of anti-corruption measures are essentially non-existent and hence we lay out a research agenda.

Keywords: corruption, anti-corruption mechanisms, public procurement, sting operation, Agent Provocateur, Leniency
JEL classification: D02, D21, D74, D44

*I would like to thank Prof. Andreas Ortmann for regular consultations and supervision of this research. This work was supported by the CERGE-EI/World Bank Fellowship.

†A joint workplace of the Center for Economic Research and Graduate Education, Charles University, Prague, and the Economics Institute of the Academy of Sciences of the Czech Republic. Address: CERGE–EI, P.O. Box 882, Politických vězňů 7, Prague 1, 111 21, Czech Republic

1 Introduction

Despite a recent flurry of anti-corruption programs and on-going work on effective legislation, corruption remains a serious problem.

Severe consequences of corruption have been widely documented in the literature[1]. For example, Mauro (1995) and Tanzi (1998) have shown empirically a negative effect of corruption on economic growth; Hwang (2002) has demonstrated empirically that corruption, through tax evasion, reduces government revenues; and Gupta, Davoodi and Alonso-Terme (2002) conclude that corruption increases income inequality and poverty.

The situation in the Czech Republic can be illustrated by several recent events. In the spring of 2005, Czech Prime Minister Gross was forced to resign after providing insufficient explanations for the origin of money that he and his wife spent on an apartment and a real estate business[2]. In August 2004 Freedom Union Deputy Zdenek Koristka accused Civil Democrats of having offered him 10 million CZK [3] if he were to vote against the coalition in a confidence vote[4] (the case remains under investigation). Several other scandals, mainly concerning suspicious tenders and money transfers, involve members of parliamentary parties and municipal halls[5]. In addition, accusations of bribery are routinely levelled against police officers[6]. Recent examples include the case of four foreign-police officers arranging for the

[1]Even though there exists literature analyzing the greasing effects of corruption, the evidence discussed below suggests that overall the effects of corruption on economic growth, government revenues and income equality are negative.

[2]The scandal led to an article in the International Herald Tribune (March 19, 2005) that made the Czech Republic look like a banana republic. That's not the kind of press likely to attract foreign direct investment.

[3]Corresponds to about 400 000 USD and in real purchasing power about twice that amount.

[4]Mladá Fronta Dnes (MFD), August 28, 2004.

[5]See for example MFD January 25, 2005; or BBC Czech, April 15, 2005.

[6]Given that police officers' salaries increased significantly at the beginning of 2005, and are likely to increase further (daily Právo, October 26, 2005), one would hope that such incidents become history soon. At least, that's what efficiency-wage theory suggests.

illegal issue of a visa without the necessary documents[7] or the 19 customs officers prosecuted for taking bribes from truck drivers for smooth transit through the border at Břeclav[8]. Finally, the reader might recall the widely-watched soccer scandal that unraveled in the spring of 2004. It cost two first-league teams 6 points and 500 000 CZK in penalties (each) and harmed the credibility of the game[9].

Less anecdotally, according to Czech daily Mladá Fronta Dnes[10], 20% of the population admits to bribing intended to speed up basic procedures at local offices, and 67% of Czech citizens believe that corruption is an alarming problem in urgent need of a solution.

Due to its illegal and secret nature, however, corruption is hard to detect. Observed indictments are therefore – as also suggested by subjective measures such as Transparency International's Corruption Perception Index – very likely only the tip of the iceberg.

Some recent studies have tried to assess anti-corruption mechanisms objectively, using natural experiments. Ferraz and Finnan (2005) use data from Brazil's randomized municipal anti-corruption audits to test how politicians' reelection incentives affect level of corruption. They find that second-term mayors are significantly more corrupt than first-term mayors, which might be explained by reelection incentives. Olken (2005) uses data from randomized government audits during village infrastructure projects in Indonesia to examine how an announced increased probability of audit reduces rent extraction. Overall, Olken's results suggest that mon-

[7]The fact that they came under suspicion because of large estates which could not be financed from their regular salaries indicates the degree of temptation that Czech bureaucrats face; MFD, March 2, 2005.

[8]The relevant press release of the Ministry of Interior from April 22, 2004 (*www.mvcr.cz/aktualit/sdeleni/2004/celnici2.html*) suggests that this group may have taken in as much as 2000-4000 EUR per day, again illustrating the degree of temptation that bureaucrats can face.

[9]An earlier discussion of the state of corruption in the Czech Republic can be found in Kočenda and Lízal (2001).

[10]MFD, December 10, 2004.

itoring can play an important role in fighting corruption even in a highly corrupt country.

