Does the reliability of institutions affect public good contributions? Evidence from a laboratory experiment

Martin Fochmann* Björn Jahnke† Andreas Wagener‡

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Abstract

Reliable institutions – i.e., institutions that live up to the norms that agents expect them to keep – foment cooperative behavior. We experimentally confirm this hypothesis in a public goods game with a salient norm that cooperation was socially demanded and corruption ought not to occur. When nevertheless corruption attempts came up, groups that were told that "the system" had fended off the attempts made considerably higher contributions to the public good than groups that only learned that the attempt did not affect their payoffs or that were not at all exposed to corruption.

JEL-Codes: H41, A13, C91.

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*Corresponding author. University of Cologne, Faculty of Management, Economics and Social Sciences, Albertus-Magnus-Platz, D-50923 Cologne, Germany. E-mail: fochmann@wiso.uni-koeln.de.

†University of Hannover, E-mail: jahnke@glad.uni-hannover.de.

‡University of Hannover, E-mail: wagener@sopo.uni-hannover.de.

1 Introduction

Studies on the causes of economic prosperity emphasize the role of high-quality institutions: societies with a strong rule of law, firmly protected property rights, a competent public administration, and solid physical and regulatory infrastructures perform economically better than societies without or with only weak institutions (Acemoglu and Robinson, 2012; Acemoglu et al., 2005; LaPorta et al., 1998; Dixit, 2004; Eicher and Leukert, 2009). Measures of human well-being, including subjective measures for happiness, are higher in countries with better governance and greater state and administrative capacity (Ott, 2010; Holmberg et al., 2009). Arguably, many positive effects of good institutions work quite directly: high-quality public infrastructure, legal security, clarity of administrative procedures and the state's power to enforce contracts, to regulate markets and to finance public goods generate immediate economic benefits to citizens (Besley and Persson, 2010). However, non-tangible aspects of institutions matter strongly, too: institutions frame agents' behavior, coordinate their beliefs, expectations, and actions. They shape the rules of the game, both formally (e.g., by laws) and informally (e.g., by defining or reflecting norms for socially adequate behavior). Good institutions impose, follow, and enforce well-defined rules in the interest of the common good. In particular, they provide a stable framework not only for interactions of citiziens with the state but also with each other. All this can have positive effects: good institutions may inculcate higher levels of civic-mindedness, altruism, and cooperation in citizens (Rothstein, 2000; Letki, 2006). The willingness of citizens to care for, and contribute to, the public good as well as their abstention from corruption and free-riding are contingent on the (perceived) quality of the system within which they operate. Our main hypothesis is: institutional reliability and credibility foment cooperative behavior among economic agents.

This hypothesis echoes earlier theoretical reasoning on the positive impact of institutional quality, legitimacy or procedural justice on citizens' cooperation, compliance, or civic morality (see Section 2 for a survey). Confirming the proposed mechanism is, however, difficult: due to positive feedback, causation may run either way. Reliable institutions encourage cooperation and compliant behavior among citizens (top-down causality) — and cooperative, norm-abiding citizens are more likely to establish and maintain high-quality institutions (bottom-up causality). As such endogeneity issues are hard to resolve empirically, we follow an experimental approach that establishes a top-down causality.[1] With our design, we are able to provide evidence that reliable institutions make citizens behave more cooperatively.

Our experiment proceeded as a sequence of standard public goods games in groups of four players (for details, see Section 3). Such games can, in various ways, be understood to elicit the civic-mindedness of individuals: the willingness to forgo individual gains for the social good, to cooperate with others, to act pro-socially, to pay taxes, to comply with individually burdensome but collectively beneficial social norms etc.[2] We embeddeded the public goods game into a setting with varying institutional reliability. By screen messages, participants were primed towards individual and institutional compliance with social norms of cooperation and non-corruptibility. After five rounds of undisturbed play (first part of the experiment), participants were informed that from then on "corruption events" might arise from outside the game (second part) – which would constitute a break of the salient norm of non-corruption. There were three potential scenarios, in addition to a Baseline treatment without corruption: corruption attempts could be fended off, without costs to players, by "the system" (System-Defense treatment); if not

[1]This is, of course, not to deny that bottom-up channels might also exist.

[2]Moreover, unlike tax evasion games, public goods games do not run the risk that results might be polluted by gambling considerations.

fended off, corruption might or might not reduce the return on contributions to the public good (Harmful-Corruption treatment and Harmless-Corruption treatment); reductions in returns presented as a deterministic change in the payoff function. For the opening round of the second part, participants were left uncertain about which treatment applied for their group. After that round, each group was informed about the actual scenario for their group, which would then remain in place for the remaining rounds of public good games.

It was made clear to players that neither they nor any of their co-players were involved in the corruption event, but that it came from outside the game itself; the occurrence of corruption was a "systemic" event. Moreover, it (potentially) called institutional reliability into question: in each round of the game, participants were primed that corruption was socially unacceptable both for citizens and institutions. In treatments where corruption attempts were let pass (with or without monetary consequences) the institutional environment would then be perceived as less reliable in maintaining no-corruption than in treatments without corruption or with warded-off corruption. The hypothesis that good institutions foster cooperative behavior would then imply for the experiment that contributions to the public good are higher, *ceteris paribus*, in treatments where the institutional framework was more reliabe (see Section 4 for our hypotheses).

Importantly, in terms of monetary payoffs the Baseline, System-Defense, and Harmless-Corruption treatments in the second part of the experiment are identical. Moreover, since they do not involve any losses in payoffs, they do not differ from the uniform no-corruption scenario of the first part. Consequently, eventual differences in behavior across the no-loss treatments can only arise from non-pecuniary, perception- or norm-based considerations.

Our key interest is in the differences in contributions to the public good between the various corruption scenarios.[3] Comparing the contribution levels between the various scenarios of the second part, Table 1 summarizes our main experimental results (see Section 5 for details).

Table 1: Summary of main results

Contributions to the public good in the . . .

		Second part (corruption is possible)
	$<$	System-Defense (corruption fended off)
		$\vee$
First part (w/o corruption)	$=$	Baseline (no corruption attempt)
		$\|$
	$=$	Harmless-Corruption

The most striking observation is that agents in the System-Defense treatment, where the corruption attempt is fended off, contributed more to the public good than in the other no-loss scenarios, including the Baseline treatment without corruption. This confirms our main hypothesis that a reliable and credible institution foments cooperative behavior (*Reliability Effect*): groups exposed to an institution that ensures that social norms are indeed obeyed contribute more than groups where institutional reliability is irrelevant (Baseline treatment) or dubious (Harmless-Corruption treatment).

In contrast to this positive effect on cooperation, we find no significant difference between the Baseline and the Harmless-Corruption treatment. Here, corruption did not pose dangers to participants' payoffs. Feeling personally

[3] The first part of the experiment, where corruption was absent, confronted all subjects with the same decision task. As expected, behavior did not differ between the groups of subjects who would later be assigned to the different corruption treatments.

unaffected by the institution's lack of reliability, players might have seen no reason to change their behavior. However, compared to the Harmful-Corruption treatment where subjects are directly confronted with an unreliable institution as they suffer from corruption, we find evidence for a negative effect on cooperation (*Lack-of-Reliability Effect*).

2 Related Literature

2.1 Theoretical studies and evidence

Our main hypothesis posits that reliable institutions (a stable public order, a firm system of rules, credible public officials etc.) are positively linked with cooperation or, more abstract, civic morality. There is quite some empirical evidence in line with this view. For example, a study of 38 democratic countries by Letki (2006) shows that the reliability of the institutional setting positively shapes citizen's community-oriented attitudes while corrupt and clientelistic policies undermine them. Likewise, citizens who believe that institutions fulfill their obligations are significantly less likely to evade taxes or claim benefits for which they are not eligible (Scholz and Lubell, 1998). While these studies report correlations, there are various channels through which the link from institutions to behavior could operate in a causal way:

Setting a model. Already Aristotle argued that governments ought to instill the formation of "good habits" in citizens, i.e., shape civic and cooperative attitudes, and social norms that are conducive to economic efficiency (see Bowles, 2014, 2008). In that perception, the repeated exposure to good institutions makes even opportunistic citizens act decently and cooperatively (Bidner and Francois, 2010). Dixit (2009) and Greif (2002) suggest that good institutions, understood as social means to detect and rein in opportunistic acts and to credibly enforce well-defined rules, "create" cooperative people.

