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# JENA ECONOMIC RESEARCH PAPERS



# 2012 – 007

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# An experiment investigating the spill-over effects of voicing outrage

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## Abstract

We report on an experiment designed to explore whether and how anger affects future levels of cooperation. Participants play three consecutive one-shot games. In between two identical two-person public goods games there is a mini dictator game that, depending on the treatment, either gives or does not give the recipient the opportunity to scold the dictator via a text message. We find that the recipients that receive an unfair offer contribute significantly less in the second public goods game. Yet, such contribution cuts are less frequent and notably smaller when messaging is allowed for. We conclude that although anger has a lasting negative effect on cooperation, giving voice to it helps to curtail selfishness.

*JEL Classification:* C72, C91, C92, D63

*Keywords:* Dictator minigame; Public goods game; Emotions; Cooperation

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## 1 Introduction

People get angry when they feel cheated, or when their partners do not live up to their expectations. Whether consciously or not, their emotions often affect the way they act.<sup>1</sup> Anger in particular tends to undermine trust and the ability to work closely together (Jehn 1995; Allred *et al.* 1997).

The influence of symbolic non-monetary punishment on behavior has been well documented in the experimental literature. Given the opportunity to express their disapproval of the others' choices, players reduce punishment activity in ultimatum games (Xiao and Houser 2005) and increase cooperation in public good games (e.g., Gächter and Fehr 1999; Masclet *et al.* 2003; Noussair and Tucker 2005). The goal of this paper is to investigate, via an experiment, whether allowing the voicing of one's anger affects future instead of current cooperation. Shedding light on this subject is important because if there are positive spillovers in "having a voice", then the introduction of mechanisms designed to encourage the verbal communication of negative emotions could help to re-establish cooperative attitudes among group members whose relations have become strained.

Our approach involves letting participants play three games in the following order: a two-person public goods game (henceforth PGG); a mini dictator game with random dictatorship (henceforth MDG); and one more PGG that is identical to the first one. Pair composition changes between the first PGG and the MDG, but does not change between the MDG and the second PGG. The MDG is an excellent device for inducing negative emotions in the laboratory. The dictator has to choose between a fair and an unfair offer. The recipient should anticipate the fair allocation as, e.g., the dictator has lucked out. In this setting, unfulfilled expectations may provoke outrage and the desire to retaliate (e.g., Haidt 2003; Nelissen and Zeelenberg 2009; Clavien and Klein 2010).<sup>2</sup>

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<sup>1</sup>Elster (1998) provides a comprehensive survey of the relationship between emotions and decision making.

<sup>2</sup>Psychologists usually distinguish between (moral) outrage and anger. The former is de-

We analyze the consequences of anger on cooperation by comparing the contributions of the resentful recipients' (i.e., those who receive the unfair offer) in the first and second PGGs.<sup>3</sup> We analyze the spill-over effects of voicing outrage by comparing the second-PPG contributions in two different treatments: a treatment with a standard MDG, and another treatment with a MDG where resentful recipients can scold the dictators that exasperated them by means of written messages.<sup>4</sup>

Our main hypothesis is that the recipients that can express themselves via symbolic gestures find it easier to contain their anger and therefore curtail selfish economic decisions. It is known, for instance, that recipients who have a right to express their opinions may enjoy a feeling of 'sweet revenge' (de Quervain *et al.* 2004). Being in a good mood, they often become more generous in future interactions (Carlson *et al.* 1988; Isen 2000; Kirchsteiger *et al.* 2006).<sup>5</sup>

Our analysis differs from existing work investigating the effects of *ex post* recipient communication in dictator games. Ellingsen and Johannesson (2008) and Xiao and Houser (2009) focus on the dictator's behavior and report that the prospect of verbal feedback motivates him to be fair. We concentrate instead on the behavior of the other party, namely the recipient that got "justifiably angry" (Ellingsen and Johannesson 2008, p. 101).

The evidence that we collected indicates that anger has a lasting effect on decisions: angry recipients tend to be less co-operative in future games. However, when they are given the possibility to express their anger, the observed reductions in contributions appear to be significantly smaller.

