



Munich Personal RePEc Archive

## **Corruption investigated in the lab: a survey of the experimental literature**

Nina Bobkova and Henrik Egbert

University College London (UCL), Anhalt University of Applied Sciences Bernburg

17 April 2012

Online at <https://mpra.ub.uni-muenchen.de/38163/>  
MPRA Paper No. 38163, posted 17 April 2012 18:53 UTC

# **Corruption Investigated in the Lab:**

## **A Survey of the Experimental Literature**

**Nina Bobkova<sup>#</sup> and Henrik Egbert<sup>\*</sup>**

**Abstract:** The article provides a survey of the growing experimental literature on the investigation of corruption and extends previous surveys. We discuss three aspects which deserve more attention in further research. These are, first, a more careful consideration of individual norms, second, a broader perspective on the influence of norms within groups on corrupt behaviour, and, third, embedding corruption experiments in more extended social science research on corruption.

**Keywords:** bribery; corruption experiments; economic experiments

**JEL classifications:** · C91 C 92 D73· Z1

**Acknowledgements:** The paper was inspired by the discussions at the workshop “Economic Activities of the Police in Transformation and Developing Countries”, State University Higher School of Economics, Moscow, 2009 and 2010. Henrik Egbert thanks Max Albert, Department of Economics, Justus Liebig University Giessen for providing the opportunity to write the paper as a visiting researcher. We thank Dominique Jung for research assistance. Of course, the usual disclaimer applies.

---

<sup>#</sup> Nina Bobkova (corresponding author), Master Student, University College London, England. Email: nina.bobkova.11@ucl.ac.uk.

<sup>\*</sup> Dr. Henrik Egbert, Professor of Economics, Anhalt University of Applied Science, Bernburg, Germany. Email: h.egbert@wi.hs-anhalt.de.

## 1. Introduction

Economists and other social scientists have shown a long and ongoing research interest in corruption (cf. Rose-Ackerman 2006). For instance, they investigate the relation between governance structure (Kaufmann et al. 2007, Shah 2006), hierarchy (Mishra 2006), political decentralization (Fan et al. 2009), culture (Lipset and Lenz 2000), or individual characteristics (Mocan 2008; Olken 2009) and the emergence of corruption. They analyze different forms of corruption, such as bribery, embezzlement in private and public organizations, and rent-seeking behaviour in general. Many studies in economics and other social sciences are motivated by an interest in the effects of corrupt activities on efficiency and development, hence the effects on the well-being of groups.

In the economic analysis of corrupt behaviour institutions play a central role (see Serra 2006 for a test of variables related to corruption). Corruption itself is an institution in the sense that it can constitute a behavioural norm for members of a group. If individuals implement these norms into their decisions, then the outcome may be an inefficient equilibrium. Moreover, corruption is an institution because it is an allocation mechanism which occurs in addition to, or replaces, other existing allocation mechanisms, such as markets or hierarchies. Consequently, an understanding of individual behaviour with respect to corruption requires consideration of institutions.

Economic theory allows predicting decisions of rational individuals in given settings. Individuals rely on the 'institution of corruption' if the expected gains from corruption are higher than the expected gains when using alternative institutions. In this sense, individuals substitute or complement different institutions by employing corruption in order to achieve individual aims. Since expected gains also depend on expected costs, corrupt behaviour may rise since the expected costs of using the institution of corruption are lower with respect to achieving the individual aims compared to those of alternative institutions.

Within the New Institutional Economics framework 'corrupt behaviour' is often defined as rational behaviour in a principal-agent model (cf. Lambsdorff 2002). If agents are corrupt, under given constraints they optimize and misuse their power for a private benefit (Lambsdorff 2007, 16). Thus negative externalities for third parties can occur. Corruption is in many contexts regarded as a form of criminal activity. If economists follow this

perspective, it is because corruption may lead to inefficiencies and consequently to a loss of social welfare.

A milestone in the economic literature on behaviour and crime is Becker's paper (1968). Becker applies rational choice theory to criminal activities and outlines the influence of fines on such behaviour. Becker's ideas have been applied to corruption of law enforcers such as the police (Becker and Stigler 1974). If the aim is to reduce corruption, then different incentive mechanisms which influence opportunity costs become important. One proposed solution is to increase salaries of law enforcers in order to increase the quality of their work and to make them less vulnerable to attempts of bribery and, with this to increase the opportunity costs of losing their job. A second solution is to implement competition among law enforcers and to allow private law-enforcing agents to operate beside state agents. Another approach is to implement a controlling agent (e.g., an anti-corruption unit) who monitors the law enforcement agency. If an anti-corruption unit is permitted to collect fines from corrupt law enforcement agents (cf. Mookherjee and Png 1995; recently Silva et al. 2007), this may reduce corrupt behaviour (cf. for casual corruption also Bowles and Garoupa 1997; Chang et al. 2000). In short, the institutional structure in which corruption is embedded influences the emergence and the level of corrupt behaviour (cf. e.g., Shleifer and Vishny 1993).

However, additionally to theoretical studies it is necessary to consider empirical microeconomic studies because their results provide a further analysis of the mechanisms underlying corruption. Moreover, empirical research allows testing variables that influence corrupt behaviour and may thus give advice for political measures aiming to reduce corruption in a society. Among other methods, economic experiments are one possibility for empirical investigation (cf. Dušek et al. 2005; Abbink 2006). Economic experiments can be considered a complementary method to those methods employed in related social sciences in order to investigate corruption, such as questionnaire surveys in Sociology or participant observation and case studies in Anthropology and Criminology: Experiments allow controlled tests on the influence of specific variables on corrupt decisions. Thus experiments are empirical tests of the formulated theories and, furthermore, results from experiments may allow formulating policy measures to fight corruption.