Societies where gods and deities (understood as religious institutions) are designed as moral beings see more cooperative and socially-minded behavior than societies with morally unconcerned, whimsical and fickle godnesses (Norenzayan and Shariff, 2008). Similarly, Bohnet and Huck (2004) establish experimental evidence that subjects' propensity to be trustworthy in the second phase of a trust game is driven by the reliability of institutions they were exposed to in the first phase. In an experimental iterated public goods game, Strimling et al. (2013) find that, when faced with socially efficient institutions at the outset, even groups with low levels of social trust manage to achieve high-yield collective outcomes. Conversely, if institutions are engaged in practices such as discrimination, clientelism, or patronage, individuals might feel compelled to engage in anti-social practices as well (Rothstein and Stolle, 2008, p. 284).
The importance one attaches to upholding a social or legal norm is a good predictor of actual behavior with respect to that norm (Bardi and Schwartz, 2003; Kirchler et al., 2008). Institutions that keep with pro-social norms signal that these norms are important, fostering pro-social behavior in citizens.

Inference. With imperfect information, individuals may use the behavior of the system as a clue for the civic-mindedness of other people (Ostrom, 1990, pp. 98f). The ethics of the system signals to citizens what kind of game is played in society.[4] There is substantial evidence that people are conditional cooperators, i.e., their willingness to cooperate is stronger when everyone else also is seen as cooperative (Hibbing and Alford, 2004). Reliable institutions might signal general willingness to cooperate.

[4]Hayek (1994) emphasizes the importance of the Rule of Law. Only within known rules of the game can individuals be sure that ad hoc actions will not be used deliberately to frustrate his efforts. Hayek likens the Rule of Law to a production function, "helping people to predict the behavior of those with whom they must collaborate" (Hayek, 1994, p. 81).

Legitimacy of the system. Dalton (2004, Ch. 8) and Tyler (2006) argue that when citizens believe that governments are acting for the common good, decisions will be perceived as legitimate and citizens will be more norm-compliant on a voluntary basis. Citizens consider paying taxes and obeying laws as the "proper" things to do precisely *because* they are members of a community with legitimate organizational structure. Rothstein (2000) reports two prerequisites why citizens pay taxes: they need to trust that other taxpayers were paying their share too (interpersonal trust), and tax authorities need to ensure that the money in fact finances what it is meant to finance rather than being diverted into corruption (institutional trust and legitimacy). This is in line with our experimental observations.

Perceptions. Rothstein (2000) and Levi (1998) emphasize that it is perceptions ("cognitive maps") of reliability and trustworthiness that matter, not the institutions *per se*.[5] In three treatments of our experiment, we therefore confine ourselves to shaping participants' "perceptions" of institutional reliability but do not alter the institutions themselves: the rules of the game and the monetary payoffs are left unchanged.

Trust. The actual performance of institutions arguably is an important determinant of trust in institutions. A number of studies report strong associations between the quality of institutions, confidence in government, and general trust (Knack and Keefer, 1997; La Porta et al., 1997; Zak and Knack, 2001). However, so far no causal relation between these types of trust has been established (Letki, 2006),[6] and links between generalized trust and co-

[5]Already Adam Smith (1776, Book V, Ch. II, p. 7) observes that "[c]ommerce and manufactures, in short, can seldom flourish in any state in which there is not a certain degree of *confidence* in the justice of government" (emphasis added).

[6]As an exception, Anderson et al. (2004) report that, when asking participants in a public goods experiments for the drivers of their behavior in the experiment, generalized

operative behavior are at best weak (Rothstein and Eek, 2009). Our experiment therefore does not test for trust spillovers from institutions to economic agents but directly tests for differences in behavior and economic efficiency when agents face institutions of different reliability.

2.2 Corruption

Our experiment exposes participants to possible events of corruption. Different from other studies on corruption (e.g., Cameron et al., 2009; Atalas et al., 2009; Xiao, 2013), subjects cannot themselves corrupt or punish corrupt subjects. We make salient the norm that corruption ought not to occur. This reflects that corruption is a most crucial political factor that lets levels of trust in governments decline (Bjørnskov 2003; Warren, 2006; Catterberg and Moreno, 2006). Even stronger, the absence of corruption already seems to serve as an indicator for general reliability. Rothstein (2000) and Rothstein and Eek (2009) experimentally show that trust in authorities, captured by low levels of (perceived) corruption, mirrors the perceptions on the general trustworthiness of others in society. In a study based on the World Values Survey, Delhey and Newton (2005, p. 323) conclude that corruption-free government seems best suited to set societal structures "in which individuals are able to act in a trustworthy manner and in which they can reasonably expect that most others will generally do the same." Varying the exposure to corruption, thus, is an appropriate scenario for eliciting differences in cooperative behavior in our experiment.

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trust (in particular towards strangers) turns out to be the most important correlate with contributions to the public good. However, this relies on surveys and there is no established causality.

3 Experimental design

3.1 General description

We employed a Voluntary Contribution Mechanism (VCM) in which subjects had to decide on their investment in a private good and on their contribution to a public good. The VCM experiment consisted of two parts with five rounds each and was played in groups of four (see the Instructions in Appendix A.1). In the first part (rounds 1 to 5), subjects played a standard, no-frills public goods game. This part of the experiment was identical for all subjects.

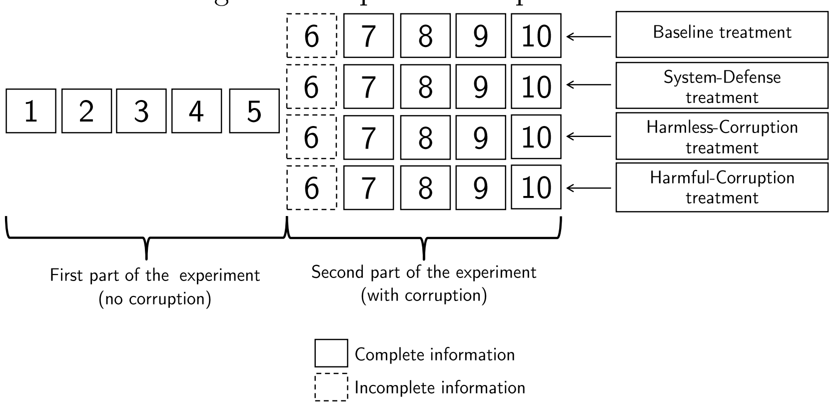
At the beginning of the second part (rounds 6 to 10), subjects were informed that now corruption events could occur that might reduce the return from contributing to the public good.[7] In fact, four within-subjects design treatments with different corruption scenarios were implemented and each group was randomly assigned to one of the treatments (with equal probability of 25%) at the beginning of round 6. This assignment was invariably kept for the rest of the experiment, confronting each subject with the same corruption scenario in each round of the second part of the experiment. Subjects were not immediately informed about the scenario to which they had been assigned. At the beginning of round 6 they only learned about the possible corruption scenarios but not which scenario their group would encounter. Thus, investment decisions in round 6 had to be made under incomplete, but symmetric information.

At the end of round 6, each subject was informed about the treatment assignment for her group in rounds 7 to 10 (but not about the scenarios for other groups). From then on, subjects had complete information about the

[7]The written instructions used the term "corruption". This approach refers to Abbink (2006, p. 425) who argues that loaded instructions trigger moral sentiments of the subjects that are in line with the context of our experimental treatment.

corruption scenario. Figure 1 depicts the experimental procedure.