There are problems with these studies and the approach as such, however. First of all, natural experiments are not always feasible. Further, for example in Ferraz and Finnan, lower first-term corruption can be alternatively explained by learning. This confound is the result of researchers' inability , in this and many other cases, to affect the design and implementation of the "field experiment", arguably strengthening the case for laboratory experiments. And, as Olken notes in the conclusion of his manuscript, his data are the result of a one-shot intervention and therefore further study of (repeated) long-term interactions would be desirable. In addition, in highly corrupt countries auditing inspectors are also likely to be corrupt and therefore, results of field experiments may be corrupted.

As an alternative to field experiments, subjective measures of corruption, based on data from surveys, might be employed. Transparency International, for instance, has utilized surveys to compile its Corruption Perception Index (CPI) since 1995. The index reflects the degree to which corruption is perceived in the public sector[11]. Looking at the performance of the four Visegrad countries, as depicted in Figure 1, Hungary has the lowest level of perceived corruption and has retained this without wavering for the past decade. Poland appears to be sinking deeper into corruption. The Czech and Slovak Republics show somewhat different down-and-up patterns. The different trajectories for the Czech and Slovak performance seem, in light of the joint history of the two countries until quite recently, surprising. For 2005, Hungary takes 40^{th} place with a CPI rating of 5.0, the Czech Republic and Slovakia 47^{th} place with a CPI rating of 4.3, and Poland 70^{th} with a CPI rating of 3.4. For comparison, the country leading the CPI, Iceland, has a 2005 CPI rating of 9.7. Clearly, for the Visegrad countries there is a lot of catching up to do.

[11]The index ranges from 0 to 10; 10 corresponding to a country with no corruption and 0 a country with the highest level of corruption.

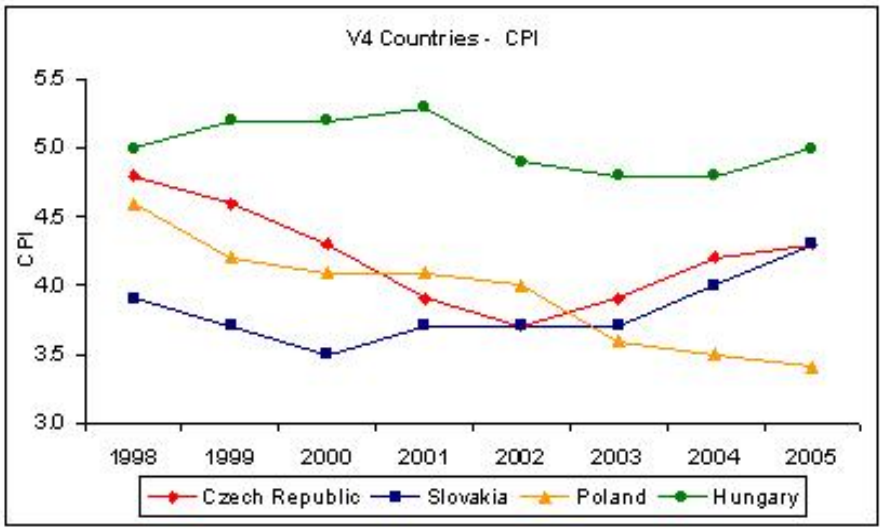

Figure 1: Transparency International's Corruption Perception Index (CPI) exhibits different trends for the Czech Republic and Slovakia, especially in 2000-1 and since 2004.

Even though there are some problems with the interpretation of year-to-year changes, the index provides a useful, and sometimes the only feasible measure of corruption. Given that, using rolling averages, it is constructed from multiple databases, its moves most likely reflect significant changes in laws and regulations as well as enforcement. I will return to this issue later.

Another project attempting to account for both subjective and objective measures is the V4 City Corruption Propensity Index compiled by Transparency International Czech Republic[12]. This new index measures the state of anti-corruption mechanisms in the four Visegrad capitals: Bratislava, Budapest, Prague, and Warsaw. The objective part is based on interviews with municipal employees, who are asked questions on the following issues: how public procurement tenders are processed, internal audit and control mechanisms, codes of ethics, conflict-of-interest regulations, and open-information policies. The interviewees are asked whether particular rules are in force in each city. The subjective part is based on interviews with businessmen, journalists, city council members and municipal

[12] *www.transparency.cz*

workers. This part measures the perception of anti-corruption efforts in each city. The difference between the scores from these two parts can be roughly interpreted as a measure of the effectiveness of the anti-corruption mechanisms in place[13].

Both the objective and the subjective index ranges from 0 to 1; 0 corresponding to an absence of anti-corruption mechanisms, 1 corresponding to the presence of all examined mechanisms. In the objective part, Budapest leads with 0.865 followed by Warsaw with 0.642, leaving behind Prague with 0.598 and Bratislava with 0.553. The differences in subjective scores are not that dramatic: Budapest still leads with 0.489, followed by Warsaw and Bratislava in a tie at 0.438. Prague is last with 0.403.