Testing corruption empirically through economic experiments is, however, a rather new field. Several years ago Renner (2004), Andvig (2005), Dušek et al. (2005), and Abbink

(2006) published first surveys on the topic. A more recent survey of Frank et al. (2011) focuses on the aspect of gender and corruption in economic experiments and Li (2012, 22-54) analyzes the influence of culture. In this paper we summarize and expand the surveys by showing recent trends in this emerging literature and outlining three aspects, which we regard as ones that should deserve a more thorough investigation in future research. First, we argue that individual's values and perceptions in experiments should be considered more carefully. Second, a broader perspective is needed to investigate the influence of groups and group norms, such as networks, on corrupt behaviour. While research on group behaviour and effects of individual behaviour on group members is a standard topic in experimental economics, the transfer to the research on corruption has not been exploited yet. Third, we emphasize that economic corruption experiments need to be embedded in broader social science research on corruption. These three aspects are outlined in the third section of the paper after the survey of the recent experimental literature in the next section.<sup>1</sup>

## **2. Corruption Investigated in the Lab**

In the surveys of corruption experiments by Andvig (2005), and particularly by Dušek et al. (2005) and Abbink (2006), several economic experiments on corruption are discussed in detail.<sup>2</sup> That is why we keep comparatively short the discussion of those papers that are already discussed and concentrate on newly emerging strands in this literature.

Two experiments on factors that influence corruptibility of individuals are conducted by Frank and Schulze (2000) and Schulze and Frank (2003). Frank and Schulze (2000) carry out the first economic corruption experiment ever recorded. They implement two different treatments: in a controlled environment without any risk of detection, individuals have first to decide in a situation with a trade-off between maximizing individual profit and maximizing

---

<sup>1</sup> Since some studies have been reviewed while being working papers, the years of publication of the studies mentioned here may differ from those in previous surveys. The literature has been developing very fast and only in 2011 a large number of working papers emerged. We are aware that this survey cannot capture all available papers. We have tried to cover all papers published by mid 2011.

<sup>2</sup> For instance, the papers of Frank and Schulze (2000) and Schulze and Frank (2003) are reviewed in Andvig (2005, 255), Dušek et al. (2005, 152-153), Abbink (2006, 420-422), and Frank et al. (2011). The same applies for the papers of Abbink (2002) and Abbink et al. (2002) which are elaborated on in Andvig (2005, 265), Dušek et al. (2005, 150-152), or Abbink (2006, 422-424), and the paper of Azfar and Nelson (2007) is reviewed in Andvig (2005, 266), Dušek et al. (2005, 154-155), and Abbink (2006, 429-431). Frank et al. (2011) summarizes, for instance, Rivas (2008), Alatas et al. (2009a), Armantier and Boly (2008), and Abbink (2006, 434-435) summarizes Büchner et al. (2008). Nevertheless, several other published papers have not been considered in previous reviews.

the gains of the public interest. In the second treatment, in addition to individual pay-off from the experiment, participants receive an additional lump-sum payment in order to examine whether corruption would decrease if individuals are rewarded for their 'job' during the experiment. Frank and Schulze (2000) find out that, apparently due to self-selection, economics students tend more to corruptibility than other groups of students, and that lump-sum payments do not affect the outcome. In their second experiment, Schulze and Frank (2003) test the impact that a detection mechanism has on the propensity for corrupt behaviour. In an experiment with a similar setting like the experiment of Frank and Schulze (2000), they introduce a detection likelihood that positively depends on the amount of the bribe proposition. If a corrupt individual is detected, she does not receive a positive pay-off. The aim is to investigate whether the possibility of detection lowers corruption or strengthens it due to the increased costs of corruption. In this experiment, only one player receives her pay-off in the end. Schulze and Frank's findings indicate that a detection mechanism significantly increases the amount of people deciding for a corrupt action, thus it abates the intrinsic motivation for honesty. However, in their experimental setting there were fewer people under monitoring who engage in corruption.<sup>3</sup>

One of the main objectives of experiments on corruption is the investigation of a bribing situation. In many cases experiments are designed in such a way that a public official takes a bribe from an individual in exchange for a favour (Abbink 2006, 422). These experiments address reciprocity and are often investigated in the form of a modified trust-game. Abbink et al. (2002) are the first who design a bribery experiment with regards to the influence of punishment and negative external effects. Abbink et al. (2002) have a lasting effect on the literature and their experiment has been replicated and adopted in many ways. The original experiment consists of three treatments with the pairing of two players, one in the role of a firm and the other in the role of a public official. The firm decides if she wants to propose a bribe to the public official and has to pay a relatively low transfer fee. If the public official rejects the bribe, both players receive their initial endowment, less the transfer fee. If the public official accepts, both payoffs increase significantly. In the second stage of the game, the public official decides between two options: one option significantly increases the pay-off of the firm but has a lower pay-off for the public official. The other option is better

---

<sup>3</sup> Olken (2007) reports about a field experiment in Indonesia. He finds that an increase in audits of road projects in villages have a positive effect on reduced missing expenditures and concludes "... that traditional top-down monitoring can play an important role in reducing corruption, even in a highly corrupt environment." (2007, 201).

for the public official but has a negative effect on the pay-off of other players. The major findings of this investigation are that the introduction of a negative external effect in the form of a reduced payoff of other players does not seem to significantly affect the amount and frequency of bribing. On the other hand, after the introduction of a punishment mechanism the average bribing amount as well as the frequency in the choice of the option, which is better for the public official, significantly declines. In follow-up studies, Abbink (2002, 2004) investigates the effects of fair salaries and the impact of staff rotation on corruption in Germany. The experimental layout is built upon the experimental design of Abbink et al. (2002). Results of the first game with staff rotation (Abbink 2004) reveal a sharp decrease in the average bribe as well as in the frequency of the choice that favours the public official. In the second game with differences in salaries (Abbink 2002), no significant difference was captured between the high-wage and low-wage treatment, so the salary seems to have no influence on corruptibility in this case. Some of the studies which also use the set-up of Abbink et al. (2002) are discussed next.<sup>4</sup>

Abbink and Hennig-Schmidt (2006) run a corruption experiment that investigates the effect of in-context framed presentation of the experiment on the level of corruption compared to an abstract neutral terminology, as typically used in experimental economics (Abbink and Hennig-Schmidt 2006, 103-104). They address the question of external validity of corruption experiments, a problem also mentioned by Dušek et al. (2005). Since the term ‘corruption’ usually has a negative connotation, Abbink and Hennig-Schmidt investigate whether a neutrally framed corruption experiment with abstract wording is capable of catching the real-life reaction of participants adequately. Their experimental design is built on one of the treatments of the bribery trust-game introduced by Abbink et al. (2002), but with different instructions in one of the two treatments. They compare the results of the neutrally framed game with the same game with framed instructions in order to provoke a framing effect by suggestive phrasing. The task is presented as an interaction between a firm and a public official, where the firm can engage in private payments in order to receive a permission for an industrial plant and with this, harm the public. Abbink and Hennig-Schmidt (2006) also implement a punishment mechanism in the form of an immediate exclusion from the experiment with the likelihood of 0.3%. In contrast to the hypothesis that framed instructions will provoke a negative attitude towards corruption and thus, lead to less corrupt behaviour,

---

<sup>4</sup> The working papers of Jacquemet (2005) and Castro (2006), both using the design of Abbink et al. (2002), are not discussed here, but see Abbink (2006, 427-428) for a discussion of Jacquemet.

there is no significant treatment effect through framing: neither the average bribe proposed by the firms, nor the frequency of permissions given by the public officials differs between the treatments. As Abbink and Hennig-Schmidt conclude, for this specific experiment, presenting this experiment with suggestive wording does not alter the findings.

