
14 Laboratory experiments on corruption

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Corrupt activities are seldom observed directly. Naturally, everyone involved in such behavior has good reasons to remain silent. Much progress has been made in cross-country econometric analysis on the determinants of corruption (Kaufmann, Kraay and Mastruzzi, this volume; Lambsdorff, this volume). Still, if one wishes to have a closer look at corrupt behavior, problems arise because the subject of study is carefully hidden from the researcher's eyes. To tackle the problem, researchers have recently begun to use an alternative approach to gather empirical data on the issue. In laboratory experiments it is possible to create analogous – although stylized – environments that mimic real-life corruption scenarios and to obtain data in a controlled manner. This chapter surveys that research.

In a laboratory experiment, subjects – typically students, since they are readily available on university campuses – make decisions according to rigid rules that they are given by the experimenter. Depending on the decisions they make, they receive payoffs that are an integral part of the rules of the game. In economic experiments it is common practice to reward subjects in proportion to the payoffs they have achieved in the experiment. This feature ensures that subjects have proper incentives to maximize their payoffs and to make careful decisions. Thus, unlike in most survey studies, subjects play for real money.

The experimental method can be applied for three purposes. The first is to test theoretical models. When modeling a strategic real-life environment, a theorist relies on behavioral assumptions, typically the assumption of fully rational selfish utility (or profit) maximization. If these assumptions are not met, the theoretical results may be distorted. In the laboratory a rigorous test of the behavioral underpinnings of the model can be carried out. Second, laboratory experiments can substitute for field data that often are unavailable when studying corruption. Finally, even if some data are available, laboratory data can be gathered in parallel with field data. The methods are strongly complementary because one method's weaknesses are the other one's strengths. On the one hand, field data are realistic because they are gathered in real life, but they suffer from noise, identification problems and lack of control. The laboratory, on the other hand, allows the use of a controlled environment in which variations in individual factors can be tested while keeping all others constant. Endogeneity problems do not

arise. However, the data are gathered in an artificial environment, which may weaken the external validity of the results.

Corruption experiments are a new field of study, with the first studies carried out in the late 1990s. Overall there are about a dozen experimental economics studies on corruption; five of them are my own work. The upside of this sparseness is that it is still possible to write a survey article that is complete, to the best of my knowledge, and that provides an outline of every completed study. However, this may not be so for too long; several studies are ongoing and were incomplete when this chapter went to press. The field is growing rapidly.

This chapter restricts itself to papers which explicitly address corruption and say so in the title or introduction. Of course, these papers are embedded in a wider literature in experimental economics. Some papers analyze the reciprocity features of a corrupt relationship. These studies would not have been possible without the large literature on trust games (for example, Fehr et al. 1993, 1997; Berg et al. 1995; Dufwenberg and Gneezy 2000; Fershtman and Gneezy 2001; Gächter and Falk 2002; Irlenbusch 2005a, 2005b). In trust (or reciprocity) games, a first mover can send money to a second mover, who in turn can voluntarily reward the trustor by sending money back. The games are constructed such that if they exhibit trust, both players can earn higher final payoffs, but if the players are strictly rational, then in equilibrium no trust and no rewarding will be exhibited. Contrary to the theoretical prediction, the common finding of these studies is that first movers often show trust by transferring money, and second movers often reward them by sending money back, even if the game is played only once and under completely anonymous conditions. These results show that even without explicit enforcement mechanisms (due to its illegality a corrupt contract naturally cannot be enforced) trust and reciprocity can lead to exchanges of favors. While in most experimental trust games reciprocal cooperation is the 'good' outcome, corruption is generally regarded as undesirable reciprocity. Despite this difference, the existing literature on trust games provides researchers with a good starting-point for analysing corruption.

Other papers draw on another classic of experimental laboratory games – the ultimatum game – introduced into the experimental literature by Güth et al. (1982; for an overview, see Camerer 2003). In this game, a first mover can propose a division of a cake to a second mover, who can accept or reject the proposal. If the second mover rejects, both players receive nothing. Because any positive amount is better than nothing, the second mover should theoretically accept any offer greater than zero, and the first mover should consequently offer no more than the smallest money unit. There is ample experimental evidence, however, that human second

movers do reject offers they consider too low, and first movers offer substantial amounts often up to an equal split. Thus the second mover has considerable veto power, which can be seen as parallel to the power that a public official has to decline an applicant's request.

Existing experimental studies on corruption can be roughly categorized into experiments addressing individual corruptibility, experiments modeling a bribery scenario, studies on embezzlement and auction design experiments. I discuss each in turn and summarize the papers in chronological order within each category.

1. Determinants of individual corruptibility

The two studies reviewed in this section, both by the same authors, attempt to identify the institutional and sociological factors that make individuals more or less corrupt. Consequently they are designed as individual decision experiments with no interaction between the participants.

Are economists more corrupt than others?