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defined as the emotion that is provoked when a moral standard – usually a standard of fairness – has been violated. The latter is defined as the emotion one may feel when his own interests are being harmed (see Batson *et al.* 2007, and references therein). While we acknowledge the importance of understanding what triggers the recipients' negative emotions, addressing this issue is beyond the scope of this study. Thus, we use the two terms interchangeably.

<sup>3</sup>Extreme care will be taken (by both the design and an appropriate data analysis) to ensure that the results are not driven by participants learning how to play the free riding equilibrium (in the sense of Andreoni 1988).

<sup>4</sup>Both resentful and grateful recipients could send a message.

<sup>5</sup>This view is reminiscent of the so-called theory of catharsis, according to which "venting one's anger will produce a positive improvement in one's psychological state" (Bushman 2002, p. 724).

The paper is organized as follows. Section 2 reviews the related research. Section 3 introduces the games that constitute the basis of our experimental design, states our hypotheses, and describes our experimental procedures. Section 4 reports our experimental results. Section 5 summarizes the main points of the study and offers concluding remarks.

## 2 Related research

Our work is associated with two different strands of the literature. First, it contributes to the experimental research relating symbolic non-monetary punishment to behavior. Second, it fits into a growing stream of experiments investigating how emotions affect decisions.

There are relatively few experimental studies documenting how symbolic punishment in general, and expressions of disapproval in particular, influence cooperation. Masclet *et al.* (2003) examine informal sanctions in the context of a repeated public goods game and observe that contribution levels increase when participants are able to express their disapproval of the others' choices.<sup>6</sup> In a similar game, Noussair and Tucker (2005) show that a sanctioning system combining both formal and informal penalties is more effective than a system allowing for only one type of sanction. The authors of both papers conjecture that cooperation increases because players incur a disutility from bearing the disapproval of the others. Our approach at this point is different as we do not analyze those who receive an expression of disapproval, but those who express their disapproval of the others. More specifically, we test whether the voicing of anger has a 'cathartic' effect on them, in the sense of cooling off their feelings and weakening their desire for retaliation at some point in the future.

In an ultimatum game, Xiao and Houser (2005) find that responders are less likely to reject unfair offers if they can concurrently convey their feelings to

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<sup>6</sup>Gächter and Fehr (1999) and Rege and Telle (2004) provide further evidence that social approval incentives enhance contributions.

the proposers. Yamagishi *et al.* (2009) conduct an impunity game and observe a different form of punishment: responders reject unfair offers even when their decisions have no bearing on the proposers' earnings. Meager offers make them angry; since there is no way to express this anger, they derive some satisfaction from showing themselves that they can preserve their integrity.

With respect to the second strand of the literature that our work is associated with, apart from a few exceptions such as Hirshleifer (1987) and Frank (1988), it was not until the late 1990s that economists began to examine the relationship between emotions and behavior (e.g., Elster 1998; Loewenstein 2000; Romer 2000). Charness and Grosskopf (2001), for instance, investigate whether a person's (self-reported) happiness influences the importance that he attaches to relative payoffs. The authors find no strong correlation between the two variables but observe that the unhappier people are, the more willing they become to lower the other person's payoff below their own. Kirchsteiger *et al.* (2006) manipulate the mood of second movers in a gift-exchange game (by letting them watch either a sad or a funny movie) and find that participants in a bad (good) mood are more reciprocal (generous).<sup>7</sup>

Recent experimental economics research emphasizes that anger has an effect on people considering whether or not to punish selfish behavior. In their power-to-take game, Bosman and van Winden (2002) detect a strong positive correlation between the probability of destroying income and the intensity of the anger-like emotions reported by the responders.<sup>8</sup> Hopfensitz and Reuben (2009) confirm this finding in a social dilemma game. They even extend it to punished individuals who – notwithstanding their former unkindness – feel angry and in their turn retaliate.

Finally, brain imaging studies conducted by Sanfey *et al.* (2003) and Bok-

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<sup>7</sup>The observation that good mood is positively correlated with generosity is not new to psychologists (see, for example, Isen and Levin 1972; Carlson *et al.* 1988; Isen 2000).