Rivas (2008), also following Abbink et al. (2002), investigates gender effects (cf. also the discussion of Rivas 2008 in Frank et al. 2011, 62-63). In the experiment four sessions are conducted in order to find out whether the behaviour of the participants depends on the gender of their opponents. In two of the sessions subjects of both genders participate: one gender in the role of the firm, and the other gender as the public official. In the other two sessions only subjects belonging to one gender participate in both roles. The result is that gender has no statistically significant effect on the probability of offering a bribe, although the bribe amount is lower if the briber is a woman. Women tend to accept bribes less frequently if the briber is a woman. After accepting a bribe, women in the role of public officials tend to engage in a reciprocal action less frequently than men. Rivas concludes that men are more corrupt than women and that a greater number of women in positions where corruption occurs could lower the level of corruption.

González et al. (2007) conduct a bribery experiment that is based on an ultimatum bargaining game (González et al. are also discussed in Abbink 2006, 426-427). González et al. investigate the effect of greasing a public official in order to reach a faster decision. The experiment is a one-shot game and uses a strategy elicitation method. In the experiment, a player in the role of a firm can portion an amount of money in three parts among herself and two other players in the role of two public officials. This reflects a situation in which a firm applies for a permit that has to be approved by two public officials. This permit will allow the firm to gain a certain surplus, which she can divide between her and the two public officials. Both public officials, independently of each other, have to accept this proposal in order for the payment to take place, thus, both public officials have veto power. Only one of the two public officials has the power to prolongate the decision, which is costly for the firm and also costly for herself. This public official has full information about the offer of the firm: she knows her proposed amount, the amount proposed to the second public official and the amount that the firm keeps for herself. The other public official, who has no power to delay the decision, has only the information of her own amount proposed by the firm. The effect of bribery is captured here through the additional amount which the firm proposes to the public official who has the power to prolongate the decision, not generally through the amount proposed to



the two officials. The findings are as follows: the public officials who have the power to delay their decision often demand a premium. The public official with delay power tends to use this power when the other public official receives a higher amount than herself. The amounts offered to the public officials by the firm are higher than one would expect according to traditional theory. The firm offers this 'premium' in order to avoid a delay, it thus engages in greasing. Proposals that implement an equal amount for each involved player lead to the highest acceptance rate. Both public officials reject very low offers, underlying the importance of social norms in strategic games.

Bilotkach (2006) tests bribery in the context of tax evasion with a comparatively small number of subjects. In the experiment students are in the role of businesspeople who can avoid being taxed through bribing an official. The experiment resembles a conspiracy situation between tax payers and public officials and is adapted to the situation in Ukraine. Bilotkach finds that participants in the role of businesspeople offer bribes more aggressively if they know about the corruptibility of participants in the role of public officials (2006, 31). However, offering bribes has no effect on the behaviour of the participants in the role of public officials.

Armantier and Boly (2008) investigate the external validity of a laboratory experiment with students from Canada against a field survey in Burkina Faso (the paper is also briefly reviewed in Frank et al. 2011, 64). One subgroup of the players has to write a dictation, and their payoff is negatively correlated to the flaws they make in their writing. They have the option to bribe the other subgroup of players who correct the dictation and could overlook flaws in reward for a bribe. In the conducted experiment, each agent bribed her corrector. In four different treatments the authors investigate the variation effects of the payment amount, the amount of the bribe, and the monitoring and punishment for bribing. The findings of Armantier and Boly reveal that results of the laboratory experiment as compared to results of the field experiment show statistically insignificant differences. With respect to individual characteristics they find that religiosity and age seem to be negatively correlated to the acceptance of bribes.

Another recent experiment investigates cultural differences. Cameron et al. (2009) conduct a corruption experiment in Australia, India, Indonesia and Singapore in order to test the impact of culture and institutional framework within a country on individual decision making. While according to Transparency International's Corruption Perception Index (CPI)

Australia and Singapore are among the least corrupt countries in the world, the opposite counts for Indonesia and India. Cameron et al. test whether a corrupt environment, on the one hand, promotes corruption since it lowers the inhibition threshold and, on the other hand, generates tolerance and thus lowers the propensity to punish corrupt behaviour. In the experiment a player in the role of a firm can offer a bribe (for little costs) to a player in the role of a public official. The public official can accept or reject this proposition. If the public official accepts the bribe offer of the firm, then the payoff of a third player, the citizen, decreases, while the payoff of both the firm and the public official increases through bribing. The citizen can punish the other two players in the last stage of the game. If she decides to punish, she reduces her own income. Two different treatments are played: one is welfare-reducing, the other is welfare-enhancing in the case of corrupt decisions. In the welfare-enhancing treatment the sum of the payoffs of all players is higher if bribing occurs because the losses of the third player are lower than the combined gains of the other two players. In line with theoretical predictions, in most of the games a bribe is offered and the public officials also accept the bribe in most of the cases. However, approximately half of the citizens whose payoff decreases through bribing, decide to make use of their punishment opportunity. Cameron et al. find a significant cross-country difference in the participants' behaviour: Indians, as compared to Australians, being confronted with corruption, have a lower punishment frequency, while their propensity to engage in corruption is higher. Contrary to these findings, participants from Indonesia who are confronted with a high level of corruption in their country, have little tolerance for corruption. As for Singapore with a low level of corruption, the participants from this country are highly inclined to engage in corruption, and also disinclined to punish corruption. Cameron et al. argue that a more detailed institutional and historical framework of corruption in the countries has a considerable impact on individual behaviour, and due to that, the CPI is not able to capture all relevant factors in order to explain the variation of behaviour across the four countries. This emphasizes the impact of institutions like laws and group norms on individual behaviour with regards to corruption, which we discuss in the third section.