Frank and Schulze (2000) carried out the first controlled experiment on corruption. However, the authors were not interested in corruption *per se* but rather in detecting differences between students of economics and students of other disciplines. Their design involved a very simple individual decision situation that used a corruption story to assess individuals' choices when a tension exists between maximizing their own payoff and acting in the public interest. The approach is somewhere in between a classical laboratory experiment and a typical field experiment. Instead of recruiting participants to show up in the laboratory, the authors conducted their experiment in a lecture hall where the university film club was showing a movie. Before the start of the movie, viewers were confronted with a fictitious decision situation, which is as follows. A DM 200 note (about €100 or US\$100 at the time of the experiment) that is the property of the film club has fallen into a drainpipe. It needs a plumber to get it out. The subject then is asked to imagine that he or she is in charge of calling a plumber, paying him, and delivering the remainder of the DM 200 to the film club. The subject has the choice of 10 offers from local plumbers. The cheapest offer involves a price of DM 20 and no bribe; in the most expensive one the price is the full DM 200 and the bribe DM 144. Recall that the remainder of the DM 200 is paid to the film club. The offers differ in the prices charged and in bribes offered to the subject. The more expensive a plumber, the higher the bribe the decision maker receives. Thus the experimental design creates a conflict of interest: it is in the public (here, the film club's) interest that the decision maker chooses the cheapest offer. However, a selfish decision maker can accept more expensive offers which provide

higher bribes. Only the subject knows the offers made by the plumbers; there is no risk of detection. Thus the authors abstract from the issue of risk attached to engaging in an illicit activity.

The authors conduct two treatments. In one treatment the situation is as described above. In a second treatment the decision maker receives an additional lump-sum payment of DM 40. The rationale for this variation is the conjecture that subjects might feel worse about taking bribes if they receive a substantial reward for doing their job.

The main hypothesis tested in the study is that economics students are expected to take more bribes because selfish profit maximization is a core assumption in much of what they learn. This difference in behavior could be induced by either self-selection (students who are attracted by profit maximization are likely to choose economics) or indoctrination (during their time at the university students are confronted with the assumption of profit maximization so often that they accept it as legitimate). Frank and Schulze (2000) collect data on major, year of study and gender. They use this data to run regressions testing the effect of these variables on the likelihood of bribe taking.

The mean bribe taken by the participants was DM 85, where 12 percent of subjects were perfectly honest and 28 percent took the maximum bribe. The results support the hypothesis that economists are more likely to take bribes than other students and also show that this is more likely to be due to self-selection than to indoctrination. Students who have been exposed to economics for a long time do not behave differently from beginners. The lump-sum payment had no detectable effect on behavior.

Intrinsic motivation versus deterrence

Moving beyond the rather secondary issue of student subject pool differences, Schulze and Frank (2003) next move closer to the heart of the corruption issue. In a follow-up study they analyze the effect of measures to combat bribery. In particular, they ask whether the possibility of detection is a suitable tool to deter individuals from bribe taking. This is far from obvious. There is some evidence that sanctions may be counterproductive because external incentives can crowd out intrinsic motivation. Instead of being a question of right or wrong, the decision problem becomes a calculation of risks and rewards. To test whether the risk of being detected increases or decreases bribery, the authors run a version of their original set-up in which subjects roll a die to determine whether they will be caught. If the decision maker is caught, he or she receives nothing. The more expensive the plumber chosen (hence the higher the bribe taken) the more likely detection becomes. In the parameterization chosen by the authors the probability of detection was quite high, up to two-thirds for

the two highest offers. However, as in the first study, the authors applied a random lottery payment technique. All participants were asked to make decisions as if playing for real, but only one was afterwards drawn to receive money, the others were not paid. Thus the probability of receiving anything was very small.

As in the first experiment, some treatments included an additional lump-sum payment to test for a payment satisfaction effect. The results show that the detection mechanism does not reduce the level of bribes or the incidence of bribery. The average bribe taken is slightly but insignificantly higher with a risk of detection than without it. The distribution of the offers being taken, however, is different. On the one hand, very high offers, with a high probability of detection, are chosen less frequently. Thus deterrence has an effect. On the other hand, very low offers are also chosen less often. Perfectly honest choices, which accounted for about 12 percent of decisions without risk, are virtually non-existent in the treatment with risk. Hence there is some evidence for a crowding out of intrinsic motivation. With the introduction of the detection lottery the choice of offer becomes a trade-off between bribe levels and risks, with the highest expected returns being earned in the middle of the range. Considerations of doing the right thing play a less important role.

Once again the lump-sum payments had no significant effect, and there might be a gender difference. Although women and men take about the same amount in the treatment without risk, women are less corrupt in the treatment with risk. Depending on how much one trusts the way these results were generated (using highly specific econometric *ex post* models), one will find this result either interesting or peculiar.

2. Bribery

Bribery is a private payment to a public official in return for a benefit or the avoidance of a cost. Bribery relies on a reciprocal relationship between briber and bribee that cannot be mediated by transparent, public procedures. This is why most studies reviewed here build on experimental trust games.

An experimental bribery game

Abbink et al. (2002) conducted the first laboratory experiment using an interactive corruption game. Their basic approach is to model bribery as a situation of undesirable reciprocity. Consequently the core of their experimental model is a reciprocity game that they develop into a bribery game. Their game is a two-player sequential game between a potential briber (for example, a firm) and a public official, and it consists of several stages.