<sup>8</sup>In the power-to-take game, one player (the take authority) can claim any part of the income of the other player (the responder). Then, after observing this take rate, the responder can react by destroying any percentage of his own income.

sem and De Cremer (2010) on ultimatum game responders indicate that players that receive unfair offers show increased activity in the “anterior insula”, an area of the brain that is associated with negative emotions. Moreover, Sanfey *et al.* demonstrate that the strength of the negative emotional response is positively correlated with the rejection rate of unfair offers. Physiological measures of emotional arousal (skin conductance level) provide further evidence that decisions to destroy in the power-to-take game are driven by anger-like emotions (Ben-Shakhar *et al.* 2007).

### 3 The experiment

Our experiment consists of a succession of games. The first and third games are identical PGGs. The purpose of the MDG that stands in between is to stimulate different emotions in participants playing different roles. We are interested in the effect of anger on the contributions of the resentful recipients, but also consider the effect of guilt or shame on the behavior of the selfish dictators.<sup>9</sup>

In what follows we give a short account of the individual games (we start with the MDG, even if it comes second in our succession of games, in order to introduce the different treatments). Then, we state our research questions and provide details on the employed experimental procedures.

#### 3.1 The mini dictator games

Our experiment has two treatments: control ( $C$ ) and message ( $M$ ). Their only difference is that the mini-dictator game in  $M$  allows for *ex post* recipient communication.

In both treatments, at the beginning of the mini-dictator games, participants are paired at random. Then a random move determines which pair

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<sup>9</sup>Although the differences between guilt and shame are contentious, it is acknowledged that both emotions are “intrinsic non-material costs associated with unfair behavior” (Xiao and Houser 2009, p. 394; see also references therein).



member will act as the dictator. The dictator is offered €20 and the choice between two alternative allocations. The first one entails keeping €18 for himself and giving €2 to the recipient. As the dictator obtained his privileged position by chance, the recipient should experience negative emotions in response to this allocation. The second allocation favors the recipient, albeit slightly; it gives €9 to the dictator and €11 to the recipient.<sup>10</sup>

In treatment  $M$ , once the recipient has learned of his payoff, he is given the opportunity to communicate to the dictator he was paired with his approval or disapproval of the chosen allocation. Dictators that receive angry messages are prone to feel guilty for having shown a selfish disregard for their fellow player.

### 3.2 The two-person public goods games

We study the consequences of emotions on future levels of cooperation and the potentially ‘cathartic’ effect of voicing one’s anger by means of two identical two-person voluntary contribution mechanisms (e.g., Isaac *et al.* 1984), one played before the MDG and the other after it. Let  $g = 1, 2$  stand for the first and second PGG, respectively, and let  $T = \{C, M\}$  be the treatment. In each PGG, each pair member is endowed with €14 which he can either consume privately or contribute to the public good. Denoting the contribution level of  $i$  ( $= 1, 2$ ) in PPG  $g$  of treatment  $T$  by  $c_i^{g,T}$ , where  $0 \leq c_i^{g,T} \leq 14$ ,  $i$ ’s monetary payoff per game is given by:

$$\pi_i^{g,T} = (14 - c_i^{g,T}) + 0.75 (c_1^{g,T} + c_2^{g,T}) \quad \forall i, g, T.$$

Since the marginal per capita return is less than unity, the dominant strategy for a monetary payoff maximizer is to contribute nothing. If all group members

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<sup>10</sup>We preferred this second allocation to the equal-split one so as to tempt the dictators with the selfish decision and obtain a larger sample of resentful recipients. Güth *et al.* (2001), for example, report that proposers in ultimatum games choose more often the unfair offer when the equal split is replaced by a nearly equal split that favors the responder. Also Charness and Rabin (2002) show that people in allocation games avoid acts of generosity that result in being paid less than the others.

free rided, then each one of them would earn €14. On the other hand, the socially efficient outcome is to contribute everything. If all group members made the socially efficient choice, then each one of them would earn €21.

### 3.3 Research questions

Our treatments and sequence of games are expressly designed to answer the following questions:

**Question 1** Do resentful recipients (that is recipients that receive only €2 in the MDG) contribute less in the second PGG?

**Question 2** Are the reductions (if any) in the resentful recipients' contributions smaller when they are allowed to express their anger?