Turning to determinants of corruption, Treisman (2000) conducted an extensive cross-national study intended to identify determinants of corruption on national levels. Using perception indices, he finds five characteristics significant for low corruption, namely Protestant traditions, histories of British rule, long exposure to democracy, advanced stage of economic development, and liberalized trade. He also finds that federal countries appear to be significantly more corrupt than centralized ones. Based on these results, Treisman concludes that policy decisions work too slowly to outweigh the influence of recent decades and that the shadow of the past weighs heavily.

Treisman's results seem to leave little hope that the Czech Republic, or the other Visegrad countries, will be able to extricate themselves from the corruption quagmire any time soon. Nevertheless, we have observed that even though the Czech and Slovak Republics are very similar in Treisman's sense, the CPI data seem to indicate different drifts. Given the way the CPI is compiled, the data are likely to indicate substantial changes in law, regulations, or enforcement[14]. The

[13]Ortmann (2004)

[14]TI press release http://www.transparency.org/cpi/2005/2005.10.18.cpi.en.html

question is, whether the reasons underlying these changes can be identified and whether such changes can have a significant impact.

An illustration is provided by the difference between Czech and Slovak anti-corruption law, which increased with the 2003 strengthening of the possibility of sting operations (Agents Provocateurs) provided by Slovak Law[15]. Apart from the Agent Provocateur provision, Czech and Slovak law both contain a provision on Leniency. Neither of these anti-corruption mechanisms has been analyzed theoretically, experimentally or empirically. Assuming that smartly designed and implemented anti-corruption measures can make a difference, the study of Czech and Slovak law, their differences, or their viable alternatives, seems a promising avenue of research.

The remainder of the paper is organized as follows. The following section describes specifics of Czech and Slovak anti-corruption law. Afterwards, a discussion of existing models of public procurement corruption, as a point of departure for further research, is given. The last section concludes.

2 Anti-Corruption Mechanisms and Measures in Czech and Slovak Law and Evidence of their Effectiveness

As the latest CPI release[16] suggests, some countries have made significant progress in tackling corruption. This prompts the question why some countries are more successful in fighting corruption than others. In light of the poor ranking of the Czech and Slovak Republics, and the low number of convictions, Czech and Slovak anti-corruption law, or its enforcement, seems wanting. What we see is that the

[15]Note that an immediate increase of Slovak CPI rating followed.
[16]*www.icgg.org/corruption.cpi_2005_pressTI.html*

laws in the twin nations differ in key aspects, and some proposed provisions - at least for an economically trained mind - are problematic at best. Therefore, research of the incentive-compatibility of these laws might shed some light on the problem.

The following two subsections discuss the specifics of Czech and Slovak law in detail. The third subsection suggests how effectiveness of these measures can be examined empirically.

2.1 Active Regret Provision

Both Czech and Slovak anti-corruption law contains an Active Regret Provision which grants immunity to bribers if they report a corrupt public official. The provision is basically the same in Czech and Slovak law, and states that the criminal act of bribing can be rendered inconsequential if : (1) a culprit paid, or promised to pay, a bribe only because he was asked to; and (2) he reported immediately to the prosecutor or to the police. Note that according to current law, only a briber can be entitled to Leniency, not a bribee.

Clearly, incentive-compatibility of the law is problematic, at least for certain types of corruption. Imagine, for example, a firm competing in public procurement and which paid a bribe in order to secure itself a win. For such firm to decide whether to report corrupt official or not, expected payoffs from both actions are compared. Note that "immediately" in the second article of the provision is interpreted as "before the advantage is provided", which in public procurement means "before the contract is allocated". Now the only benefit of reporting is elimination of the risk of being involved in an illegal deal, so the change in expected payoff depends on the probability of detection and penalties. However, empirically, the probability of detection seems to be low[17]. On the other hand, if the firm reports before the contract is allocated, the chance that it will win after all is substantially

[17]Note that at least some level of risk is necessary for Leniency to work.

reduced than if it had not reported. Reporting thus basically puts future profit on the line. Therefore, the current law does not seem to encourage incentives to report. Accordingly, we do not observe much reporting in reality.

The incentive-compatibility of this provision has been studied neither theoretically nor experimentally in the context of bribery. Indeed, both would be highly desirable. Recently, for example, the possibility of extending the statute of limitation of the provision was under discussion in the Czech Republic. The obvious problem is that allowing firms to report and to get immunity even after the project is allocated would enable them to effectively punish the agent. This was clearly not the intention of lawmakers but it would be the likely effect. It is, in any case, a counterfactual that can be studied experimentally (and possibly theoretically).