At the first stage, the first mover (that is, the firm) decides on whether or not to transfer an amount of money, t , to the second mover (that is, the

public official), and if yes, how much he wishes to transfer. If he transfers a positive amount, he must pay a small 'transfer fee' of 2. The fee represents the initiation costs of the briber when he approaches the civil servant to establish a reciprocal relationship. These costs must be paid even if the official rejects the bribe.

The second mover is then asked whether she accepts or rejects the transfer. If she rejects, the transfer is not performed; both accounts remain unchanged except for the first mover's small transfer fee. If the official accepts, then she receives triple the amount offered by the firm (the tripling reflects a difference in marginal utility between the bigger firm and the official). At the second stage, the public official has to make a binary decision between two alternatives, called X and Y. Y is much more favorable to the first mover, X is slightly better for the second mover. This condition means that the briber's advantage from a favorable decision is large, but the public official has only a slight preference for the honest alternative arising, for instance, because of the effort necessary to justify a manipulative choice to her superiors.

The authors conduct the experiment in three treatments to isolate the effect of the essential characteristics of corruption. These are (i) the reciprocal relationship between briber and bribee, (ii) the negative externality that the harmful activity inflicts on the public, and (iii) the severe punishment that briber and bribee face when caught. The first treatment consists of 30 repetitions ('rounds') of the trust game as described above. The impact of reciprocity can be identified by the extent to which participants engage in the exchange of favors, that is, the transfer of money from the firm to the official and a choice of Y by the second mover. Such exchange is, though mutually beneficial, in sharp contrast to game-theoretic prediction.

The first treatment (which does not much resemble a corruption scenario) serves as a control condition to generate the benchmark to compare with other, more corruption-like, treatments. A comparison of treatments allows one to identify the effects of a corruption scenario that make it different from the mutually beneficial exchange of favors between, say, an employer and an employee. Although in a typical reciprocity experiment the exchange of favors enhances efficiency, in a corrupt relationship between firm and official such an exchange is harmful to the public and thus prohibited. To isolate the effect of damages done to the public, the authors introduce a second treatment in which a Y choice inflicts costs on others. This is done as follows. In each session nine pairs of a firm and an official play the game in parallel. Whenever an official chooses Y, all other participants receive a deduction from their payoffs. In total, the damages done to others exceed the mutual benefits that the two members of the pair can gain, making the Y choice overall inefficient. In the experiment, for

a typical exchange of bribes, the total damage is twice the mutual gain between firm and official. Because bribes are assumed to be paid secretly, subjects are not informed about the damages others have done to them by choosing Y.

In a third treatment, the authors examine the effect of adding severe punishments that briber and bribee face when caught. In the real world, the probability of discovery is very low, but penalties are harsh, ranging from hefty fines and job loss to imprisonment. The authors attempt to model this situation by introducing a lottery that is played every time a bribe has been accepted. With a small probability, 0.3 percent, the two players are disqualified from the experiment without receiving earnings from play.¹

Two main effects can be observed immediately. First, there is no detectable effect of the negative externality. If costs are inflicted on others, this does not significantly affect either the average bribe or the average number of Y choices, which remains essentially constant at about two-thirds. Somewhat surprisingly, subjects do not seem to care about the costs their actions inflict on the other participants.

The possibility of punishment, however, has a strong and significant effect – reducing both the average bribe and the average frequency of the Y choice by about one-third. Thus punishment serves as a strong deterrent against corruption. This result is strengthened by accompanying questionnaire results showing that subjects tend to underestimate the overall probability of disqualification – had they assessed the risk correctly the penalty would probably have been even more effective.

The effect of staff rotation

Two follow-up studies by Abbink (2004, 2005) use the above game for policy applications. Abbink (2004) tests an instrument that was introduced by the German government in 1998. The government implemented a directive requiring regular rotation of staff in sensitive areas. In the laboratory the effectiveness of this instrument can be tested by creating an environment with and without staff rotation, keeping everything else constant. To this end the author conducted an additional treatment of the set-up described above. In the original experiment the pairs of firms and officials remained the same over the 30 rounds. The new treatment involves randomly re-matched pairs in every round. Thus corrupt firms have no opportunity to punish officials who do not choose Y. The data can then be compared to the original set-up. The results show a strong effect of staff rotation. The average bribe decreased from 2.93 to 1.65 talers, and the average number of Y choices fell even more, from 43.8 to 14.3 percent. Strong effects over time cannot be detected. Thus the experiment shows that staff rotation is a very promising tool against bribery, although

in practice these gains need to be weighed against possible efficiency losses due to the upsetting of routines and higher training costs under staff rotation.