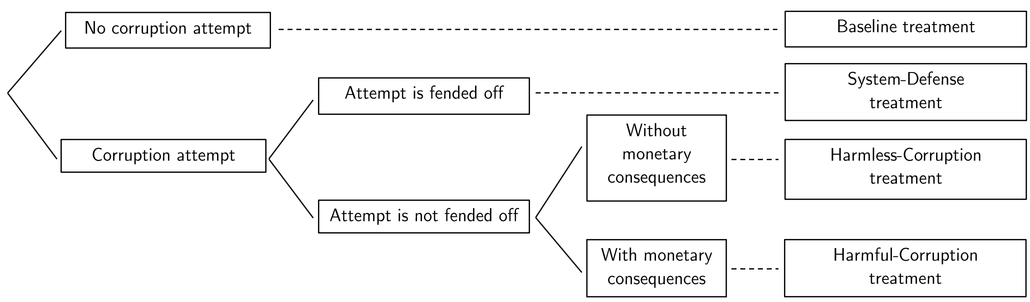
Figure 1: Experimental procedure



3.2 Treatments in the second part

Rounds 6 to 10 consisted of public goods games, as did the first part. But now attempts of "corruption" from outsiders to the game might arise. In case they occurred, corruption attempts might be successfully fended off by "the system" and would then remain innocuous for the participants in the experiment. If not averted, corruption attempts might, however, reduce the return on investments in the public good and, hence, the total payoff from the experiment. Figure 2 depicts the four scenarios that could arise:

Figure 2: Corruption attempts and treatments



- **Baseline treatment:** No corruption attempt occurs. Public good returns and total payoffs do not change compared to the first part of the experiment. This treatment serves as a benchmark.

- **System-Defense treatment:** A corruption attempt occurs. However, the attempt is fended off by the system. As a consequence, public good returns and total payoffs are not affected and, from a purely monetary perspective, subjects face the same decision problem as in the first part of the experiment.

- **Harmless-Corruption treatment:** A corruption attempt occurs and is not fended off by the system. However, no monetary consequences result: neither public good returns nor total payoffs are affected. From a purely monetary perspective, subjects faced the same decision problem as in the first part of the experiment.

- **Harmful-Corruption treatment:** A corruption attempt occurs, is not fended off by the system, and has negative monetary consequences: the returns on contributions in the public good (and consequently total payoffs) are reduced; returns on investments in the private good remain unchanged. Changes in payoffs are deterministic in that the new payoff matrix is known to participants. Subjects are now confronted with a different decision problem than in the first part.

The idea behind our design of treatments is as follows. Throughout the experiment, participants were primed by screen messages that corruption is not (to be) tolerated in Germany, the country of play. Under such circumstances, a good (i.e., reliable) institutional system can be expected to fend off corruption in case it arises; the mechanisms built into the system would then appear functional in detecting and neutralizing the trespassing of social norms. Thus, the System-Defense treatment — where the corruption attempt did not to succeed — represents a scenario where institutions are strong and reliable. In the other two (non-baseline) scenarios institutions fail to live up to the implicit expectation that corrupters ought not to get away with their attempts. In both treatments, institutions are not fully reliable, either without or with harmful economic consequences for citizens.

A couple of remarks on our modeling and framing of "corruption" seem in place. Attempts for corruption come from outside the experiment; they are not carried out by participants in the experiment. In the experimental instructions, we used a neutral wording ("an outside individual") that did not specify who was the corrupter and how corruption actually was (planned to be) carried out. To motivate why corruption might go along with a reduction in participants' payoffs, participants were told that the corrupter would get a benefit at the expense of subjects who contributed to the public good. However, there was no possibility to interact with the corrupter, not even indirectly. To participants, corruption was an exogenous event that could not be influenced by themselves or by any player in the experiment. Consequently, participants should not harbor any desire to punish or retaliate against any member of their group.

Corruption in the experiment could only lead to a reduction in the return on contributions to the public good; the return on investment to the private good is not affected. This should not imply that corruption does not affect private economic activities; "public good" and "private investment" are simply labels for activities where, respectively, players interact with each other and where they do not.

3.3 Payoffs

Subjects are randomly assigned to groups of size N. The assignment is constant over all ten rounds. At the beginning of each round, each subject receives an endowment E that she has to divide into an "investment" in a private good and a "contribution" to a public good. Both uses earn the individual independent payoffs of, say, v_i and g_i, which add up to total payoffs, $\pi_i = v_i + g_i$.

Denote by x_i participant i's contribution to the public good; they are the main variable of interest in our study. Investments in the private good earn a safe and constant return $v > 0$ per unit:

$$v_i = v \cdot (E - x_i).$$

The return on contributions to the public good depends on own contributions and those by the other group members. To limit the risk that players get stuck in corner solutions where potential corruption could not show much effect, we use a voluntary contribution mechanism (VCM, see, for example, Keser, 1996, and Willinger and Ziegelmeyer, 2001) that plausibly leads to interior solutions, particularly, for any behavior between best response play and efficiency. Specifically, the VCM has a quadratic return function:

$$g_i = g(x_i + X_{-i}) = \frac{1}{N}\left(a(X - C) - b(X - C)^2\right),$$

where $X = \sum_{i=1}^{N} x_i$ denotes total contributions and $X_{-i} = \sum_{k \neq i} x_k$. Parameters $a, b > 0$ are set such that g is strictly increasing and strictly concave in the relevant range and that contributions are positive in a Nash equilibrium (specifically, $a > vN$). Variable C represents the potential damage done by corruption to the return on the public good. In the Harmful-Corruption treatment, $C > 0$; in all other treatments (where corruption does not occur, is fended off, or does not have monetary effects), $C = 0$. Participant i's total payoff amounts to

$$\pi_i = \pi(x_i, X_{-i}) = v \cdot (E - x_i) + \frac{1}{N} \cdot \left(a(x_i + X_{-i} - C) - b(x_i + X_{-i} - C)^2\right).$$

While lowering absolute payoffs, harmful corruption (i.e., $C > 0$) increases the marginal returns of contributing to the public good ($\frac{\partial^2 \pi}{\partial x_i \partial C} = 2b/N > 0$), *ceteris paribus* strengthening individuals' incentives to contribute. To motivate this specification recall that the change in the payoff function (only) materializes in a treatment with non-reliable institutions. We hypothesize that such irreliability alone makes individuals lower their contributions (see Section 4). Letting the effects of changes in material payoffs and in institutional perceptions point into opposite directions (rather than into the same direction) allows for a cleaner separation of these two features of corruption.

The symmetric Nash equilibrium of the public goods game is

$$x_i^N = \frac{1}{N}\left(\frac{a - vN}{2b} + C\right) > 0$$

for all i, with total contributions $X^N = Nx_i^N$. The efficient solution maximizes $\sum_{i=1}^{N} \pi(x_i, X_{-i})$ and is given by

$$x_i^* = \frac{1}{N}\left(\frac{a - v}{2b} + C\right)$$

for all i. It entails higher individual and total contributions than the Nash equilibrium. Again, a larger C calls for higher contributions to the public good.

In the experiment, group size is $N = 4$ and endowments are $E = 10$ (Euros). Parameters in the payoff function were set to $v = 0.36$, $a = 2.4$, and $b = 0.03$. For simplicity, we allowed only integer values for investments. Payoffs v_i, g_i, and π_i were presented to participants in tables (see Tables A1 to A5 in Appendix 1). Public good returns and total payoffs were tabulated as functions of individual contributions (x_i) and the aggregate of others' contributions X_{-i}. This provides enough information to find out best responses, Nash equilibria and efficient solutions (if players wished so). Due to the integer constraints, Nash equilibrium and efficient solutions in the tabular form of the game were $x_i^N = 4$ and $x_i^* = 9$ without corruption and $x_i^N = 6$ and $x_i^* = 10$ with corruption $C = 8$.

3.4 Priming

Following the recommendation in Binmore (2010) that social norms needed for an experiment should be triggered before the experiment starts, we primed participants towards cooperation and non-corruption.[8] We reminded them that the majority of the people in Germany (where the experiment was conducted) socially demanded cooperative behavior, believed in the welfare-enhancing property of public contributions (Mau, 2003, pp. 99–104.) and reject anti-social behavior such as cheating on taxes (Stiftung Marktwirtschaft, 2010, p. 7 and figure 4.5) or accepting bribes.[9] Prior to each round, a message appeared on every participant's computer screen, stating:

> "Scientific studies regularly show that the majority of people living in Germany favor community responsibilities over individualism. Most of the people are therefore willing to make own contributions to the public community. Similarly, the majority of the people in Germany consider private benefits from corruption and the associated burden for the public community as never justifiable." (originally in German)

In the first part of the experiment corruption does not occur and the norm of cooperation and non-corruption could sink in. In the non-baseline treatments of the second part, the norm is then violated to various degrees.