Alatas et al. (2009b) conduct another field experiment with regard to subject pool effects. Participants are on the one hand Indonesian students and on the other hand Indonesian public servants. As corruption in Indonesia is comparatively high, they expect public officials to be more exposed to and, thus, more experienced with corruption than Indonesian students (this hypothesis was also confirmed through a post-experimental questionnaire about

corruption contact at work, but not outside the working place). The corruption experiment is built on the experimental design of Cameron et al. (2009), but does not explore cross-country differences of student behaviour but the inner-country differences among different subject pools instead. In contrast to most other corruption experiments, Alatas et al. (2009b) frame their experiment in the form of loaded instructions and use the terms 'bribe' and 'punishment' (Alatas et al. 2009b, 117). In this way, they first test for an experience effect with corruption. Second, they test for a selection effect whether people with a specific attitude towards corruption are inclined to become public officials. The game is a one-shot game and three participants are included in a single round: one has the role of a firm who can bribe the public official in order to boost her payoff; the other participant is a public official who can accept or deny the proposal of the firm; the third player has the role of a citizen who is harmed by a bribing action between the two former participants. This citizen can punish the other two players by decreasing their income after bribing has taken place. Through punishment she diminishes her own payoff as well. Engaging in or abstaining from punishment also shows her tolerance level for corruption. Results show that students in the role of a firm are more likely to engage in bribing than public servants in the role of the firm. Furthermore, students in the role of a public official are also more likely to accept a bribe than public servants in the same role. No significant difference in tolerance for corruption through punishment frequency is captured between the two subject pools. No self-selection effect is found in the experiment: the behaviour of students who indicate that they plan to become a public servant, is not statistically different from the behaviour of the other students, but is statistically different from the behaviour of public servants. Alatas et al. (2009b: 125) conclude that this underlines the impact of real-life work experience on behaviour. The experience effect expresses itself in the low tolerance for corruption of participants who are often confronted with corruption at work.

A new strand of experiments has been developed by Barr and Serra (2009) who employ a modified one-shot ultimatum game, and analyze the impact of framing and variations of external costs. They find that bribe acceptance is comparatively low if negative externalities are comparatively high, hence individuals tend to abstain from corrupt behaviour if the external costs are heightened. However, the effect may be due to inequity aversion of players. A different framing does not lead to a significant difference in bribe acceptance in their experiment. Based on the experimental design of Barr and Serra (2009), Barr and Serra (2010) conduct two corruption experiments (in 2005 and 2007) in order to test the cultural

impact on the propensity for corruption. The first experiment in 2005 is conducted with a group of 195 students from Oxford. One third of them are British, the other participants come from 33 different countries which Transparency International rates differently regarding corruption. The experimental design is as follows: 15 participants play in five groups of three players each. One participant in the role of a citizen proposes a bribe to a participant in the role of an official. If the player in the role of the official accepts (this is captured through the strategy elicitation method), the payoff of both players increases. Simultaneously, the payoff of the third players in the role of a member of the society in each of the five groups diminishes (Barr and Serra 2010: 864). Barr and Serra's findings indicate that undergraduate students coming from countries with a comparatively high corruption index are also more inclined to engage in a 'corrupt' action in this experiment. However, these results do not hold for graduate students. Barr and Serra comment that the time spent in the immigration country and the selection process of the different immigration procedures may have distorted their subject pool and, thus, lead to different results for undergraduates and graduates. In 2007 Barr and Serra conduct another slightly different experiment (Barr and Serra 2010) in which they try to reduce the inaccuracy of their explaining variables. Here, the official indicates her bribing request, and the citizen indicates whether she accepts to pay the amount (the behaviour of the citizen is captured through strategy elicitation). This approach is reverse to the experiment in 2005, but all the other parameters of the 2005 game remain unchanged. Again, one third of the students are from Britain, and the other participants come from 21 different countries. In this experiment, as in 2005, undergraduates coming from a country with a comparatively higher rate of corruption (according to Transparency International) show also a higher propensity to engage in corruption than undergraduates coming from countries with a comparatively lower rate of corruption. Again, this result does not hold for graduates. A deeper analysis of the impact of the time spent in the immigration country reveals that the propensity to engage in corruption decreases over time spent in Britain. However, this cannot explain the variations between undergraduate and graduate behaviour. Barr and Serra try to capture a selection effect of students coming to Britain by asking these students whether they are financed by a fellowship or their families. The hypothesis is that families who are financing their children's education from their home country are richer, and thus, more corrupt, which may have an impact on the student behaviour. Barr and Serra find no confirmation of this hypothesis. They conclude that cultural socialization and norms can influence corruption.

In another recent study Serra (2011) tests the effectiveness of different monitoring mechanisms. One monitoring approach is top-down monitoring. The intervention against corrupt behaviour is conducted by the state, i.e. one public official controls another public official. An alternative monitoring approach is bottom-up monitoring where auditing is performed by citizens who are affected by corrupt relationships and, thus, have more information. The experiment of Serra (2011) is a one-shot game and builds on Barr and Serra (2009). It is conducted with 15 participants per round with 5 participants in each role. A player in the role of a citizen requires a service from the official. A player in the role of an official can demand a bribe from the citizen for a higher quality or for a faster processing of the service. If the citizen accepts to pay the bribe demanded by the public official, both players are better off. But if bribing is successful, then the payoff of the five other players in the role of the society diminishes. Serra (2011) investigates the propensity to demand bribes in three different treatments: first, a treatment without any form of monitoring, where the highest bribing frequency occurs; second, a treatment with top-down monitoring where the punishment likelihood for bribing is given as a percentage; third, a treatment with a combined mechanism, i.e. a bottom-up mechanism that enables top-down monitoring only after a complaint from a citizen. After a public official has demanded a bribe from a citizen, the citizen has the opportunity to report the public official without facing punishment costs herself. Only in cases where the public official is reported, she has to expect punishment with the same probability as in the second treatment. Otherwise the punishment probability is zero. Thus, the likelihood of being punished for a corrupt action in the third treatment is lower than in the second treatment with only top-down auditing. In contrast to the theoretical prediction, in this third treatment the bribing frequency is lower than in the second treatment although bribing in this third treatment is more rewarding for public officials. Surprisingly, the third treatment with the combined auditing mechanism and the lower probability of detection is the most effective mechanism to reduce corruption. Serra (2011:17) concludes that this result may have been obtained due to an aversion to betrayal by violating a subjective norm, and the non-monetary costs of a social disapproval in the form of being formally reported by a citizen. Serra also considers a behavioural bias, the conjunction fallacy in probability judgments, as an explanation for the experimental deviation from the theoretical prediction.