The impact of fair salaries on corruption

In a follow-up study, Abbink (2005) uses the bribery game to test a hypothesis put forward by van Rijckeghem and Weder (2001). In their econometric study the authors analyze the effect of public sector salaries on civil servants' corruptibility. They find that higher salaries do lead to lower corruption, but their search for possible reasons did not produce conclusive answers. The authors find some support for what they call the 'shirking' hypothesis: better-paid public officials have more to lose when they are caught and therefore are more reluctant to accept bribes. The second conjecture, dubbed the 'fairness' hypothesis, is not supported by their data. No evidence can be found to support the claim that poorly paid public officials are more corrupt because they feel unfairly paid and therefore find bribe taking legitimate. The authors admit, however, that their dataset does not allow them to detect direct evidence of these attitudes.

Abbink (2005) addresses the fairness hypothesis in an experimental framework. The game is analogous to the one described above, but the damages from the choice of Y are inflicted not on other pairs, but on 'workers' not involved in the interaction between firms and officials. In two treatments the wage paid to the workers is varied. In the high-wage treatment they earn substantially more than the firms and officials; in the low-wage treatment their earnings are always lower. To avoid wealth effects the official's own absolute wage is held constant, but the relative wages is varied.² If fairness considerations were effective, officials should be less reluctant to harm workers who earn much more than they do, so we would expect more corruption in the high-wage treatment. The data, however, do not reveal such an effect. Significant treatment differences cannot be found. In some sense this corroborates the findings of van Rijckeghem and Weder (2001), who also failed to find such an effect in their data.

Instructions framing in bribery experiments

The last bribery experiment in this series deals not with corruption as such, but more with experimental methodology. In all of the experiments described so far in this section, the task was presented in neutral terms, that is, without making any reference to bribery. This has been done to avoid designs that seem to suggest a 'right' answer. However, this approach is open to the objection that one might be 'neutralizing away' important aspects of behavior by presenting the decision situation out of context and reducing it to a system of strategic choices and payoffs. To assess the impact

of framing on the experimental results, Abbink and Hennig-Schmidt (2002) conduct the original experiment by Abbink et al. (2002) using a different set of instructions. In their experiment the situation is presented as one in which a firm applies for the permission to run a plant that pollutes the environment. A civil servant can decline or award this permission. Up front the firm can make a 'private payment' to the civil servant. The authors hypothesize that, since corruption has a clearly negative connotation, the use of explicit language would emphasize corruption as a negative act, and, therefore, we could expect less corruption with loaded framing. The experimental results, however, do not support this hypothesis. Although average bribes and permission frequencies are slightly lower, the difference is not significant. Abbink and Hennig-Schmidt (2002) conclude that the game is rather robust and, therefore, is not particularly sensitive to the way it is presented.

Greasing to speed up bureaucrats

The experiment by González et al. (2004) is an exception in the group of bribery experiments. Their experiment does not focus on the reciprocal relationship between briber and bribee but models a corrupt relationship as a three-player ultimatum game. The authors use a variant of the ultimatum game to study grease payments in the relationship between firms and public officials. Often an official has discretion to speed up or delay a decision, with costly consequences for the firm. It is not uncommon, especially in developing countries, to pay bribes in order to obtain a quicker decision. The authors thus model a situation in which two public officials, A and B, process a file, where both of them have veto power, but only A also has the power to delay a decision. In the game the proposer, taking the role of the applicant, divides a cake (the surplus of a project) between himself and the two public officials. The project is implemented if both officials accept the proposed division. In addition, the second official can, at a minor cost, delay the project and thereby reduce the applicant's payoff by some factor. Official A with delaying power knows the entire offer of the applicant, B only knows his own share. The effect of greasing can be identified by the additional share that official A can extract compared with official B who only has veto power. The experiment was conducted as a one-shot game using strategy elicitation. That is, the officials were asked to specify a decision for every possible offer that the proposer could make before knowing the proposer's decision. Strategy elicitation is a very useful tool to gather more data with the same number of participants; it provides a way to collect data for decision nodes that may be reached less frequently.

In line with the vast number of ultimatum game experiments, the results show that proposals involve substantial shares for the officials. In contrast,

in standard game theory, only the smallest money unit would be offered (and accepted) in equilibrium. More importantly, however, the data show that officials with delaying power tend to demand a premium, and that such a premium tends to be offered. The highest acceptance rate without delay is observed for full-equity offers, stressing the importance of equity norms in experimental games (and possibly in reality as well). Rejections occur for very low offers, a result that holds for both officials. Delays are frequently observed when official B, with no delaying power, receives a share that is higher than that of A, apparently as a way of punishing the proposer without harming the other official.

Loyalty conflicts in bribery

Another recent study on bribery extends the model of Abbink et al. (2002). Jacquemet (2005) introduces a third player, the principal, explicitly to address the agency relationship that facilitates corrupt acts. The game, therefore, is slightly more complex than the original game. The full-fledged variant consists of four stages. First, Nature draws one of two states, good or bad. In the good state all players' payoffs are, *ceteris paribus*, higher by a constant than in the bad state. Because only the agent knows the outcome of the draw, the agent can hide his actions from the principal. The payoff combinations are chosen so that the principal cannot infer the state of Nature from the payoff she receives. At the next stage, without knowing the draw, the principal sets the agent's wage. Then a third player, the briber, can offer the agent a transfer (bribe) that the agent can accept or reject. Finally, the agent chooses one of three actions. He can either do nothing (shirk) and save the costs of exerting effort. Or he can take one of two costly actions and implement one of two projects. One of them favors the principal and the other one the briber. In the (extreme) equilibrium prediction the agent always shirks and hence the briber never offers a bribe and the principal offers the lowest wage. However, this prediction only serves as a benchmark because it is well known that in this type of reciprocity game subjects do manage to set-up mutually beneficial relationships off the equilibrium path.