[8]A number of experimental studies investigates find that pro-social behavior in social dilemmas is indeed influenced by interventions such as framing (e.g., Andreoni, 1995; Dufwenberg et al., 2010; Cubitt et al., 2011), non-binding cooperation defaults (Altmann and Falk, 2009) or priming (Drouvelis et al., 2015).

[9]World Values Survey (2015, Wave 6, Question 202, own estimations): More than 70 percent of the people living in Germany consider accepting a bribe as "never justifiable".

3.5 Experimental protocol

The experiment was run at the computerized laboratory (LLEW) of Leibniz University Hannover in May and July 2015. The experimental software was programmed with z-Tree (Fischbacher, 2007). Participants were recruited from the general student population with the software hroot (Bock et al., 2014). A total number of 184 subjects (85 females and 99 males) participated in our experiment and earned on average 15 Euros, including a show-up fee of 4 Euros, in approximately 80 minutes (i.e., around 11.25 Euros per hour). We conducted twelve sessions and attempted to have 16 subjects (i.e., four groups) per session to assign participants to each of our four treatments in each session. Since some invited participants failed to show up, we had to limit the number of groups to three in two sessions. In total, we had 46 independent groups: each twelve in the Baseline and Harmful-Corruption treatment and each eleven in the System-Defense and Harmless-Corruption treatment. As each group went through ten rounds of decisions, we ended up with 1,840 observations from 460 rounds in total.

At the beginning of the experiment, subjects were seated randomly, assigned to groups, and given the instructions for the first part of the experiment. Instructions included tables with the returns on investments in the private good (Table A1, Appendix A.1), the returns from contributing to the public good (Table A2) and total payoffs (Table A3). The understanding of the experiment was checked by a computer-based comprehension test before the experiment (see Appendix A.2). After round 5 participants received the instructions for the second part of the experiment. The instructions described the possible corruption scenarios in the rounds to come and the payoff tables for the scenario with harmful corruption (Tables A4 and A5).

At the end of each round, each player was informed about her own contribution to the public good (x_i), the total contribution of the other group members (X_{-i}), and her resulting total payoff ($\pi(x_i, X_{-i})$).

To avoid income effects, payouts were only made at the end of the experiment. Specifically, the total payoff of one round (randomly selected) was paid in cash immediately after the experiment. Although very unlikely, a negative total payoff could arise in the Harmful-Corruption treatment. Any negative payoff would have been offset against the show-up fee, keeping effective positive. Subjects were informed about the payout procedures.

At the end of the experiment (but before payouts), a questionnaire solicited socio-demographic information on participants, their experiences with tax filing, and attitudes towards tax compliance, solidarity, risk, etc. We summarize the characteristics of our subjects in Table 2.

4 Hypotheses

In the first part of the experiment all treatments are identical. We therefore expect no differences between groups. As common in public goods games we expect contributions to be above their Nash equilibrium level $x_i^N = 4$, but below the efficient level $x_i^* = 9$. In the second part, treatments differ. We are interested in how contributions to the public good vary across treatments. For this analysis, the Baseline treatment (no corruption) serves as a natural benchmark. For those in this treatment, the first and second parts of the experiment are identical.

In contrast to the Baseline treatment, corruption attempts occur in the System-Defense and Harmless-Corruption treatments. They do, however, not affect payoffs. From a purely monetary perspective, the first and second part are identical both within and across Baseline, System-Defense, and Harmless-Corruption treatments. The parts and the scenarios potentially differ, however, in how reliable the institutional system (= the experimental setting) is perceived.

As discussed in Section 2, there are several channels how reliable institutions

Table 2: Descriptive statistics for individual characteristics

	Mean	**Median**	**Standard deviation**
Female	46.20%		
Economics major	36.96%		
Bachelor's degree	78.26%		
Religion	71.74%		
Job	42.08%		
Social insurance	73.37%		
Tax declaration completed	65.76%		
Age	23.40	23.00	4.23
Risk attitude	5.00	5.00	2.59
Flexible monthly income	293.04	250.00	354.16
No. of semesters studied	5.55	6.00	3.44
Solidarity attitude	8.28	9.00	1.90
Cooperative behavior in society	4.47	4.00	1.99
Tax compliance attitude	8.30	9.00	2.15

Notes: Total number of subjects is 184. "Economics major" ("bachelor's degree") denotes whether a subject studies economics or management (in a bachelor program). "Religion" denotes whether a subject belongs to a religious community. "Job" denotes whether a subject has a job besides studying. "Social insurance" denotes whether a subject contributes to social insurance due to employment. "Tax declaration completed" denotes whether a subject has ever completed a tax declaration in the past. "Risk attitude" is subjects' self-reported willingness to take risk, measured on an 11-point scale (0: not willing to take risk; 10: highly willing to take risk). "Flexible monthly income" is the monthly income after fixed cost. Furthermore, we asked subjects to state to what extent they agree with the following statements: "It is important to make one's contribution to the common good" ("solidarity attitude"); "Individuals generally behave cooperatively and not selfishly" ("cooperative behavior in society"); and "Tax evasion is never justified" ("tax compliance attitude"). Each variable is measured on a 10-point scale, with 1 indicating strong agreement and 10 strong disagreement with the statement.

foment cooperative behavior. In particular, subjects who learn that they are operating in a reliable framework (where institutions comply with the social norm) behave more cooperatively (*Reliability Effect*). Hence,

Hypothesis 1 (Reliability Effect): *In the System-Defense treatment, contributions to the public good are higher than in the Baseline treatment.*

In contrast, subjects who face an institution of lower reliability (one that lets norm transgressions pass) reduce their cooperative effort (*Lack-of-Reliability Effect*). Hence,

Hypothesis 2 (Lack-of-Reliability Effect): *In the Harmless-Corruption treatment, contributions to the public good are lower than in the Baseline treatment.*

In the Harmful-Corruption treatment, the corruption attempt is not fended off and leads to reductions in absolute payoffs. To compensate for this negative effect, rational subjects should increase their public good contribution (see Section 3.3). In particular, we expect contributions to lie between Nash equilibrium $x_i^N = 6$ and efficient solution $x_i^* = 10$. However, as subjects are exposed to an unreliable institution, the Lack-of-Reliability Effect should decrease the willingness to cooperate, implying lower contribution levels. Since both effects work in opposite directions we refrain from formulating a hypothesis for this treatment. Nevertheless, this treatment is important: first, a corruption treatment with negative monetary consequences is necessary to ensure credibility of the experiment to our subjects. Second, the results from this treatment enable us to assess the Reliability and Lack-of-Reliability Effects revealed in the System-Defense and Harmless-Corruption treatments, respectively, where payoffs are not affected.

Although belonging to the second part of the experiment, round 6 is special. As in rounds 1 to 5, all treatments are identical. The setting differs from previous rounds, however, by involving uncertainty about the corruption scenario to which the group would be exposed. This uncertainty is resolved at the end of round 6. We incorporate this setting to check whether potential corruption events have the same systematic effect in all groups: if subjects reacted differently to the corruption threats in round 6, observed differences across groups in rounds 7 to 10 could not be cleanly attributed to the differences in treatments but might reflect different reactions to the corruption environment itself. Since information is symmetric across treatments (though incomplete) in round 6, we do not expect any significant differences in behavior across groups. Compared to rounds 1 to 5, there are three channels through which contributions might be affected: first, expected payoffs from the investment in the public good decrease (calling for higher contributions). Second, payoffs are uncertain. Third, the reliability of the system is in doubt. We refrain from offering a hypothesis how these effects worked in conjunction.[10]

5 Results

5.1 Descriptive statistics and non-parametric tests

Individual contributions to the public good are our variable of interest. The contribution levels observed in each treatment in the first and second parts of the experiment are shown in Table 3; their mean values are depicted in Figure 3. The data set for the first part of the experiment consists of rounds 4 and 5. We ignored the first three rounds as subjects might have needed time

[10]Decisions in rounds 7 to 10 are made under certainty: all participants know their treatment. Risk attitudes and risk perceptions, thus, should not impact on contribution behavior.

to get familiar with the decision problem. The data for the second part of the experiment come from rounds 7 and 8. To exclude last-round effects, as observed in many public good experiments, we decided to ignore the last two rounds. Our findings are robust if we relax these restrictions (see, for example, section 5.2).