There does exist a literature analyzing Leniency, though as a mechanism for deterring cartels. For example, Spagnolo (2004) analyzes the impact of various Leniency programs on cartel formation theoretically, while Apesteguia, Dufwenberg and Selten (2004) test them experimentally.

Specifically, Spagnolo determines optimal law enforcement policy when no Leniency is available; with moderate Leniency providing fine reduction; and with optimal Leniency when rewards for whistle-blowing on other cartel members are feasible. He shows that law enforcement agencies should not commit to targeting those cartel members who defect from agreement and that this policy should go public. That is, if cartel members know that they will not be prosecuted for their past law-breaking after they defect from collusion, they will be more prone to do so. If constrained moderate Leniency laws (allowing only for a non-negative reduction of fines) are introduced, the collusive agreements are even harder to sustain. The effect of protection from fines and punishment (when repeat offenders are punished more severly than novices) together with undermining the trust among parties suffice even when Leniency is restricted to the first reporting cartel mem-

ber[18]. However, the author shows that moderate Leniency can never lead to the first best. This can only be achieved with maximal rewards. In the first best, all the fines collected from other than first reporting member are paid as the reward to the whistle-blower. This would maximize the deterrence effect of the law at no cost.

Apesteguia et al. (2004) conduct an experiment in order to verify promising cartel-deterring properties of Leniency policies. They assume that three firms with identical production costs of 90 compete on the market. The consumers' willingness to pay is 100. This game has a unique Nash equilibrium, in which each firms sets price 91 and wins with probability 1/3. The interaction is to happen under four experimental treatments: STANDARD, LENIENCY, BONUS and IDEAL. STANDARD corresponds to a situation without Leniency. In this case, any symmetric price vector (also with highest possible prices) is sustainable as subgame perfect equilibrium. Some equilibria of this game involve collusion, some not. LENIENCY offers a reduction of fine to the firms which blow the whistle. Unlike Spagnolo, Apesteguia et al. award Leniency to each reporting firm, though the reduction awarded to each of them is divided by the total number of whistle-blowers. The theoretical prediction compared to STANDARD remains unchanged, the only difference being that in LENIENCY the whistle-blower can never get worse, indeed he can better himself. In BONUS, all the whistle-blowers share the total fines collected from non-reporting firms. This assumption encourages incentives to rat significantly. In equilibrium, cartel is deterred and competitive price is restored. Finally, in IDEAL a perfect world with no possibility of cartels is assumed and thus competitive pricing emerges.

The experiments were conducted at the Laboratory for Experimental Economics at the University of Bonn with 12 groups of three participants for each treatment

[18] Allowing more wrongdoers to be eligible for Leniency would just reduce the rewards and make the program more exploitable.

except LENIENCY, where 16 groups participated. As to results, the lowest prices are found in the IDEAL setup, but they are not significantly different from LENIENCY. Prices in STANDARD are significantly higher. The lowest cartel formation is found under LENIENCY. Surprisingly, prices in BONUS are found to be above LENIENCY levels. In addition, BONUS induces the highest cartel formation together with the highest rate of reporting in the lab. This result does not completely support Spagnolo's theoretical prediction.

Overall, these results suggest that a similar policy might also be successful in corruption deterrence. However, whereas in the case of cartels the situation is completely symmetric (profits from corrupt agreement as well as penalties if caught), in bribery it is not, as a briber and a bribee face different expected payoffs. In cartels, competitors are in various ways invited to rat on each other. In a typical bribery scenario, the second mover (possibly competitors) is induced to rat on the first mover. Therefore the applicability of Leniency models to bribery is not straightforward and to the best of my knowledge, has not been modelled yet.

2.2 Agent Provocateur Provision

The main difference between Czech and Slovak law is a provision on Agent Provocateur which has been in force in Slovakia since 1999 and whose powers were extended in 2003. Since then, Agent Provocateurs can play an active role, which means that they can offer bribes to officials suspected of corruption in order to gather evidence. Moreover, police can create fictitious cases in order to screen civil servants and government officials[19]. In order to limit misuse and ethical problems[20], an Agent Provocateur must be authorized by a judge in advance. In addition, he can

[19]Empirical evidence on the effectiveness of screening can be found for example in Olken (2005), who studies monitoring mechanisms (or audits). In some sense, Agent Provocateur can be seen as an aggressive form of auditing.

[20]A discussion of ethical aspects can be e.g. found in Hay (2003).

only be employed in cases where there is no other feasible way to gather evidence.

The key difference is that the Agent Provocateur can initiate the corrupt agreement (i.e. he can offer a bribe), while the active regret provision only grants immunity to those who were asked to pay a bribe according to the present law. The former thus provides a seemingly very effective instrument for collecting evidence against suspects, both those who take as well as those who pay bribes. Despite continued discussions, sting operations are still not allowed by Czech law. The Agent Provocateur provision is thus an important deviation from Czech law, which is only aimed at detecting those who ask for a bribe.