Jacquemet conducts two basic treatments with some parametric variations. In one treatment the game is played as described above. In the other one the principal's decision node is removed and the wage the agent receives is exogenously determined. This variant allows one to examine the effect of the reciprocity conflict the agent faces. When accepting a bribe, the agent must betray one of the other players. He can either choose the action favored by the principal who pays his wage, but then he disappoints the trust of the briber. Or he can respond to the briber's payoff, which means betraying the principal.

The results show clear evidence of a ‘delegation effect’. If a high wage has been explicitly chosen by a principal, then agents tend to be significantly less prone to accept bribes. If the principal has chosen low wages, then agents reciprocate negatively and are more likely to be corrupt. The data show that the wage effect solely stems from the reciprocity relationship between principal and agent. If the wages are exogenously given, higher wages lead to even more corruption (the author conjectures that this is because better-paid agents in the experiment can afford the costs of implementing a corrupt decision more easily).

A cross-cultural comparison

Corruption is often seen as a cultural phenomenon. Indeed, there are countries with similar economic systems and performance that nevertheless exhibit very different levels of corruption. Previous experimental studies have been conducted in a single country and have therefore not been able to capture cultural differences. Cameron et al. (2005) address this issue. They design an experiment based on a reciprocity game that allows them to detect different attitudes towards corruption in different cultures. They are interested in people’s propensity to engage in corrupt acts as well as in their willingness to tolerate corruption by others. To this end they construct a three-player, three-stage game between a firm, a public official and a citizen. At the first stage the firm can offer a bribe to the public official. The official can then either reject the bribe or accept it. If he accepts, two consequences follow. First, the outcome most favorable to the firm is implemented (the official does not have the option to take the bribe and default), and second, the citizen’s payoff is reduced. At a last stage (and this is the fundamental difference from the other reciprocity-based bribery experiments) the citizen has the opportunity to punish the official. However, the punishment is costly. If the citizen spends an amount P on punishment, then the official’s payoff is reduced by $3P$. The game is played one-shot. Therefore, in equilibrium a rational selfish citizen would not punish, but previous experiments in other contexts have shown that humans are willing to sacrifice money to punish ‘wrong’ behavior, either out of moral considerations or negative reciprocity.

The authors conduct three treatments of their experiment, varying two dimensions. In the baseline treatment bribery is welfare enhancing, that is, the gain that firm and official make from bribery exceeds the damage done to the citizen. This game is played in two variants. From the first to the second treatment the punishment opportunities are increased, in a way that the feasible range of punishment amounts is widened. Finally in the third treatment, which is played with the wider punishment range, bribery is welfare reducing, that is, the damages to the citizen exceed the gains for firm and official.

The experiment is conducted in four countries: Australia, India, Singapore and Indonesia. These four countries were selected because two of them rank among the least corrupt countries in the world (Australia and Singapore), and the remaining two are persistently among the most corrupt ones. In addition, the choice of countries allows one to examine the effect of institutional change. Singapore has had corruption levels similar to India, but the government has recently fought corruption with an iron hand. Indonesia, on the other hand, has recently become a democracy with a free press, and as a result awareness of corruption in the public has risen tremendously, though this has not (yet) led to significantly less corruption.

The results of the cross-cultural comparison are somewhat mixed. The significant differences are as follows.³ Australians offer slightly higher bribes than Indians (though the percentage of bribers among firms is not different). Australians also punish bribe taking more often than Indians, and also spend higher amounts on punishment if they do. Singaporeans are less likely to punish than both Australians and Indonesians. Finally, Indonesians are more likely to reject bribes than Singaporeans. These differences are very hard to interpret and look rather unsystematic, despite being statistically significant. Further, differences, where insignificant, often are in opposite directions. Apparently there is no clear and robust relationship between the level of corruption in the four countries and subjects' behavior in the experiment.

Treatment effects are detected in the Australian sample only, where a wider range of punishment opportunities reduces bribe taking and accepting, and, interestingly, higher negative externalities *reduce* the amounts spent on punishment. Although bribery is much more harmful to the citizen in the treatment with high damages, it seems that citizens feel less inclined to reduce their payoffs even further after they already have been hit hard.

3. Embezzlement

In the bribery experiments described above, bribers actively offered money to officials in the hope of inducing a favorable decision, but they were unable to hold the officials to account if they failed to deliver the expected benefit. The case of embezzlement does not involve such an active briber. Rather, the official diverts resources to his own personal use that are meant to benefit the public.