In the first part of the experiment, subjects contributed approximately 5.5 Euros to the public good – which, in line with previous studies, is between the Nash equilibrium level $x_i^N = 4$ and the efficient level $x_i^* = 9$. As expected, we observe no significant differences between the groups of subjects who are assigned to the different treatments in the second part. In the incomplete-information round 6, individuals made higher contributions to the public good than in the first part. As expected, there were (again) no significant differences in behavior across treatments (two-sided Mann-Whitney U-test; 5%-level). Consequently, we did not observe any differences between the groups in the rounds before they were informed about the treatment assignment.

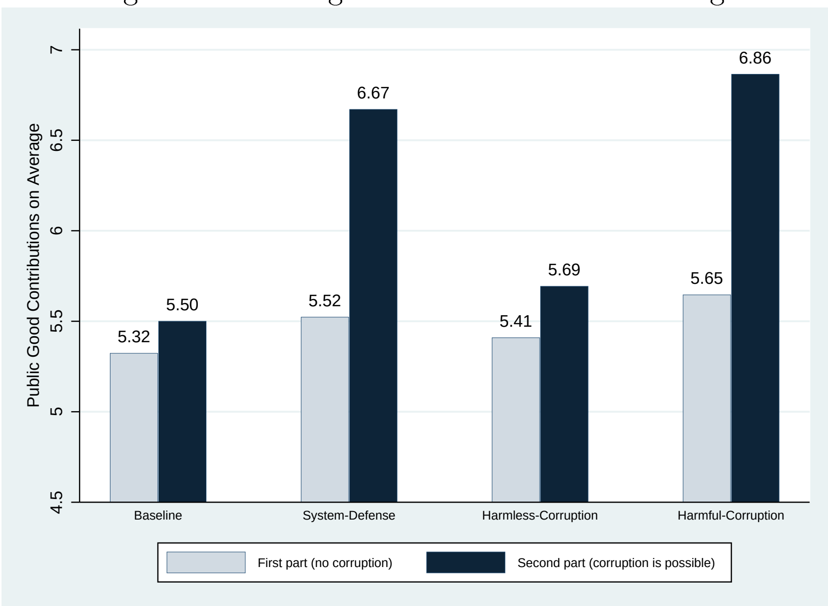
However, in rounds 7 and 8, where all subjects knew their assigned corruption scenario, subjects in the System-Defense and in the Harmful-Corruption treatment increased their contributions to the public good significantly ($p = 0.016$ and $p = 0.003$, respectively; Mann-Whitney U-test, two-sided). Contributions remained on the same level in the Baseline and Harmless-Corruption treatment. For the latter two treatments, we observe no significant differences between the first and second part.

Comparing the treatment results in the second part, we observe no significant differences between System-Defense and Harmful-Corruption treatments or between Baseline and Harmless-Corruption treatments. However, the other treatment effects are significant (at least at the 5%-level, Mann-Whitney U-test, two-sided). This implies that contributions are significantly higher in the System-Defense and the Harmful-Corruption treatment than in the Baseline or the Harmless-Corruption treatment. Consequently, we find support for Hypothesis 1, but not for Hypothesis 2. These findings are robust with respect to rounds selection: we observe the same pattern when using the data of rounds 7 to 10 or of the entire second part of the experiment (i.e., rounds 6 to 10).

Table 3: Public good contributions across treatments

		Baseline	System-Defense	Harmless-Corruption	Harmful-Corruption
First part	mean	5.32	5.52	5.41	5.65
(no corruption)	median	6.00	6.00	5.00	6.00
	SD	3.25	3.20	3.14	3.07
	obs.	96	88	88	96
Second part	mean	5.50	6.67	5.69	6.86
(corruption	median	6.00	7.00	6.00	7.50
is possible)	SD	3.14	2.79	3.10	3.02
	obs.	96	88	88	96

Figure 3: Public good contributions on average



5.2 Regression analysis

To verify our descriptive results we ran linear regressions, having contributions to the public good by individual participants in each period as the dependent variable (see Table 4). Since subjects face repeated decisions, we run regressions with random effects, with the round number as time variable and the subject's identity number as the cross-sectional variable.

To analyze the treatment differences in the first and second part of the experiment, we use four specifications. Model 1 and 3 encompass the observations from the first part (rounds 1 to 5), Model 2 and 4 those from the second part (rounds 6 to 10). In all models, we regress on the treatment dummies "System-Defense treatment", "Harmless-Corruption treatment", and "Harmful-Corruption treatment", with dummy value 1 indicating that the subject participated in the respective treatment. The Baseline treatment serves as the default; the coefficient of each treatment dummy measures the difference between the treatment and the baseline. Statistical significance of treatment dummies was checked by Wald tests, and the resulting p-values are reported at the bottom of Table 4. Although the assignment to treatments took place only at the beginning of the second part, we ran regressions with treatment dummies also for the first part to check whether subjects had already differed then. In Models 1 and 2 only the treatment dummies are taken into account.

In Models 3 and 4, we use the following controls: number of rounds ("rounds"), "age", "gender" (female = 0, male = 1), "economics major" (1 if subject studies economics or management, 0 otherwise), "bachelor's degree" (1 if subject studies in a bachelor program, 0 otherwise), "number of semesters studied", "risk attitude" (subjects' self-reported willingness to take risk, measured on an 11-point scale where 0 = not willing to take risk and 10 = highly willing to take risk), "flexible monthly income" (monthly income after fixed cost, in Euro), "religion" (1 if subject belongs to a religious community, 0 otherwise), "job" (1 if subject has a job besides studying, 0 otherwise), "social insurance" (1 if subject contributes to social insurance due to employment, 0 otherwise), "tax declaration completed" (1 if subject stated that she has ever completed a tax declaration, 0 otherwise). Furthermore, we asked subjects to state to what extent they agree with the following statements: "It is important to make one's contribution to the common good" (solidarity attitude); "Individuals generally behave cooperatively and not selfishly" (cooperative behavior in society); and "Tax evasion is never justified" (tax compliance attitude). Each variable is measured on a 10-point scale, with 1 indicating strong agreement and 10 strong disagreement with the statement.

All regressions corroborate our descriptive observations. There are no significant treatment differences in the first part of the experiment (Model 1 and 3). In the second part (Model 2 and 4), we observe significant differences across treatments. In particular, subjects contributed significantly more in the System-Defense than in the Baseline treatment ($p < 0.05$ in both Models 2 and 4). As a consequence, Hypothesis 1 is supported. However, we observe no significant differences between the Baseline and the Harmless-Corruption treatment. Therefore, we find no support for Hypothesis 2. Wald tests reveal that subjects contributed more in the System-Defense than in the Harmless-Corruption treatment ($p = 0.0499$ in Model 2 and $p = 0.0330$ in Model 4). Furthermore, we observe significant differences between the Harmful-Corruption and Baseline treatment ($p < 0.01$ in both Models 2 and 4) and between the Harmless- and Harmful-Corruption treatment ($p < 0.01$ in both Models 2 and 4), but no significant difference between the System-Defense and Harmful-Corruption treatment ($p = 0.3192$ and $p = 0.3006$).[11]

Contributions decrease significantly with the number of rounds – which is

[11] As further robustness tests, we ran linear regressions with session fixed effects to control for session differences. The results of these tests indicate that our findings are robust.

in line with previous public goods experiments. Among the other controls, only "solidarity attitude" and "risk attitude" are significantly correlated with public goods contributions in both Models 3 and 4. Specifically, subjects who stated that contributing to society was important contributed more while subjects who stated that they were more willing to take risk contributed less.

5.3 Interpretation

To interpret our results, two features of the experiment should be recalled. First, from a purely materialistic perspective, the treatments Baseline, System-Defense, and Harmless-Corruption are identical. Second, payoff functions were crafted such that they warranted *higher* contributions in the Harmful-Corruption scenario than in the other treatments: marginal returns on investments in public goods were higher with corruption.