Drugov et al. (2011) investigate the role of agents as intermediaries in a corruption framework. Intermediaries facilitate the relationship between a briber and a bribee by lowering information costs, for instance the costs of whom to bribe and also negotiation costs

of an agreement upon a bribing amount. An intermediary could also reduce the risk of being detected and punished and also lower the risk of a promise breach, as the intermediary is able to build up a long-term relationship to the bribee, which may be impossible for a briber (Drugov 2011, 3-4). Drugov et al. test whether intermediaries that facilitate the relationship between a briber and a bribee enhance the level of corruption: They expect that intermediaries may have the effect to abate the moral costs of a corrupt action, thus corrupt activities may increase (Drugov et al. 2011, 7). They use the experimental structure of Barr and Serra (2009). A player in the role of a citizen decides whether to bribe a public official in order to receive a certain service. The player in the role of a public official can accept or reject this proposition. If she accepts, her payoff and the payoff of the citizen increase, while the payoff of the third player diminishes. Drugov et al. conduct three treatments. In the first one, no intermediaries are involved. Here, citizens have no information about the bribing amount the public officials are likely to accept. In the second treatment, intermediaries are introduced as a fourth player. They communicate the minimum amount the public official would accept as a bribe to the citizens, who now have to decide whether to pay or not to pay this amount. In the third treatment, no intermediary is present, but the citizens are informed about the minimum bribing amount the public official is willing to accept. Findings suggest that intermediaries increase the share of corrupt public officials and the share of citizens who engage in corruption. In the presence of intermediaries, the moral costs of a corrupt action seem to diminish for the briber and bribee, as the average bribing amount demanded is lower and is paid more frequently by citizens.

Barr et al. (2009) use an experimental design previously introduced by Azfar and Nelson (2007). In the experiment of Barr et al. (2009) a typical principal-agent relation is constructed in which the agent provides a service to a third party. Information asymmetries exist and the principal engages a monitor who controls the agents but can behave opportunistically. The set-up resembles a situation in public service sectors with the principal being the government which employs civil servants to provide services for third parties: the service recipients. Barr et al. (2009) conduct the experiment with employees in the Ethiopian health sector. They find out (2009, 237) that if the service recipients elect the agents *ex ante*, they then provide better services. If monitors are elected, these show higher efforts in their monitoring activity. The positive effects of electing monitors have previously been analyzed by Azfar and Nelson (2007) as well. They also reveal that increasing wages reduce corrupt

behavior and that reducing the options to conceal gains derived from corrupt decisions has the same effect.

Lambsdorff and Frank (2010) test how the wording influences decisions in a corruption game. Proposers in an ultimatum game are in the role of a businessperson who can label her bribe as a 'bribe' or as a 'gift'. Receivers play the role of public servants who can reciprocate, whistle-blow, or behave opportunistically. Results show that those businesspeople who prefer to call their bribe a 'bribe' are willing to punish opportunistic behavior of public servants harder than those businesspeople who label their bribe a 'gift'. Their interpretation is that the term bribe is consciously chosen by proposers since the word indicates an expectation for reciprocity on the part of the civil servant (2010: 354). If the bribe is labeled as 'gift', the expectations of the bribe giver are signaled less clear. The wording itself becomes a signal for an individual's expectation of other people's behavior and thus, an enforcement mechanism of corruption. Schikora (2010, 2011) has investigated the effects of whistle-blowing on corruption more specifically. He finds that in a situation where both parties, a client and a public official, have the option to initiate corrupt behavior and where both have the option of whistle-blowing, then corruption increases rather than decreases (cf. also Lambsdorff and Frank 2010). A possible interpretation is that the option of whistle-blowing stabilizes reciprocal behavior.

In an early survey of Dušek et al. (2005: 155) another line of experiments is addressed. Dušek et al. refer to an experiment of Falk and Fischbacher (2002) in which participants have the option to maximize their own utility at the expense of others. The authors find out that "the average subjects steal the more, the more others steal." (Falk and Fischbacher 2002, 859). The neutrally framed experiment does not address corruption as such, however the results are relevant for situations in which corruption can occur. If social interaction effects within groups emerge, then corruption may be a self-enforcing institution within groups (cf. additionally Goette et al. 2006 for the effects of group membership on norm enforcement, and also Funk 2005; Dong et al. 2008 introduce the term 'conditional corruption'). Thus, information about others' behaviour may influence individual decisions whether to engage in corrupt behaviour or not. This line of experimental studies has not found much attention in experimental investigations on corruption yet.

One recent exception is Schikora (2010, 36-76) who addresses in his study the relationship between corruption and cooperation. He conducts three experiments: First, he

tests the Four Eyes Principle in the Lab. Although this mechanism is often claimed to diminish corruption, Schikora finds that introducing this principle in an experiment has ambiguous effects and can increase corruption. Second, he analyzes the effect of a whistle-blowing option on corruption. Whistle-blowing had two effects: It stabilized a corrupt relationship, and it serves as an insurance against exploitation by a public official. In his third experiment, Schikora analyzes the relationship between cooperation in a modified public good game and group composition. His findings of the differences in cooperation with regards to different groups stress the importance of within-group dynamics for the behaviour of individuals.

### **3. Outlook**

In this concluding section we discuss aspects that, according to our opinion, deserve more careful consideration in future experiments on corruption. We fully confirm Abbink's (2006, 435) statement on corruption that "[g]iven the vastness of the phenomenon and the plethora of situations in which it occurs, a dozen papers can barely scratch the surfaces." Nevertheless, the literature is growing rapidly and more corruption experiments have been recently conducted but have not been published yet. In 2006 Abbink provided an outlook on three issues, which he thought to be important for further experimental research: the discussion on using neutral or loaded instructions, the influence of culture, and the link between field and laboratory research on corruption. To a certain degree the literature published over the last years has considered some of these issues, for instance, Barr and Serra (2009), Lamsdorff and Frank (2010) on framing effects, or Barr and Serra (2010) and Li (2012) on cultural differences. Our analysis refers to these issues but considers them in a broader context. Particularly, we suggest for the future a more careful consideration (1) of individual values in corruption experiments, (2) a broader perspective on the influence and emergence of norms within groups on corrupt behaviour, and (3) embedding corruption experiments in the much broader social science research on corruption. Next, we outline these issues and refer, where necessary, to further papers which point in the respective direction.