The only comprehensive discussion of sting operations found in the literature is that of Hay (2003). The author discusses two roles of sting operations: informational, to generate evidence against suspected offenders; and behavioral, to deter corruption. There exists a tension between these two purposes. In order to gather evidence, the less criminals know about Agent Provocateurs on the streets the better, whereas the deterrence effect is enhanced by making publicly known that Agent Provocateurs are being used.

Hay also discusses possible problems with targeting sting operations, particularly the possibility of convicting those who would not commit the crime if not tempted by an Agent Provocateur ("innocents" or "non-offenders"). The crucial tradeoff is between preventing convictions of non-offenders and between preventing crime. Taking into consideration the expected cost of convicting innocents and of not convicting real criminals, Hay formalizes the properties of a desirable sting operation. The author does not provide any economic analysis of the impact the introduction of Agent Provocateurs has on crime, though.

It is an interesting question (but one difficult to answer) whether the recent improvement in the Slovak Republic's CPI rating is due to this mechanism[21]. Further

[21]Recall that Agent Provocateurs have existed in Slovak law since 1999, though the range of

study of the impact of introducing the sting operations might bring some insights.

Theoretically, the impact of sting operations can be illustrated using the simple static model of procurement corruption by Celentani and Ganuza (1999). The timing of the game is as follows. First, agents privately learn their individual costs of being corrupt, which are drawn from a commonly known distribution. Second, the principal announces a quality requirement and simultaneously, the agents decide to be corrupt or honest. In the third stage, an honest agent instructs the firm to produce the required quality and reimburses it exactly the production cost, as unit costs of quality are assumed to be common knowledge. A corrupt agent bargains with the firm over a bribe, allows it to produce lower-than-required quality, but reimburses it as if it produced the required quality level. In the last stage, with positive probability corruption is detected and both the agent and the firm incur penalties.

Nash equilibrium of the game is identified as an intersection of two best-response functions. The principal sets the quality standard assuming fraction γ of agents as being corrupt, whereas the agents' decision to be corrupt is a function of that quality requirement. A straightforward result of the model is that the equilibrium level of corruption is decreasing in probability of detection. As introduction of an Agent Provocateur would increase the probability of detection, an immediate effect of the model would be a reduction in the equilibrium level of corruption.

Looking at the welfare implications of introducing Agent Provocateurs into Celentani and Ganuza's model, we see that if the probability of detection is sufficiently high, implementation of this measure is welfare improving. For a very small probability of detection, however, it leads to welfare reduction. The size of the threshold depends on the parameters of the model (agents' individual costs of being corrupt,

situations where they may be employed was significantly extended in 2003. It is therefore not absurd to conjecture that the recent uptick in the rankings for the Slovak Republic is the result of this strengthening of the provision.

reservation quality and penalties). This somewhat surprising result is driven by the choice of particular forms of the utility function (logarithmic) and of the cost function (linear) in the original model.

2.3 What drives CPI increases?

Our reading of models of corruption has also drawn our attention to possible empirical questions. Clearly, there has been a significant increase of some countries' CPI rating within the last year. For example, France improved from 7.1 to 7.5, Estonia from 6.0 to 6.4, Slovakia from 4.0 to 4.3, Turkey from 3.2 to 3.5, and Kazakhstan from 2.2 to 2.6.

The question is how important such increases are. As one has to be careful interpreting the numbers themselves, looking at relative rather than absolute increases seems appropriate. For example, Slovakia improved by 7.5%. Taking the full sample of countries between 1998 and 2005[22], less than 13% of year-to-year relative increases is higher than 7.5%. The relative increase of e.g. Kazakhstan is even higher, 18.2%. Relative increases which are at least this high account for only 2.2% of the sample. Finally, the average standard deviation in the sample is 0.2978, which also suggests that the above mentioned improvements are indeed significant.

Based on how the index is constructed, these changes likely indicate that something interesting is going on in such countries. An example is the Slovak Republic, where strengthening the Agent Provocateur provision in 2003 and subsequent increase in CPI rating can be observed. The supposition of a causal relationship seems supported by the results of Celentani and Ganuza's model, which, as we have seen, also suggest that an increase in probability of detection should reduce corruption. It thus seems promising to examine the data from the surveys on which CPI is

[22]In this period, the Czech and Slovak Republics are part of the sample. Also note that only those countries that have all 8 observations of CPI are considered.

constructed to see which indicators are most responsible for improvements of some countries' standing. One would expect that underlying causes can be identified at least for those countries with outstanding leaps (e.g. Kazakhstan).