We address Question 1 by comparing  $c_i^{1,C}$  to  $c_i^{2,C}$ , where  $i$  is restricted to the subsample of resentful recipients. We address Question 2 by comparing  $c_i^{1,C} - c_i^{2,C}$  to  $c_i^{1,M} - c_i^{2,M}$ , where  $i$  is restricted to the subsample of resentful recipients that reduce their contributions.

On the basis of earlier studies (e.g., Charness and Grosskopf 2001; Bosman and van Winden 2002; Kirchsteiger *et al.* 2006; Hopfensitz and Reuben 2009), we expect recipients to feel anger after receiving an unfair offer and to retaliate by becoming less cooperative. Hence, we conjecture an affirmative answer to Question 1. Similarly, for Question 2, the existing literature on the influence of non-monetary punishment on behavior (e.g., Masclet *et al.* 2003; Noussair and Tucker 2005; Xiao and Houser 2005; Yamagishi *et al.* 2009) points to an affirmative answer.

### 3.4 Procedures

The experiment was programmed in z-Tree (Fischbacher 2007) and conducted in the experimental laboratory of the Max Planck Institute of Economics (Jena, Germany). The subjects, undergraduate students from the Friedrich-Schiller

University of Jena, were recruited using Greiner's (2004) ORSEE software. Upon entering the laboratory, they were randomly assigned to visually isolated computer terminals.

The three games (PGG 1, MDG, and PGG 2) were presented separately at different stages of the experiment. The instructions for the first PGG and the MDG were distributed to the subjects and then read aloud. For reasons that will become clear later on, the instructions for PGG 2 were displayed on the subjects' screens.<sup>11</sup> All games were run one-shot. We implemented a stranger matching protocol between PGG 1 and MDG, and a partner matching protocol between MDG and PGG 2.

The full sequence of events unfolded as follows. First, the participants were randomly paired up. Before starting PGG 1, they had to answer a control questionnaire testing their comprehension of the rules. Additionally, they had to go through three practice periods.<sup>12</sup> PGG 1 is the yardstick of the participants' cooperative attitudes. It also serves the purpose of ascertaining whether our sample suffers from recruitment bias.<sup>13</sup>

Once all participants made their contribution decisions, the instructions for the MDG were handed out.<sup>14</sup> In the case of treatment *M*, the players were informed that the prospective recipient would get the opportunity to text his partner expressing his feelings about the allocation. Pairs were reshuffled (subjects were aware that they were playing with new partners), each pair member was randomly assigned one of the two roles, and dictator subjects were asked to submit their allocation choices.

In treatment *M*, each recipient could use a text box to type in his message.

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<sup>11</sup>The appendix contains a translation of the *M*-treatment instructions (they were originally in German).

<sup>12</sup>The practice periods did not involve any interaction (the other's decision was selected at random by the computer). Our aim was to familiarize the participants with the game and its incentives (no payments were associated with them).

<sup>13</sup>Even if players have a better understanding of the dominant strategy while they play the second PGG, the contribution cuts that could be attributed to learning should not be different between treatments.

<sup>14</sup>We framed the game as neutrally as possible, avoiding suggestive terms like dictator (he is named player *X* in the instructions).

The recipient was given four minutes to compose the message, but it was at his discretion to send it ahead of the deadline. The form of the message was free; the only restriction to its content was that its sender could not identify himself.

Next, subjects were instructed that they would repeat PGG 1, this time with their MDG partners. We took two measures to shorten the span of time between the possible feeling of emotions at the end of the MDG (in response to either the dictator's allocation or the receipt of a judgmental message) and the contribution decisions in PGG 2: (i) we presented concise on-screen instructions (the participants were reminded only about the salient characteristics of the game, namely endowment and payoff function); (ii) we allowed each pair to proceed from the MDG to PGG 2 at its own pace (i.e., without having to wait for the decisions of the other participants).