Embezzlement and monitoring

Currently three experimental studies have addressed embezzlement. The first was carried out by Azfar and Nelson (2003). The experimental set-up they use is far more complex than the individual decision setting employed by Frank and Schulze or the reciprocity games reviewed in the previous section.

Azfar and Nelson introduce a multi-stage game with eight players in different roles. At the outset of each round, three of the eight players are randomly selected to stand as candidates in an election to select the executive. After short campaign speeches the other five players elect one of them. Another player, either appointed by the executive or elected by the voters (which is a treatment variation), is made 'attorney general', in charge of monitoring the executive. The remaining six players are voters for the rest of the round.

After the roles have been assigned, the executive rolls a die to determine how many valuable 'tiles' he (or she) will receive to distribute among the voters. This number is private information only known to the executive. The valuable tiles are then combined with worthless tiles. The executive chooses six of the tiles to be distributed among the voters. He is free to choose worthless tiles and keep valuable tiles for himself. This act constitutes embezzlement or corruption in this game. The six tiles are put into a bag and each voter draws one tile out of the bag.

The attorney general's task is to flip up to four of the tiles remaining in the executive's hand. The value of these tiles is exposed to the voters, and valuable tiles exposed become worthless. The first two tiles that the attorney general flips are free of charge, for the third and the fourth the attorney general has to pay a cost.

At the end of the round the voters elect an executive (and in half of the sessions also an attorney general) for the following round. The current executive and attorney general are automatically candidates, and they are challenged by one randomly selected voter. After brief campaign speeches, the voters choose one of the candidates. The next round then follows exactly the same structure as the previous one.

The experiment consists of two blocks of six rounds each. From one block to the next the appointment regime for the attorney general is varied. In one block the attorney general is elected, in the other one he is appointed by the executive. The order of the blocks is changed across sessions to control for sequence effects.

The design allows one to test the effectiveness of policy measures to combat corruption. The authors are interested in how different levels of transparency affect the corrupt behavior of executives. The number of worthless tiles that are added to the valuable ones is varied such that the total number of tiles was 10, 14 or 22 in different sessions. The number of tiles determines how well the executive can hide embezzlement from the attorney general. If the valuable tiles the executive has diverted to himself are hidden among many worthless tiles, then it is unlikely that the monitor will flip a valuable tile that exposes the executive's embezzlement. Another treatment variable already mentioned is the way the attorney general is chosen. A monitor appointed by the executive may feel grateful for being

selected, thus he may not spend effort in monitoring the executive. A monitor who stands for reelection, on the other hand, has a strong incentive to appear vigilant to the voters (the attorney general had better earnings in the experiment than the voters). A third dimension was the wage level of the executives and the attorney general; in half of the sessions it was much higher than in the other half. It is often hypothesized (with some empirical evidence as support) that poorly paid officials are more likely to engage in corrupt activity. Several reasons are advanced for this claim. The result might hold because the officials have little to lose when they get caught, because they cannot live on their low salaries, or because they do not consider corruption to be illegitimate given the little recognition the employer gives to their work.

In the experiment, executives were surprisingly honest and monitors vigilant. Despite the costs of turning tiles, most attorneys general flipped more than the two free tiles. The majority of executives did not divert valuable tiles to themselves, and those who did typically embezzled small amounts. Despite this general rule, the researchers could identify important treatment differences. The experimental results strongly support the hypothesis that transparency and accountability discourage corrupt behavior. Executives embezzled less when there were fewer worthless tiles, such that it was harder for them to hide embezzlement from the monitor. Executives found to be corrupt were rarely reelected, so getting caught meant a considerable financial loss. Thus executives were keen to avoid detection. In line with this, higher wages for executives also reduced corruption. However, it made no significant difference whether the attorney general was elected, despite the finding that elected monitors were more vigilant than appointed ones.

Corruption in health services

Barr et al. (2004) closely follow the approach introduced by Azfar and Nelson (2003), but try to make the game more realistic. The controlled anonymous conditions characteristic of most standard laboratory experiments are often difficult to implement in the field, and these researchers do not seek to replicate those conditions. Because they are interested in health-care delivery in poor countries such as Ethiopia, they modify the original game in order to adapt it to that situation. Consequently, they do not use university students from a Western country as subjects, but rather they use Ethiopian nursing students. These students are likely to experience in their future working life the situation modeled in the experiment. Azfar and Nelson's set-up is particularly suited for experiments in the field because it is conducted using face-to-face interaction and without a computer network.

The basic structure of the game is the same as the one in Azfar and Nelson but with the 'health worker' substituting for the executive. A health

worker receives resources meant to be distributed among citizens but can divert part or all of the resource to him- or herself. The major modifications of the original game are as follows.

- The health worker is randomly selected. However, if the incumbent has not been found stealing, his or her chances of retaining his or her position are much higher than the chances of other players. If embezzlement is detected, the health worker is prevented from being the health worker in the next round.
- The monitor is either elected or randomly selected but is never appointed by the health worker.
- Each time the monitor flips is costly; there are no free tiles.