The interpretation then is as follows: rounds 1 to 5 of public goods games generate among participants the perception that they were operating under stable and credible rules. The salience of the "cooperate and don't-corrupt" norm primed individuals to cooperate and rely on the system (= experimenter). The potential emergence of a corruption event in round 6 constitutes, per se, a breach of this norm and of the previously valid rules, calling institutional reliability into question. If participants learn in the System-Defense treatment, before round 7, that the system fended off the corruption attempt this not only restores, but reinforces the institutional credibility of the "system". Such assurance leads agents to behave consistently more cooperatively than agents in the Baseline treatment (i.e., Reliability Effect). The monetary value of having a reliable institution can be calculated as the increase in average payoffs, caused by the rise in contributions to the public good from the first to the second part of the experiment. Specifically, the rise in average contributions from 5.52 to 6.67 Euros (see Table 3) meant an

Table 4: Regressions with random effects (DV: public goods contribution)

	Model 1 first part (rounds 1-5)	Model 2 second part (rounds 6-10)	Model 3 first part (rounds 1-5)	Model 4 second part (rounds 6-10)
System-Defense treatment	0.1394	0.9208**	0.4471	1.0424**
	(0.4354)	(0.4266)	(0.4635)	(0.4407)
Harmless-Corruption treatment	-0.3200	0.0663	-0.2739	0.0850
	(0.4354)	(0.4266)	(0.4485)	(0.4264)
Harmful-Corruption treatment	-0.2833	1.3458***	-0.1063	1.4967***
	(0.4259)	(0.4173)	(0.4566)	(0.4341)
round			-0.3983***	-0.5017***
			(0.0535)	(0.0602)
age			0.0618	0.0111
			(0.0566)	(0.0538)
gender			0.2547	0.7483**
			(0.3330)	(0.3166)
economics major			-0.4289	-0.1394
			(0.3964)	(0.3769)
bachelor's degree			0.5633	0.3352
			(0.4427)	(0.4209)
no. of semester studied			0.0676	0.0912*
			(0.0501)	(0.0477)
risk attitude			-0.1437**	-0.1460**
			(0.0663)	(0.0631)
flexible monthly income			0.0025***	0.0008
			(0.0008)	(0.0008)
religion			0.2063	0.0290
			(0.3721)	(0.3538)
job			0.2049	0.2862
			(0.3955)	(0.3760)
social insurance			0.2516	0.6763*
			(0.4107)	(0.3905)
tax declaration completed			0.4065	-0.5035
			(0.3677)	(0.3496)
solidarity attitude			0.2209**	0.2453***
			(0.0917)	(0.0872)
cooperative behavior in society			0.0275	-0.0690
			(0.0815)	(0.0775)
tax compliance attitude			0.0298	-0.0496
			(0.0808)	(0.0768)
constant	6.1833***	5.3792***	2.1069	6.8290***
	(0.3011)	(0.2951)	(2.0318)	(1.9852)
observations	920	920	880	880
number of subjects	184	184	176	176
R-sq within	0.0000	0.0000	0.0731	0.0898
R-sq between	0.0085	0.0750	0.1329	0.2249
R-sq overall	0.0043	0.0336	0.1031	0.1494
Wald test				
System-Defense = Harmless-Corr.	$p = 0.3020$	$p = 0.0499$	$p = 0.1269$	$p = 0.0330$
System-Defense = Harmful-Corr.	$p = 0.3316$	$p = 0.3192$	$p = 0.2304$	$p = 0.3006$
Harmless-Corr. = Harmful-Corr.	$p = 0.9334$	$p = 0.0027$	$p = 0.7153$	$p = 0.0012$

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

increase in payoffs by 6 percent (from 11.20 to 11.87 Euros).
In treatments where, by contrast, the corruption attempt is not fended off, the reliability of institutions and the validity of the social norm are in question. In the second part of the experiment, agents who do not experience any material loss from corruption (Harmless-Corruption treatment) do not behave differently from agents in the no-corruption baseline scenario. As a consequence, a Lack-of-Reliability Effect is – in contrast to our conjecture – not revealed. Although institutions are not reliable, cooperate behavior is not negatively affected in this case.
One explanation for the asymmetric effects is that subjects had different perceptions of the corruption attempts and their consequences. The corruption attempt in the System-Defense treatment could, if not fended off, have directly harmed the individual (after all, payoff reductions appeared possible). Hence, players had reason to interpret the institution's reliability as beneficial: the institution's steadiness protected them from potential individual losses. By contrast, when learning, in the Harmless-Corruption treatment, that a corruption event had occurred, players remained individually unaffected by institutional unreliability; if anybody, it was outsiders who were harmed. With adverse effects being remote, agents might have chosen not to change their behavior.
Against this backdrop, the results in the Harmful-Corruption treatment, where agents experienced material losses from corruption, are illuminating. As theoretically predicted, players in this treatment contribute more to the public good (6.86 Euros in the second versus 5.65 Euros in the first part of the experiment; see Table 3). Still they experienced an average reduction in payoffs by 11.9 percent (from 11.30 to 9.96 Euros), relative to the first part of the experiment. However, the increase in contributions is smaller than what the increase in marginal returns would dictate, provided that players did not change their rationale for contributions. Given our param-

eters, the marginal return on contributions at total contribution level X is given by $\frac{\partial g_i}{\partial x_i} = 0.25(2.4 - 0.06(X - C))$. If the players assigned to the Harmful-Corruption treatment had wished to maintain the same marginal return for their contributions as in the first part (where they on average contributed $X = 4 \times 5.65 = 22.6$ Euros at $C = 0$) they should have contributed $30.6/4 = 7.65$ Euros in the treatment at $C = 8$ – but they contributed less (6.86 Euros).[12]

This tentatively suggests that having experienced harm from a failed institution *per se* reduces incentives to contribute. As a consequence – and in line with the previous explanation –, in a situation where an individual is directly confronted with an unreliable institution, we find evidence for a negative effect on cooperative behavior (i.e., Lack-of-Reliability Effect).

6 Conclusions

Civic responsibility, which makes citizens care for and contribute to the public good and deters them from corruption and free-riding, is contingent on the quality of the system within which citizens operate. With the help of public goods games, we experimentally confirm the hypothesis that institutions that stick to professed rules and social norms increase cooperation among citizens. The effect also arises relative to scenarios where non-compliance by institutions does not alter (absolute or marginal) monetary payoffs. This is noteworthy as, in a pure rational choice framework, institutions affect behavior only by changing incentives or constraints – but not by influencing motivation.

[12] Likewise, if the players assigned to the Harmful-Corruption treatment (where they on average contributed $X = 4 \times 6.86 = 27.4$ Euros at $C = 8$) had wished to reach the same marginal return on their investment already in rounds 1 to 5, they should only have contributed $19.4/4 = 4.85$ Euros then – but they actually had contributed more.

Equating the experimenter in a laboratory with "the government", the common setting of economic experiments is one with strong, impartial and reliable institutions that stick to the rules of the game. In reality, the setting often is less ideal, and institutions, though paying lip service to decent norms of cooperation and honesty, often fail to live up to expectations. Our experimental design tries to depict institutions with various degrees of imperfections (without cheating participants, though). In the lab, credible institutions leave citizens better off. Needless to say, the question of how to build such high-quality institutions outside the lab is a separate and thorny issue.

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Appendix

A.1 Instructions

This appendix provides a verbatim translation from the German original of the experimental instructions handed out to participants.

Instructions

Thank you very much for participating in today's experiment. Each participant will be credited a show-up fee of 4 Euros right from the outset.
The experiment consists of two parts. You can earn money in each part. Before each part you will receive introductions that describe the experiment to come. Then the experiment proper will be carried out. The experiment is finished after the second part. You will then receive a payment that depends upon the results of the two part experiments.
Before we start, we would like to call your attention to some important points.

- You are not allowed to communicate with other participants during the experiment or to leave your seat. Please keep your eyes on the screen in front of you.
- Please switch off your cellphone and store it in your bag.
- Please read through the instructions carefully.
- It is important that you understand the instructions. Do not hesitate to ask questions. Please raise your hand if you have a question. We will come to your seat to answer your question. Please do not ask questions aloud.
- You may make notices and marks on the instructions.
- You may use the pen in front of you.

- Please do not take home these instructions but return them to us when the experiment is finished.
- The program that runs the experiment - the gray area on your screen - must not be closed. Please do not open any other programs because it might lead to the abortion of the experiment.
- Please observe that the experiment might involve some waiting time: participants vary in the speed of responding. Please be prepared to wait for a couple of minutes.

You will find the instructions to the first part of the experiment on the following pages.