3 Literature on Public Procurement Corruption

Several authors have analyzed corruption in public procurement. This class of models seems to be a useful point of departure for the analysis of the above discussed anti-corruption mechanisms for two reasons. First, this type of corruption is a form of grand corruption causing high social costs. Second, public procurement is the most likely domain in which Leniency and Agent Provocateur are going to be applied. Investigating models of public procurement for their suitability to analyzing effects of Leniency and sting operations thus seems a promising strategy.

Throughout the discussion of theoretical models, I will adopt the definition of corruption given by Glaeser and Goldin (2005), who outline the common features of corruption as: (1) payments to public officials beyond their salaries; (2) any action associated with such payments that violates law or implicit social norms; and (3) losses incurred by the public, resulting either directly from that action, or indirectly, due to a system that does not provide a legitimate alternative to that action.

In the public procurement literature there are typically three types of players: principal (buyer), agent (public official) and N firms (potential sellers). An agent is hired in order to evaluate bids, typically two dimensional vectors of price and quality. The mechanism generally used is a sealed-bid auction. As there is some information that the buyer does not possess, there is room for corruption. Note that the issue of who initiates corruption is crucial to the Leniency and Agent Provocateur provisions.

Leniency, as defined in the Active Regret provision of Czech and Slovak law, applies to those bribers only who paid the bribe because they were asked to, i.e. those who did not initiate a corrupt agreement. Thus, only those models in which the agent (public official) demands a bribe are relevant for a study of Leniency provisions of current law. However, the aim of our research is not only the current law but also its viable alternatives. An analysis of provisions which would award Leniency to any player who did not initiate, independent on whether he takes the role of briber or of bribee, seems worth undertaking.

The Agent Provocateur is an initiator. He could play both roles, a briber and a bribee. In practice, he might be employed to gather evidence against the public official who is publicly known to be corrupt.

Based on the mode of initiation, existing models can be categorized into the following three classes: (1) the firm offers a bribe to an agent with an unknown attitude towards bribery; (2) the firm offers a bribe to an agent who is ex-ante assumed to be corrupt; and (3) the agent approaches a firm and demands a bribe. Note that all three classes provide a plausible point of departure for the theoretical study of Leniency and Agent Provocateur provisions. Also note that the introduction of Leniency would change expected penalties, whereas introduction of an Agent Provocateur would change the probability of detection.

The first two classes shall be discussed together, as in both it is a firm which offers a bribe to an agent. The main difference between these two classes is that in the first, the decision of agents to be corrupt comes as a result of optimization and therefore anti-corruption mechanisms would directly affect these decisions and hence the equilibrium level of corruption.

Such a situation is for example analyzed in Cule and Fulton (2005). The authors, however, do not model public procurement but tax evasion, in which auditing

inspectors may be corrupt. With certain probability, the auditing inspectors are monitored. Cule and Fulton show that under certain conditions, the increase in both firm auditing and penalty rate for cheating firms might increase tax evasion and corruption, which seems contrary to intuition. The reason behind this result might be a poorly designed contract of the auditing inspector (fixed wage, no threat of being fired if corruption is detected). Nonetheless, the timing and presence of the risk of corruption in the model make it a suitable candidate for straightforward introduction of Leniency and Agent Provocateur provisions.

In the second class, the agent is just ex-ante assumed to be corrupt. In this case, not paying the bribe would basically exclude the firm from the competition. Such a situation is analyzed in Burguet and Che (2004) or Lengwiler and Wolfstetter (2004).

Burguet and Che analyze the impact of different levels of an agent's discretion, which is an exogenous parameter of the model. As a result of special properties of the selection rule employed by the agent to allocate the contract, there exists a mixed strategy equilibrium of the game in which the inefficient firm can outbid the efficient one. This is a rather surprising result. As the authors do not model the risk of corruption, it has to be introduced before Leniency and Agent Provocateur provisions can be applied.

Lengwiler and Wolfstetter are the only ones to discuss the potential impact of Leniency (however, they do not model it specifically) granted to the bidder[23]. They analyze two possible types of corruption; type I, where the selected bidder is allowed to decrease his original bid; and type II, where the selected bidder is allowed to increase his original bid[24]. In type I corruption, nobody can profit from ratting (as the original highest bid would have to be paid) and therefore Leniency would be

[23]The auctioneer as an initiator is not eligible, as in current law.

[24]Of course, each type is typical for a different type of interaction.

ineffective. However, under type II corruption, the winner pays the highest bid and thus the seller is not stinted. Therefore, if the winner blows the whistle, he would avoid detection and penalties, plus he might get back his bribe without affecting his surplus from the auction. Therefore, Leniency would deter type II corruption. This result suggests promising properties of Leniency provisions.