(1) Individual values: The answer to the question *which* specific behaviour can or cannot be considered as corruption is complex. Laws label certain actions as corrupt in the sense that they are illegal. Implementing such an exogenous definition into an economic experiment unambiguously for all participants is challenging: Whether an individual perceives her actions



as corrupt may considerably differ from the law and strongly depend on the environment of the experiment. Furthermore, if an individual in an experiment chooses an action framed with the words ‘corrupt’, it does not necessarily mean that she considers herself corrupt after picking that move. In fact, no legal consequences follow, and any punishment mechanism in the form of social pressure after detection normally ends with the experiment. The only similarity to actual corruption consequences in an experiment is the participants’ associations with the wording. A participant could engage in a ‘corrupt’ action only due to utility maximizing or reciprocity without considering herself in violation of any norms or legal framework. Abbink (2006, 435-436; cf. also Abbink and Hennig-Schmidt 2006) refers to the problem when he addresses the issue of wording experimental instructions, i.e. using loaded versus neutral wording. He emphasizes the specific, morally loaded context of corruption.

We believe that the basic reason of the problem is the reference to an exogenously set definition, i.e. the definition of an experimenter who defines corrupt and non-corrupt behaviour in a specific experimental context. Specific terms may be, due to individually different moral values, of importance for some but not for other participants in a group of participants. If we assume that individual perceptions of corrupt behaviour are different within groups of participants in an experiment, then the same decisions may not be interpreted in the same way for all individuals. Decisions that have been considered as an indication for corruption, then, may in fact be interpreted rather differently. We know from empirical studies that a correlation between demographic variables, such as gender or age, and corruption exists (cf. Gatti et al. 2003; for gender Frank et al. 2011) and that tolerance levels of corruption differ between sub-groups of a population (see Alatas et al. 2009b for Indonesian students vs. Indonesian public servants). Hence, testing the impact of variables on corrupt behaviour requires additional knowledge on whether participants themselves consider their behaviour as corrupt. The subjective perception of and attitude towards corruption is important, if policy measures are derived from experiments to fight corruption. Nevertheless, most of the economic experiments on corruption have not systematically tested whether individuals violate their subjective values if they decide for a corrupt action. The only exception is, to the best of our knowledge, a working paper of Campos-Ortiz (2011) who reports on an experiment in this direction. He let participants report on their previous experience with bribery and on their individual attitude towards it. He finds out that those participants who have shown a propensity to corruption and a higher willingness to pay bribes

in the past show a stronger pro-bribery behavior in his experiment. This result is challenging for developing policy measures to fight corruption.

(2) Intra-group Norms: Some experiments address the relation between culture and corruption.<sup>5</sup> One assumption of these studies is that moral values are different between members of different groups and that these can be measured with variables such as nationality (Cameron et al. 2009). The hypothesis reads that such differences in behaviour could be due to dissimilar social norms prevalent in different groups, hence cultures. Experimental results show (Cameron et al. 2009) that differences in behaviour can be related to cultural variables even if participants decide under the same legal framework (cf. Barr and Serra 2010). While culture is an important aspect to be investigated in more detail, we argue that it is insufficient to control for group characteristics, such as nationality, ethnicity or religion. Additionally, processes *within groups* need a more careful consideration.

The experimental starting point could be Falk and Fischbacher's (2002) results that social interaction effects are relevant, as already discussed in Dušek et al. (2005, 155). Economic experiments on corruption have not addressed the influence of group members on other members in detail yet. In many cases when corruption occurs, the principal-agent situation is rather complex because principals, agents and also monitors are members of specific or different social groups. Thus, group norms regarding corruption may emerge and influence individual decisions. If several subgroups within a society develop similar group norms regarding corruption, then whole societies may be caught in a corruption trap. Thus, an individual decision does not necessarily depend on her individual values but also on social norms that have emerged endogenously, i.e. within a group. We may ask which factors promote the evolution of a specific social norm within a group, for instance a behavioural norm of pro-corrupt behaviour that all individuals of a group follow. Certain factors influence such a norm, e.g. individual preferences of group members, group size, fluctuation of members, or entry and exit barriers to the group (cf. Abbink 2004, for the effect of staff rotation, also Schikora 2010, 36-76). The emergence of stable equilibria such as norms of pro-corrupt behaviour is of particular interest for economic research because social norms which emerge endogenously in groups may constitute Nash equilibria. Thus, once a norm of pro-corrupt behaviour has established, it becomes a stable equilibrium. Hence, negative

---

<sup>5</sup> In the experimental context the term 'culture' is often applied to participants with different nationality, ethnicity, religion, etc. It is documented, for instance, in the Corruption Perception Index by Transparency International (2010) that perceptions of corruptions are different between countries. However, they are also different between groups of one and the same country (cf. Alatas et al. 2009b).

externalities as a consequence of corruption become persistent and may inhibit social development. Then, only a ‘big-push’ in the form of an exogenous shock may bring a society out of such a corruption trap (e.g., Collier 2000).

The present experimental literature does not address these problems on the emergence and persistence of pro- or anti-corrupt behaviour sufficiently. Particularly, we suggest testing in repeated games for variables which have an influence on the formation of such behaviour in groups. The only recent exception in this direction is Schikora (2010, 36-76). A closely related topic is the investigation of network formation. Particularly, those factors that lead to the establishing of networks with *negative* network externalities have not been investigated by experimental research in detail. However, it is known from many contexts that networks exhibit negative externalities for third parties as well as for some network members.<sup>6</sup> The appearance of negative network externalities can be set within the context with topics related to corruption. Thus, economists and other social scientists should pose the question which factors mitigate and constrain negative externalities of networks, and thus avoid the emergence of ‘cultures of crime’ or ‘corruption traps’. Such a focus on endogenous variables may go hand in hand with the already identified exogenous variables that seem to influence corrupt behaviour in one way or another.