The treatments are similar to those used by Azfar and Nelson. The health worker's wage is set high or low (where the high wage is three times the low wage). The total number of tiles is set at either 10 or 18, and, as noted above, the monitor may be elected or selected randomly. In addition to these treatments, the authors vary treatments along an additional dimension. In half of the sessions neutrally worded instructions were used; in the other half the situation was explained in the context of the health worker's task.

The downside of this richness in variations is that the number of sessions conducted with each treatment combination was small. Indeed, among the eight sessions not a single one was replicated using exactly the same combination of treatment variables. This sparseness of data is partly due to the resource-intensive nature of data collection in Ethiopia, which is not the homebase of any of the authors. This limits the number of sessions that can be conducted. However, the authors gave high priority to using an authentic subject pool, which in their view enhances the external validity of their results.

With these limitations in mind, the statistical analysis provides some interesting results. As in Azfar and Nelson (2002), health workers receiving a high wage embezzle less, although the effect is small. An interesting result, not found in the previous study, is a positive relationship between the agent's wage and the monitor's effort. Monitors facing reelection are more vigilant than those selected at random because monitors who put more effort into their task are more likely to be reelected. There is no overall effect from the way the instructions were framed, but the variance seems to increase when the experiment was explained as one dealing with healthcare.

The donor problem in development

The third paper in this category is by Abbink and Ellman (2004). In their much simpler set-up the authors test some very specific hypotheses.

A donor who wants to deliver goods to poor villagers often needs to rely on an intermediary (typically a local village leader) to select the neediest recipients. Combining selection and delivery poses a potential problem. If the intermediary is dishonest, he (or she) might try to divert funds to himself. To maximize his own wealth, he may deliberately select richer villagers as the recipients because they feel more grateful for being selected (knowing that they do not deserve it) and are therefore less likely to complain. As a result there are two negative effects of embezzlement. Not only do the recipients get less than they should, but also the aid goes to the wrong people.

Abbink and Ellman test this hypothesis in a simple laboratory experiment with five players: one intermediary and four 'villagers'. Two of the villagers are poor and are given no endowment at the start, and two are relatively rich and are endowed with 50 talers each. The intermediary is the richest villager, who has 100 at the start. In addition, he receives 100 to be distributed to the two poor villagers. He is, however, free to select rich villagers and also free to allocate less than 50 to the villagers he selects. The remainder then goes into his own pocket. Villagers who receive less than 50 can file a costly complaint. If one complaint is filed, then an investigation discovers the intermediary's embezzlement, and the intermediary is punished. Villagers know about their own allocation and whether they are selected, but are not informed about other villagers' allocations. To avoid suggestive instructions, intermediaries were not explicitly told how they were supposed to behave, but equity is a very well-established fairness norm in experimental games, so a strong moral and social norm to pick the poor and allocate 50 to each of them can be assumed. Further, the rules of the game ensured that zero embezzlement was the only way to be safe from complaints.

The results show that rich villagers are indeed less likely to complain about embezzlement, and there is significant diversion of funds to rich villagers. Rich and poor villagers are selected about equally often. Thus, although the intermediary has the information needed to select poor villagers, selection is not improved over a merely random selection of recipients.

A control treatment with such a random selection of recipients reveals that random selection outperforms selection by the intermediary. Although the distortion from selecting the wrong recipients is about the same, random selection significantly reduces the amounts embezzled. If intermediaries are not in charge of selection, they know that villagers have no reason to be grateful for being selected. Thus they fear complaints more and embezzle less. This leads to an improved allocation of resources, though the effect of the selection method on actual complaint behavior is smaller than the intermediaries seem to expect. Overall, the authors draw the conclusion that selection by an outsider has the potential to be superior

to selection by the intermediary, even though outsiders often lack the information needed to identify the needy.

4. Procurement

The procurement of inputs for public projects presents a distinct set of corrupt incentives, especially when bidding mechanisms are used. Thus, the work reported in this section stands on its own because it does not focus on the interpersonal relationship between officials and their clients. Rather, it compares three mechanisms that are feasible for procurement auctions.

By its very nature, public procurement is one of the most sensitive areas in public administration. Officials decide how to allocate large amounts of money, but, being paid a flat salary, they do not directly benefit from lower prices. Büchner et al. (2005) model a procurement auction with two sellers. The bids the sellers submit are composed of two parts: a price that the government has to pay (p) and a bribe offer (b) to the buyer expressed as a share of the selling price.

A seller's payoff, if his (or her) offer is chosen, consists of his bid minus his costs minus the bribe he has paid. A seller who does not win the auction gets a payoff of zero. The buyer, a public official, has a utility function that takes into account both the social value of the contract and his (or her) own monetary payoff through the bribe. The buyer's utility function has a weight that specifies importance of the social value in his preferences. The higher this parameter, the less sensitive he is to bribes. The buyer will choose the offer that he prefers according to this utility function with regard to both parts of the offer, price and bribe.

Following standard assumptions in auction theory, in each auction each seller's cost parameter is drawn randomly and independently from a uniform distribution over the interval $[0, 1]$. Each seller's costs are private information, that is, a seller knows only his own costs, but not those of the competitor (but he knows that the competitor's costs are drawn the same way).