Since in all three models discussed above it is a briber who initiates corruption, Leniency as it is currently defined in Czech and Slovak law can therefore not be applied directly. This is because according to the provision, the bribee is never eligible for Leniency and the briber only when he does not initiate. However, it seems worth investigating an alternative provision which would award Leniency to a non-initiator regardless of which role he plays. For example, Cooter and Garoupa (2001) analyze how Leniency programs can undermine trust between a debtor and a corrupt agent responsible for collecting the debt. In their model, any whistle-blower is entitled to bounty. They show that equilibrium may change from cooperation to non-cooperation, depending on how penalties and rewards are set.

Turning to the third class of models, here it is an agent who approaches a firm and demands a bribe. Therefore this class of models is relevant for Leniency as it is currently defined by law. Such a situation is for example analyzed in Compte, Lambert-Mogiliansky and Verdier (2000), Koc and Neilson (2005), and Celentani and Ganuza (1999, 2002).

Compte et al. analyze the impact of corruption controls on firms and on an agent. The basic result of the model is that in the presence of corruption, firms collude on bidding reservation price and compete in bribes. The authors show that the imposed limit on an agent's ability to receive illegal transfers makes collusion cheaper and thus more profitable for firms. Controls imposed on firms might be effective. However, if at the same time the agent's discretion is too high, limiting the firms' ability to make illegal transfers might lead to the exclusion of the efficient

firm from the competition. As the authors do not model the risk of corruption, Leniency would not affect the result unless the probability of detection enters into the game.

Koc and Neilson model ex-ante bribery, meaning that before regular bids are placed, each bidder has to decide to pay a bribe or not. The firm which placed the highest bid is then selected as the winner and, conditional on that particular firm paying a bribe, its bid can be lowered to the second-highest bid. The authors show that only the bidders with valuation exceeding some threshold will decide to bribe. Furthermore, they analyze an asymmetric auction, in which the strong bidder's valuation is drawn from the distribution which stochastically dominates the distribution of the weak bidder. They show that if the demanded bribe is sufficiently high, the strong buyer bribes only when his valuation is higher than the weak buyer's maximal valuation. In that case, bribery increases expected efficiency[25]. As in Compte et al., before implementing Leniency the risk of corruption would have to be introduced into this model.

In both models by Celentani and Ganuza, the decision of the agent to become corrupt is a result of optimization. In addition, in the more complicated setup from 2002, the firm also decides whether to accept or reject the corrupt offer. The authors show that the probability of corruption is decreasing in penalty, monitoring probability, and principal's reservation quality. The 2002 model seems to capture very nicely all the crucial aspects of the real-world interaction, including probability of detection. Consequently, Leniency and Agent Provocateur provisions can be introduced straightforwardly. In this specific case, Leniency might be some discount parameter in the ultimate payoff of the reporting firm, whereas Agent Provocateur can be represented as an increase in the exogenous probability of detection.

[25]The authors refer to Maskin and Riley (2000), who show that such an auction might result in an inefficient allocation when the weak bidder bids more aggressively than the strong bidder even if his valuation is lower.

Finally, note that a simple interpretation of introducing the Agent Provocateur provision in all these models would be an increase in the exogenous probability of detection.

4 Conclusion

Even though existing models seem to capture a variety of interactions which might occur in the real world, few specifically model the risk of being involved in corruption. Those which do, model the risk as an exogenous probability of detection, which might have various reasonable interpretations. However, we know from the literature on cartel deterrence that well-designed Leniency programs might undermine incentives to engage in (symmetric) illegal agreements. We observe that the Czech and Slovak anti-corruption laws include Leniency provisions concerning (asymmetric) bribery. Nevertheless, numerous corruption cases, together with recent CPI data, suggest that something is wrong either with the law covering anti-corruption measures or with enforcement (although possibly differentially so for the Czech and the Slovak case). These observations raise three interesting questions.

The first question concerns the incentive-compatibility of the Leniency provision in current (Czech and Slovak) law, as well as alternative arrangements currently being discussed. Despite the currently existing Leniency provisions, we do not observe much reporting which indicates that the law might not be well designed. In addition, some current proposals seem to make the situation even worse. As theoretical models and experiments enable us to deal with counterfactuals at relatively low cost, it seems reasonable to develop a simple model which would shed some light on the problem.

Second, theoretical and experimental studies of the Agent Provocateur provision and its impact on corrupt incentives seem necessary. It seems possible that Slo-

vakia's improvement in TI rating last year followed from the recent extension of the powers of Agent Provocateurs in Slovak law, connected with widened applicability of this provision.