(3) Integrating Research Methods: Now we turn to the final aspect, i.e. applying research methods from different disciplines as complementary tools to economic experiments. Abbink (2006, 436) also emphasizes an aspect of this issue when he calls for “stronger links between field and laboratory research”. However, we go one step further and would not include only experiments but also methods in the neighbouring fields. We have already emphasized the importance of considering individual perceptions of norms and within-group dynamics in experiments. Here it could be fruitful for economists to employ insights applied in other sciences. This does not only refer to methodological issues but also to available results derived through other methods. The sheer acceptance of results derived solely by incentive compatibility methods may restrict potential insights and be an obstacle in the specific context of corruption. Particularly, if the aim of corruption experiments is to derive insights on mechanisms which can be used for developing policy measures, then a combination of experiments with other methods seems to be reasonable. The investigation of corruption has produced abundant literature in disciplines such as Anthropology,

---

<sup>6</sup> Gatti et al. (2003, 5-6) mentions a number of empirical studies on corruption and networks.

Criminology, Development Theory, Organizational Studies, Political Science, Psychology, and Sociology. Thus, a large methodological toolbox is at hand: surveys, in-depth interviews, participant observation and case studies are well established methods in other social sciences. Findings obtained by these methods can be used as complements to economic experiments, as they might allow for synergetic effects. A general rejection of non-incentive compatibility methods limits the possible insights. Especially where an incentive compatible design is impossible – where participants are asked to reveal their values or other information they might not be aware of – Economics can gain from e.g. in-depth interviews. After all, economists collect personal data after most of the economic experiments, without this post-experimental questionnaire being incentive-compatible.

This paper has striven to provide a survey of the fast growing literature on experimental economics on corruption and corrupt behaviour. The topic has only recently gained attention by experimental economists. We have outlined some issues which we consider important after having reviewed the literature. We expect a severe impact of experimental research not only on understanding the fundamental causes of corruption but also on developing tools to fight against it and thus to promote growth and social well-being.

## References

- Abbink, K. (2006), "Laboratory Experiments on Corruption." in Rose-Ackerman, S. ed., *International Handbook on the Economics of Corruption*. Cheltenham UK; Northampton, MA, USA: Edward Elgar, pp. 418-437.
- Abbink, K. (2004), "Staff Rotation as an Anti-corruption Policy: An Experimental Study." *European Journal of Political Economy*, 20(4): 877-906.
- Abbink, K. (2002), "Fair Salaries and the Moral Costs of Corruption." Working Paper (CeDEx 2002-5, University of Nottingham).
- Abbink, K., Hennig-Schmidt, H. (2006), "Neutral versus Loaded Instructions in a Bribery Experiment." *Experimental Economics*, 9(2): 103-121.
- Abbink, K., Irlenbusch, B., Renner, E. (2002), "An Experimental Bribery Game." *Journal of Law, Economics and Organization*, 18(2): 428-454.
- Alatas, V., Cameron, L., Chaudhuri, A., Erkal, N., Gangadharan, L. (2009a), "Gender and Corruption: Insights from an Experimental Analysis." *Southern Economic Journal*, 75(3): 663-680.
- Alatas, V., Cameron, L., Chaudhuri, A., Erkal, N., Gangadharan, L. (2009b), "Subject Pool Effects in a Corruption Experiment: A Comparison of Indonesian Public Servants and Indonesian Students." *Experimental Economics*, 12(1): 113-132.
- Andvig, J. C. (2005), "Experimental Research and Corruption: A Survey of Budding Research," in Transparency International (ed.), *Global Corruption Report*. Cambridge UK: Cambridge University Press, pp. 255-267.
- Armantier, O., Boly, A. (2008), "Can Corruption be Studied in the Lab? Comparing a Field and a Lab Experiment." Working Paper (CIRANO Scientific Publications No. 2008s-26).
- Azfar, O.; Nelson, W. (2007), "Transparency, Wages, and the Separation of Powers: An Experimental Analysis of Corruption." *Public Choice*, 130: 471-493.
- Barr, A., Serra, D. (2010), "Corruption and Culture: An Experimental Analysis." *Journal of Public Economics*, 94(11-12): 862-869.
- Barr, A., Serra, D. (2009), "The Effects of Externalities and Framing on Bribery in a Petty Corruption Experiment." *Experimental Economics*, 12(4): 488-503.
- Barr, A., Lindelow, M., Serneels, P. (2009). "Corruption in Public Service Delivery: An Experimental Analysis." *Journal of Economic Behavior and Organization* 72(1): 225-239.
- Becker, G. S. (1968), "Crime and Punishment: An Economic Approach." *Journal of Political Economy*, 76, 169-217.
- Becker, G. S., Stigler, G. J. (1974), "Law Enforcement, Malfeasance, and Compensation of Enforcers." *Journal of Legal Studies*, 3(1): 1-18.

- Bilotkach, V. (2006), “A Tax Evasion—Bribery Game: Experimental Evidence from Ukraine.” *European Journal of Comparative Economics*, 3(1): 31-49.
- Bowles, R., Garoupa, N. (1997), “Casual Police Corruption and the Economics of Crime.” *International Review of Law and Economics*, 17(1): 75-87.
- Büchner, S.; Freytag, A.; González, L.G.; Güth, W. (2008), “Bribery and Public Procurement: An Experimental Study.” *Public Choice*, 137: 103-117.
- Cameron, L., Chaudhuri, A., Nisvan, E., Gangadharan, L. (2009), “Propensities to Engage in and Punish Corrupt Behavior: Experimental Evidence from Australia, India, Indonesia and Singapore.” *Journal of Public Economics*, 93(7/8): 843-851.
- Campos-Ortiz, F. (2011), “Experience, Attitudes and Corrupt Behavior: Insights from an Experiment on Bribery.” Working paper (Brown University, Department of Economics, January 2011). [http://www.econ.brown.edu/students/f\\_campos-ortiz/fco\\_jmp\\_jan2011.pdf](http://www.econ.brown.edu/students/f_campos-ortiz/fco_jmp_jan2011.pdf)
- Castro, M. F. (2006), “To Bribe or Not Bribe? An Experimental Analysis of Corruption.” Working Paper (Società italiana di economia pubblica – dipartimento di economia pubblica e territoriale – università di pavia).
- Chang, J., Lai, C., Yang, C. (2000), “Casual Police Corruption and the Economics of Crime: Further Results.” *International Review of Law and Economics*, 20(1): 35-51.
- Collier, P. (2000); “How to Reduce Corruption?” *African Development Review*, 12(2): 191-205.
- Dong, B.; Dulleck, W.; Torgler, B. (2008), “Conditional Corruption”, Discussion Paper (CREMA Center for Research in Economics, Management and the Arts) Working Paper No. 2008 – 29, Basel. (<http://www.crema-research.ch/papers/2008-29.pdf> accessed: January 12, 2012).
- Dušek, L., Ortmann, A., Lizal L. (2005), “Understanding Corruption and Corruptibility through Experiments: A Primer.” *Prague Economic Papers*, 2005(2), 147-162.
- Drugov, M., Hamman, J., Serra, D. (2011), “Intermediaries in Corruption: An Experiment.” Working Paper (SSRN: <http://ssrn.com/abstract=1838591>, accessed: May 11, 2011).
- Falk, A., Fischbacher, U. (2002), “‘Crime’ in the Lab-Detecting Social Interaction.” *European Economic Review*, 46(4/5): 859-869.
- Fan, C. S., Lin, C., Treisman, D. (2009), “Political Decentralization and Corruption: Evidence from around the World.” *Journal of Public Economics* 93(1/2): 14-34.
- Frank, B., Schulze, G. (2000), “Does Economics Make Citizens Corrupt?” *Journal of Economic Behavior and Organization*, 43(1): 101-113.