The authors first solve the model for the symmetric game-theoretic equilibrium and find that the equilibrium price offer increases with the cost parameter and that the bribe is lower the higher are the costs. Then laboratory experiments are designed to test the theoretical prediction. In all experiments only the sellers are represented by human participants; the buyers are robots maximizing the utility function mentioned earlier. For each experiment the auction game was repeated 30 times. Beyond testing the equilibrium prediction, treatments were designed to test the effect of certain institutional changes. One treatment highlighted the socially negative effect of bribery. For this, the sessions were divided into subgroups of three pairs of bidders. Every ten rounds each subgroup was compared with another subgroup. The subgroup in which bribes were higher received

a lower exchange rate from experimental into real currency in the next block of ten rounds. A second treatment variation was the matching protocol. Each variant of the game is played using a partners' scheme (fixed pairs of bidders) and a strangers' scheme (random re-matching every round). The partners' scheme can be expected to be more conducive to collusion.

The results in general support the theoretical prediction. Asking prices rise and bribes fall with higher costs. Quantitatively, prices tend to be slightly below the equilibrium bid. This is in line with previous findings from auction experiments, in which participants bid more aggressively than in equilibrium. Interestingly, bribes are also lower than predicted, which corresponds to less aggressive offerings. This holds for the treatments with and without negative externalities. In the treatment with variable exchange rates (thus explicit social costs of bribery) bribes tend to be slightly lower. Thus bidders do take the damage they do to their groups into account. The matching protocol had no impact on prices and bribes, as it is generally difficult to establish collusion in a competitive auction environment in which costs are private information.

5. Outlook

Experimental work on corruption is only just beginning and lacks a critical mass. Given the vastness of the phenomenon and the plethora of situations in which it occurs, a dozen papers can barely scratch the surface. This is particularly true because the papers are very different, and each one is only a snapshot of a particular environment. For a more comprehensive picture we need to develop a research program that systematically covers a variety of different, but related, issues in a common environment. Given the ongoing activity in the area, this is likely to happen in the future, but we are not there yet.

There are several methodological issues to be addressed. First, the experimental community continues to debate the right way of wording instructions to the participants. Should they be phrased 'neutrally', using only abstract terms and not mentioning corruption, or should they be presented in the the context of a corrupt transaction? In an area so heavily loaded with moral values, this question may be more important than in, say, a market experiment. On the one hand, one may argue that loaded instructions are always prone to be suggestive and hence will tempt subjects into making particular decisions. On the other hand, neutral instructions may eliminate those moral values that are so relevant to corrupt behavior and that cannot be induced by the payoff structures only. Evidence is mixed so far. Abbink and Hennig-Schmidt (2002) do not find significant differences; Barr et al. (2004) identify a small effect. It seems that there is

no common answer for all corruption experiments, but that the effect depends on the particular game. More research is needed to ascertain the right way to proceed for the scenarios we wish to capture.

Second, future work should study the impact of culture on corrupt behavior in experiments. An important first step has been made by Cameron et al. (2005), but their inconclusive results suggest that cultural effects are subtle and complex, such that much more research is still needed to understand them. Note that the possibility of cultural influences does not invalidate results gathered from one-country studies. In most cases, experimentalists do not look at absolute levels of corruption (which are not very informative given that most games are played with invented parameters), but at the differences between treatments. Thus, experimental results would only be invalidated if different cultures responded differently to the treatment variations. Although it is plausible that cultural differences induce different levels of corruption, it is typically less plausible that different cultures would respond to changes in a particular variable in opposite ways. (It cannot be entirely ruled out, of course.) If changes in particular variables lead to similar effects in different cultures, then the use of one particular subject pool can even turn out to be a virtue of experimental methods. Drawing the participants for all treatments from the same subject pool then controls for cultural differences that could distort cross-country field studies. Nevertheless, identifying the effect of different cultures on behavior in corruption experiments is an interesting area for further future research.

For the future it also seems promising to create stronger links between field and laboratory research. This is very ambitious given that field data are so hard to come by for corrupt behavior. Often the motivation for designing a laboratory experiment is precisely that real-world data are prohibitively hard to get. It may not be impossible, however. Recent progress in the econometric analysis of corruption may open up opportunities to study aspects of corruption in field and laboratory in parallel. Although it is naturally impossible to prove the external validity of experimental results, such parallel investigations could dramatically add to the robustness of the stylized facts we can identify in laboratory experiments.

Notes

- *. This work has been carried out while the author was a visitor at the Institut d'Anàlisi Econòmica (CSIC), Barcelona. He gratefully acknowledges their hospitality and support.
- 1. For simplicity, the probability is independent of the size of the bribe.
- 2. Effects of an official's own wage are studied in other papers discussed in this chapter, for example, Jacquemet (2005) in a similar setting.
- 3. This refers to the comparisons backed by straightforward difference-in-means tests. The authors also run regressions to extract additional significances from their data. Their robustness is questionable, however, as they very much depend on the specification of the model.

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