Instructions for the first part of the experiment

This experiment allows you to earn money. How much you earn depends upon your own decisions, the decisions of the other players, and chance. These instructions explain how you can influence your payouts by your decisions. Please read through the following paragraphs carefully.

General. The experiment consists of two parts. Each part consists of 5 rounds. The rounds are independent from each other. After all 10 decisions have been made, the computer randomly selects (with the same probability) one round. You will get paid in cash the total payoff you achieved in that round plus the the show-up fee.
In both parts of the experiment you will be a member of a group of four. Each of the four group members will face the same decision problem. The composition of the group remains the same for the 10 rounds. Hence, you always interact with the same people. It is guaranteed that neither you nor any other participant knows about the group composition.

Initial endowment and decision. At the beginning of each round you (and each member of your group) receive an initial endowment of 10 Euros. The endowment has to be divided into a private account (= investment) and a public account (= contribution). Your decisions will not be communicated to other group members and thus remain anonymous.
Since the initial endowment has to be completely divided between the private and the group account, participants only need to decide how much to contributed to the public account. The investment in the private account residually results from:

Investment into private account = 10 Euros - contribution to the public account.

For simplification only integer amounts can be paid in both accounts.
Both accounts lead to returns. The returns on the private account are presented in Table A1. The returns to contributions to the public account are presented in Table A2. The money you can earn in this experiment depends on the total return. The total return is the sum of the two returns and is presented in Table A3.

Return on investment in private account. Dependending on the amount you invested in the private account, you receive the following return (in Euros) on the private account:

Table A1: Return on the private account

Investment in private account	10	9	8	7	6	5	4	3	2	1	0
Return on group account	3.60	3.24	2.88	2.52	2.16	1.80	1.44	1.08	0.72	0.36	0.00

Please observe: your investment in the private account has no influence on the return on the private investment of any other group member.

Return on contributions to the public account. In contrast to the private account, your return on the public account not only depends on your

contribution to that account but also on the contributions by the other three group members. The more a group member contributes to the public account, the higher is the return on the public account for every group member.
The following table gives your individual return (in Euros) on the public account, depending on your contribution and the sum of the contributions by the other three group members. The table is based on a formula that is the same for all group members.

Table A2: Return on the public account

	Your contribution to the public account										
Sum of contributions by the other three group members to the public account	0	1	2	3	4	5	6	7	8	9	10
0	0.00	0.59	1.17	1.73	2.28	2.81	3.33	3.83	4.32	4.79	5.25
3	1.73	2.28	2.81	3.33	3.83	4.32	4.79	5.25	5.69	6.12	6.53
6	3.33	3.83	4.32	4.79	5.25	5.69	6.12	6.53	6.93	7.31	7.68
9	4.79	5.25	5.69	6.12	6.53	6.93	7.31	7.68	8.03	8.37	8.69
10	5.25	5.69	6.12	6.53	6.93	7.31	7.68	8.03	8.37	8.69	9.00
11	5.69	6.12	6.53	6.93	7.31	7.68	8.03	8.37	8.69	9.00	9.29
12	6.12	6.53	6.93	7.31	7.68	8.03	8.37	8.69	9.00	9.29	9.57
13	6.53	6.93	7.31	7.68	8.03	8.37	8.69	9.00	9.29	9.57	9.83
14	6.93	7.31	7.68	8.03	8.37	8.69	9.00	9.29	9.57	9.83	10.08
15	7.31	7.68	8.03	8.37	8.69	9.00	9.29	9.57	9.83	10.08	10.31
16	7.68	8.03	8.37	8.69	9.00	9.29	9.57	9.83	10.08	10.31	10.53
17	8.03	8.37	8.69	9.00	9.29	9.57	9.83	10.08	10.31	10.53	10.73
18	8.37	8.69	9.00	9.29	9.57	9.83	10.08	10.31	10.53	10.73	10.92
19	8.69	9.00	9.29	9.57	9.83	10.08	10.31	10.53	10.73	10.92	11.09
20	9.00	9.29	9.57	9.83	10.08	10.31	10.53	10.73	10.92	11.09	11.25
21	9.29	9.57	9.83	10.08	10.31	10.53	10.73	10.92	11.09	11.25	11.39
24	10.08	10.31	10.53	10.73	10.92	11.09	11.25	11.39	11.52	11.63	11.73
27	10.73	10.92	11.09	11.25	11.39	11.52	11.63	11.73	11.81	11.88	11.93
30	11.25	11.39	11.52	11.63	11.73	11.81	11.88	11.93	11.97	11.99	12.00

Please observe that your contribution to the public account influences the return on the public account for all other group members: from their perspective, the sum of the contributions by the other three group members includes your contribution.
Please also note that for purpose of presentation Table A2 does not show the

contributions by the other group members in steps of one Euro but rather in steps of 3 Euros. You might not see in the table the returns on the public account for some combinations of contributions. In these cases, the computer automatically calculates the correct value in accordance with the employed formula.

Total return. The money you can earn in the experiment depends on the total return. The total return in a round is given by:

Total return = return on private account + return on public account.

Table A3 (that combines the numbers from Tables A1 and A2) presents the total return, depending on your own contribution and the sum of the contributions by the other three group members to the public account.

Table A3: Total return

		Your contribution to the public account										
		0	1	2	3	4	5	6	7	8	9	10
Sum of contributions by the other three group members to the public account	0	3.60	3.83	4.05	4.25	4.44	4.61	4.77	4.91	5.04	5.15	5.25
	3	5.33	5.52	5.69	5.85	5.99	6.12	6.23	6.33	6.41	6.48	6.53
	6	6.93	7.07	7.20	7.31	7.41	7.49	7.56	7.61	7.65	7.67	7.68
	9	8.39	8.49	8.57	8.64	8.69	8.73	8.75	8.76	8.75	8.73	8.69
	10	8.85	8.93	9.00	9.05	9.09	9.11	9.12	9.11	9.09	9.05	9.00
	11	9.29	9.36	9.41	9.45	9.47	9.48	9.47	9.45	9.41	9.36	9.29
	12	9.72	9.77	9.81	9.83	9.84	9.83	9.81	9.77	9.72	9.65	9.57
	13	10.13	10.17	10.19	10.20	10.19	10.17	10.13	10.08	10.01	9.93	9.83
	14	10.53	10.55	10.56	10.55	10.53	10.49	10.44	10.37	10.29	10.19	10.08
	15	10.91	10.92	10.91	10.89	10.85	10.80	10.73	10.65	10.55	10.44	10.31
	16	11.28	11.27	11.25	11.21	11.16	11.09	11.01	10.91	10.80	10.67	10.53
	17	11.63	11.61	11.57	11.52	11.45	11.37	11.27	11.16	11.03	10.89	10.73
	18	11.97	11.93	11.88	11.81	11.73	11.63	11.52	11.39	11.25	11.09	10.92
	19	12.29	12.24	12.17	12.09	11.99	11.88	11.75	11.61	11.45	11.28	11.09
	20	12.60	12.53	12.45	12.35	12.24	12.11	11.97	11.81	11.64	11.45	11.25
	21	12.89	12.81	12.71	12.60	12.47	12.33	12.17	12.00	11.81	11.61	11.39
	24	13.68	13.55	13.41	13.25	13.08	12.89	12.69	12.47	12.24	11.99	11.73
	27	14.33	14.16	13.97	13.77	13.55	13.32	13.07	12.81	12.53	12.24	11.93
	30	14.85	14.63	14.40	14.15	13.89	13.61	13.32	13.01	12.69	12.35	12.00

Information at the end of a round. In each round, after every group member has chosen her contribution to the public account, you will receive information on your returns on the private and the public account and on your total returns in that round. Moreover, the sum of the contributions by the other three group members to the public account will be announced.

Final information. After you have read these instructions we ask you to answer some questions at your computer. Answering these questions only serves to check your understanding and does not influence your payoffs. Then the first part of the experiment will start, consisting of five rounds. Please note that the computer program does not separate decimal places by a comma but by a dot.

Instructions for the second part of the experiment

The second part of the experiment is almost identical with the first part. The only difference is that now events of corruption can arise that might affect the returns on investments to the public account and, hence, total returns. The second part of the experiment again consists of five rounds (rounds 6 to 10).