Frank, B., Lambsdorff, J. G., Boehm, F. (2011), "Gender and Corruption: Lessons from Laboratory Corruption Experiments." *European Journal of Development Research*, 23(1): 59-71.

Funk, P. (2005), "Governmental Action, Social Norms, and Criminal Behavior." *Journal of Institutional and Theoretical Economics*, 161(3): 522-535.

Gatti, R., Paternostro, S., Rigolini, J. (2003), "Individual Attitudes Towards Corruption: Do Social Effects Matter?" Working Paper (World Bank Policy Research Working Paper 3122, August 2003).

Goette, L., Huffman, D., and Meier, S. (2006), "The Impact of Group Membership on Cooperation and Norm Enforcement: Evidence using Random Assignment to Real Social Groups," *American Economic Review Papers and Proceedings* 96(2): 212-216.

González, L., Güth, W., Levati, V. (2007), "Speeding up Bureaucrats by Greasing Them: An Experimental Study." *Homo Oeconomicus*, 24(1): 5-20.

Jacquemet, N. (2005), "Corruption as Betrayal: Experimental Evidence on Corruption under Delegation." Working Paper (GATE Groupe d'Analyse et de Théorie Économique, Laval University, Working Paper 05-06).

Kaufmann, D., Kraay, A., Mastruzzi, M. (2007), "Governance Matters VI: Governance Indicators for 1996-2006." Working Paper (World Bank Policy Research Working Paper 4280, July 2007).

Lambsdorff, J. G. (2007), *The Institutional Economics of Corruption and Reform: Theory, Evidence and Policy*. Cambridge: Cambridge University Press.

Lambsdorff, J. G. (2002), "Corruption and Rent-Seeking." *Public Choice*, 113(1/2): 97-125.

Lambsdorff, J. G., Frank, B. (2010), "Bribing versus Gift-Giving: An Experiment." *Journal of Economic Psychology*, 31(3): 347-357.

Li, Sha (2012), *Interkulturelle experimentelle Korruptionsforschung: deutsche und chinesische Akteure im Vergleich*. Kassel: Kassel University Press.

Lipset, S. M., Lenz, G. S. (2000), "Corruption, Culture and Markets." in Harrison, L, Huntington, S. eds., *Culture Matters*. New York: Basic Books, pp. 112-124.

Mishra, A. (2006), "Corruption, Hierarchies and Bureaucratic Structure." in Rose-Ackerman, S. ed., *International Handbook on the Economics of Corruption*. Cheltenham, UK; Northampton, MA, USA: Edward Elgar, pp. 189-215.

Mocan, N. (2008), "What Determines Corruption? International Evidence from Microdata." *Economic Inquiry*, 46(4): 493-510.

Mookherjee, D., Png, I. P. L. (1995), "Corruptible Law Enforcers: How Should They be Compensated?" *Economic Journal*, 105(428), 134-159.

- Olken, B. A. (2009), "Corruption Perception vs. Corruption Reality." *Journal of Public Economics*, 93(7-8): 950-964.
- Olken, B. A. (2007), "Monitoring Corruption: Evidence from a Field Experiment in Indonesia." *Journal of Political Economy*, 115(2): 200-249.
- Renner, E. (2004), "Wie lässt sich Korruption wirksam bekämpfen?" *Vierteljahreshefte zur Wirtschaftsforschung*, 73(2): 292-300.
- Rivas, M. F. (2008), "An Experiment on Corruption and Gender." Working Paper (The Papers from Department of Economic Theory and Economic History of the University of No 08/10).
- Rose-Ackerman, S. (ed.) (2006), *International Handbook on the Economics of Corruption*. Cheltenham, UK; Northampton, MA, USA: Edward Elgar.
- Schikora, J. T. (2011), "Bringing Good and Bad Whistle-blowers to the Lab." Department of Economics, University of Munich (Munich Discussion Paper No 2011-4).
- Schikora, J. T. (2010), *Four Essays on Corruption and Cooperation*, Dissertation, University of Munich ([http://edoc.ub.uni-muenchen.de/12664/1/Schikora\\_Jan.pdf](http://edoc.ub.uni-muenchen.de/12664/1/Schikora_Jan.pdf), accessed 3.1.2012).
- Schulze, G., Frank, B. (2003), "Deterrence versus Intrinsic Motivation: Experimental Evidence on the Determinants of Corruptibility." *Economics of Governance*, 4(2): 143-160.
- Serra, D. (2011), "Combining Top-down and Bottom-up Accountability: Evidence from a Bribery Experiment." *Journal of Law, Economics, and Organization*, June 9, 2011 (<http://jleo.oxfordjournals.org/content/early/2011/06/08/jleo.ewr010.short?rss=1>).
- Serra, D. (2006), "Empirical Determinants of Corruption: A Sensitivity Analysis." *Public Choice*, 125(1): 225-256.
- Shah, A. (2006), "Corruption and Decentralized Public Governance." Working Paper (World Bank Policy Research Working Paper No, 3824).
- Shleifer, A., Vishny, R. W. (1993), "Corruption." *Quarterly Journal of Economics*, 108(3), 599-617.
- Silva, E. C. D., Kahn, C. M., Zhu, X. (2007), "Crime and Punishment and Corruption: Who Needs 'Untouchables'?" *Journal of Public Economic Theory*, 9(1): 69-87.