The final question concerns the reasons underlying the recent upward movement of some countries in TI rating. As countries probably differ in their anti-corruption provisions, one would expect to observe similar effects for countries having laws with common characteristics. Effective anti-corruption mechanisms could possibly be identified and linked with the class of corruption cases for which they are particularly relevant (e.g. petty vs. grand corruption). Data from the surveys which TI uses to construct its Corruption Perception Index seem to provide relevant information for such a study.

References

Apesteguia, J., Dufwenberg, M., Selten, R. (2004). Blowing the Whistle. *GaMes Research Paper 10/04, Granada and Malaga Experimental Society.*

Burguet, R., Che, Y. (2004). Competitive Procurement with Corruption. *The RAND Journal of Economics, 35(1)*, 50-68.

Celentani, M., Ganuza, J. (2002). Corruption and Competition in Procurement. *European Economic Review, 46*, 1273-1303.

Celentani, M., Ganuza, J. (1999). Corruption and the Hadleyburg effect. *Universitat Pompeu Fabra, Department of Economics Working Paper No. 382.*

Che, Y. (1993). Design Competition Through Multidimensional Auctions. *The RAND Journal of Economics, 24(4)*, 668-680.

Compte, O., Lambert-Mogiliansky, A., Verdier, T. (2000). Corruption and Competition in Public Market Auction. *CEPR Discussion Paper No. 2434.*

Cooter, R. D., Garoupa, N. (2001). The Virtuous Circle of Distrust: A Mechanism to Deter Bribes and Other Cooperative Crimes. *The Berkeley Law and Economics Working Papers, 2000(2)*, Article 13.

Cule, M., Fulton, M. (2005). Some Implications of the Unofficial Economy–bureaucratic Corruption Relationship in Transition Countries. *Economics Letters, 89*, 207–211.

Dušek, L., Lízal, L., Ortmann, A. (2004). Understanding Corruption and Corruptibility through Experiments: A Primer. *Prague Economic Papers, 14.2., 2005*, 147-163.[CERGE-EI Discussion Paper No. 136]

Dyer, D., Kagel, J. H. (1996). Bidding in Common Value Auctions: How the Commercial Construction Industry Corrects for the Winner's Curse. *Management Science, 42(10)*, 1463-1475.

Glaeser, E. L., Goldin, C. (2005). Corruption and Reform: Introduction. *Corruption and Reform: Lessons from America's History. The University of Chicago Press*, forthcoming.

Gupta, S., Davoodi, H., Alonso-Terme, R. (2002). Does Corruption Affect Income Inequality and Poverty? *Economics of Governance, 3(1)*, 23-45.

Hay, B. (2003). Sting Operations, Undercover Agents and Entrapment. *Harvard Law and Economics Discussion Paper No. 441.*

Hwang, J. (2002). A Note on the Relationship Between Corruption and Government Revenue. *Journal of Economic Development, 27(2)*, 161-178.

Koc, S. A., Neilson, W. S. (2005). Bribing the Auctioneer in First-Price Sealed-Bid Auctions. *Texas A&M University Working Paper.*

Kočenda, E., Lízal. L. (2001). State of Corruption in Transition: Case of the Czech Republic. *Emerging Markets Review, 2*, 137-159.

Lengwiler, Y., Wolfstetter, E. (2000). Auctions and Corruption. *CESifo Working Paper No. 401.*

Maskin, E. S., Riley, J. G. (2000). Asymmetric Auctions. *Review of Economic Studies, 67*, 413-438.

Mauro, P. (1995). Corruption and Growth. *Quarterly Journal of Economics, 110*, 681-712.

Olken, B. A. (2005). Monitoring Corruption: Evidence from a Field Experiment in Indonesia. *Harvard University, Mimeo.*

Ortmann, A. (2004). "Corruption Prague," (a review of the TI CR V4-City Corruption Propensity Index), *The Prague Post, August 5, 2004*, 5.

Spagnolo, G. (2004). Divide et Impera: Optimal Leniency Programmes. *CEPR Discussion Paper No. 4840.*

Tanzi, V. (1998). Corruption Around the World: Causes, Consequences, Scope and Cures. *IMF Working Paper 98/63.*

Treisman, D. (2000). The Causes of Corruption: a Cross-national Study. *Journal of Public Economics, 76*, 399-457.

Individual researchers, as well as the on-line and printed versions of the CERGE-EI Discussion Papers (including their dissemination) were supported from the following institutional grants:

- Economic Aspects of EU and EMU Entry [Ekonomické aspekty vstupu do Evropské unie a Evropské měnové unie], No. AVOZ70850503, (2005-2010);
- Economic Impact of European Integration on the Czech Republic [Ekonomické dopady evropské integrace na ČR], No. MSM0021620846, (2005-2011).

Specific research support and/or other grants the researchers/publications benefited from are acknowledged at the beginning of the Paper.