Events. In the second part of the experiment your group might be exposed to attempts of corruption which diminish the return on investments to the public account. Corruption attempts can be fended off by the system. In that case the return on investment to the public account and your total return remain the same as in the first part of the experiment. In case a corruption attempt is not fended off, the return on the public account can be reduced and this might diminish your total return; this will be explained below. Such a reduction need not always arise with corruption: then (like in the case tht no corruption attempt occurs) the return on investment in the public account and, thus, your total return do not change in comparison to the first part of the experiment.

Please note that corruption is not carried out by a group member but by an outside individual. If a corruption attempt is not fended off, the corrupter can get a private benefit at the expense of your group. The return on the private account remains unaffected by corruption. The following table lists the possible events.

Event	**Description**	**Return on the public account and total return**
A	No corruption attempt	Payoff tables as in the first part
B	A corruption attempt occurs. The corruption attempt is fended off.	Payoff tables as in the first part
C	A corruption attempt occurs. The corruption attempt is *not* fended off. Returns on the public account are *not* reduced.	Payoff tables as in the first part
D	A corruption attempt occurs. The corruption attempt is *not* fended off. Returns on the public account are reduced.	New payoff tables (see below)

The corruption attempt, the possibility of fending off corruption, and the level of the reduction of the return on the group account are exogenously given. In fact, neither you nor any other participant in this experiment can influence the event of corruption or whether it has negative consequences for your group.

New return tables for Event D. In case a corruption attempt will not be fended off and the return on the group will be actually be reduced (event D), new return tables A4 and A5 become valid.

Table A4: New table for the return on the public account

		Your contribution to the public account										
		0	1	2	3	4	5	6	7	8	9	10
Sum of contributions by the other three group members to the public account	0	-5.28	-4.57	-3.87	-3.19	-2.52	-1.87	-1.23	-0.61	0.00	0.59	1.17
	3	-3.19	-2.52	-1.87	-1.23	-0.61	0.00	0.59	1.17	1.73	2.28	2.81
	6	-1.23	-0.61	0.00	0.59	1.17	1.73	2.28	2.81	3.33	3.83	4.32
	9	0.59	1.17	1.73	2.28	2.81	3.33	3.83	4.32	4.79	5.25	5.69
	10	1.17	1.73	2.28	2.81	3.33	3.83	4.32	4.79	5.25	5.69	6.12
	11	1.73	2.28	2.81	3.33	3.83	4.32	4.79	5.25	5.69	6.12	6.53
	12	2.28	2.81	3.33	3.83	4.32	4.79	5.25	5.69	6.12	6.53	6.93
	13	2.81	3.33	3.83	4.32	4.79	5.25	5.69	6.12	6.53	6.93	7.31
	14	3.33	3.83	4.32	4.79	5.25	5.69	6.12	6.53	6.93	7.31	7.68
	15	3.83	4.32	4.79	5.25	5.69	6.12	6.53	6.93	7.31	7.68	8.03
	16	4.32	4.79	5.25	5.69	6.12	6.53	6.93	7.31	7.68	8.03	8.37
	17	4.79	5.25	5.69	6.12	6.53	6.93	7.31	7.68	8.03	8.37	8.69
	18	5.25	5.69	6.12	6.53	6.93	7.31	7.68	8.03	8.37	8.69	9.00
	19	5.69	6.12	6.53	6.93	7.31	7.68	8.03	8.37	8.69	9.00	9.29
	20	6.12	6.53	6.93	7.31	7.68	8.03	8.37	8.69	9.00	9.29	9.57
	21	6.53	6.93	7.31	7.68	8.03	8.37	8.69	9.00	9.29	9.57	9.83
	22	6.93	7.31	7.68	8.03	8.37	8.69	9.00	9.29	9.57	9.83	10.08
	23	7.31	7.68	8.03	8.37	8.69	9.00	9.29	9.57	9.83	10.08	10.31
	24	7.68	8.03	8.37	8.69	9.00	9.29	9.57	9.83	10.08	10.31	10.53
	27	8.69	9.00	9.29	9.57	9.83	10.08	10.31	10.53	10.73	10.92	11.09
	30	9.57	9.83	10.08	10.31	10.53	10.73	10.92	11.09	11.25	11.39	11.52

Information about the prevailing case Which of the events A to D applies to your group will be randomly assigned by the computer at the beginning of the second part. The event will remain in place for the entire second part of the experiment. The information about the prevailing event will be announced to you not until after your decision about your contribution to the public account at the first round of the second part. This means that you will not know the event that applies to you in your first decision. In

Table A5: New table for the total return

Sum of contributions by the other three group members to the public account		Your contribution to the public account										
		0	1	2	3	4	5	6	7	8	9	10
	0	-1.68	-1.33	-0.99	-0.67	-0.36	-0.07	0.21	0.47	0.72	0.95	1.17
	3	0.41	0.72	1.01	1.29	1.55	1.80	2.03	2.25	2.45	2.64	2.81
	6	2.37	2.63	2.88	3.11	3.33	3.53	3.72	3.89	4.05	4.19	4.32
	9	4.19	4.41	4.61	4.80	4.97	5.13	5.27	5.40	5.51	5.61	5.69
	10	4.77	4.97	5.16	5.33	5.49	5.63	5.76	5.87	5.97	6.05	6.12
	11	5.33	5.52	5.69	5.85	5.99	6.12	6.23	6.33	6.41	6.48	6.53
	12	5.88	6.05	6.21	6.35	6.48	6.59	6.69	6.77	6.84	6.89	6.93
	13	6.41	6.57	6.71	6.84	6.95	7.05	7.13	7.20	7.25	7.29	7.31
	14	6.93	7.07	7.20	7.31	7.41	7.49	7.56	7.61	7.65	7.67	7.68
	15	7.43	7.56	7.67	7.77	7.85	7.92	7.97	8.01	8.03	8.04	8.03
	16	7.92	8.03	8.13	8.21	8.28	8.33	8.37	8.39	8.40	8.39	8.37
	17	8.39	8.49	8.57	8.64	8.69	8.73	8.75	8.76	8.75	8.73	8.69
	18	8.85	8.93	9.00	9.05	9.09	9.11	9.12	9.11	9.09	9.05	9.00
	19	9.29	9.36	9.41	9.45	9.47	9.48	9.47	9.45	9.41	9.36	9.29
	20	9.72	9.77	9.81	9.83	9.84	9.83	9.81	9.77	9.72	9.65	9.57
	21	10.13	10.17	10.19	10.20	10.19	10.17	10.13	10.08	10.01	9.93	9.83
	22	10.53	10.55	10.56	10.55	10.53	10.49	10.44	10.37	10.29	10.19	10.08
	23	10.91	10.92	10.91	10.89	10.85	10.80	10.73	10.65	10.55	10.44	10.31
	24	11.28	11.27	11.25	11.21	11.16	11.09	11.01	10.91	10.80	10.67	10.53
	27	12.29	12.24	12.17	12.09	11.99	11.88	11.75	11.61	11.45	11.28	11.09
	30	13.17	13.07	12.96	12.83	12.69	12.53	12.36	12.17	11.97	11.75	11.52

the following four rounds the same event applies to your group as in the first period of the 2. part experiment. You then exactly know about the event when making your decisions.

Negative total returns? In case the computer selects a round where you had a negative total payoff to be paid out at the end of the experiment, the negative payoff will be offset with your show-up fee of 4 Euros. Please observe that the design of the experiment does not allow for negative payouts after offsetting.

Final information. After all participants understood the instructions, the second part of the experiment with five periods starts. When the five rounds are finished we ask you to answer some questions. A short questionnaire will automatically start.

A.2 Comprehension test

Experimental proceedings. We would like to ask you some questions regarding your understanding of the experiment. Please let us know whether the following statements are correct or wrong. Please tick a box below the statement and mark **Yes** if the statement is correct or **No** if the statement is wrong.

- The experiment consists of two parts. ☐ Yes ☐ No
- Each group consists of 4 players. ☐ Yes ☐ No
- The contributions to the public account of all players will be announced. ☐ Yes ☐ No
- All players receive the same payoff from the public account. ☐ Yes ☐ No

Expected total returns. Now we would like to ask you to calculate your total return from the public account. [Follows a series of questions with the following wording:]

- What is the return on the public account if you give X Euros and the other three players contribute Y Euros to the public account?