Finally, we had recipients report the emotion, if any, they experienced when they found out the dictator's decision. Recipients had to select one among the following eleven emotions: pride, envy, anger, happiness, shame, irritation, gratitude, surprise, contempt, admiration, or none.<sup>15</sup>

To minimize path dependence (i.e., the dependence of choices on previous outcomes), as well as learning effects (see Andreoni 1988), subjects received feedback about contributions and payoffs in PGG 1 only after the end of the experimental session. Then one game was chosen at random and subjects were paid according to their decisions in that game (subjects knew about this procedure since the beginning of the session.)

We run 7 *C*- and 7 *M*-treatment sessions. The total number of subjects was 222 in the first case and 220 in the second. Each experimental session lasted about one hour. Averaging over both treatments, mean earnings amounted to €18.65 for the dictators and €16.15 for the recipients.

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<sup>15</sup>The overwhelming majority of resentful recipients did select a negative emotion. Note that the list contains both negative and positive emotions. The reason for this is twofold. First, we did not want to push subjects in a particular direction. Second, we expected recipients receiving €11 to report a positive emotion.

## 4 Experimental results

Figure 1 draws boxplots of the participants' contributions in the two PGGs. There should be no difference between  $c_i^{1,C}$  and  $c_i^{1,M}$ , provided that recruitment was unbiased. Indeed, it is not possible to reject the null hypothesis that they have identical distributions ( $p = 0.62$ ; two-sided Wilcoxon rank sum test).

[Figure 1 about here.]

The  $C$ -treatment participants tend to reduce their contributions in the second PGG. A Wilcoxon signed rank test confirms that the differences between  $c_i^{1,C}$  and  $c_i^{2,C}$  are statistically significant ( $p = 0.00$ ; two-sided test), which indicates that emotions matter on later decisions. Furthermore, the distributions of  $c_i^{2,C}$  and  $c_i^{2,M}$  differ ( $p = 0.00$ ; two-sided Wilcoxon rank sum test), which implies that the afforded opportunity for self-expression is important to our subjects. It also follows that the contributions cuts in  $C$  cannot be attributed to learning; there is no reason why learning should influence the participants in  $C$  more than the participants in  $M$ .

These conclusions should be treated with some caution, as they depend on the composition of our sample. Table 1 categorizes our subjects according to their role and earnings in the MDG, and reports measures of location of the data sample associated with each group in each PGG. Dictators do not modify their contributions in any systematic way.<sup>16</sup> On the other hand, (a) resentful recipients decrease their contributions significantly,<sup>17</sup> which provides an affirmative answer to Question 1, and (b) grateful recipients increase their contributions

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<sup>16</sup>Contribution levels in the two PGGs do not differ significantly for the  $C$ -treatment generous dictators and the  $M$ -treatment selfish dictators ( $p = 0.75$  and  $0.22$ , respectively; two-sided Wilcoxon signed rank test). Contribution levels in the first PGG are significantly higher than contribution levels in second PGG for the  $C$ -treatment selfish dictators ( $p = 0.00$ , one-sided Wilcoxon signed rank test). The opposite holds for the  $M$ -treatment generous dictators ( $p = 0.03$ ).

<sup>17</sup>In comparison to their contributions in PGG 1, the resentful recipients' contributions in PGG 2 are significantly smaller ( $p = 0.00$  for both  $C$  and  $M$  treatments; one-sided Wilcoxon signed rank test).

significantly.<sup>18</sup> Therefore, for each treatment, the change in the overall level of contributions depends on the relative frequency of resentful recipients.

[Table 1 about here.]

In what follows we make between-treatment comparisons of only homogeneous groups: we examine the behavior of resentful recipients for evidence on the effects of anger, and the behavior of selfish dictators for evidence on the effects of guilt.

#### 4.1 Resentful recipients

In the *C*-treatment, the proportion of resentful recipients that contribute less in the second PGG equals 0.54. In the *M*-treatment, the value of this proportion is smaller, 0.41, indeed it is weakly significantly so (the *p*-value of a two-sample test for equality of proportions – against the alternative of a smaller proportion in the *M*-treatment – equals 0.08).

We use the variable  $c_i^{1,T} - c_i^{2,T}$ ,  $T = \{C, M\}$ , where  $i$  is restricted to the resentful recipients that reduce their contributions, as a proxy measuring the outcome of anger. Based on a Wilcoxon rank sum test, these differences are significantly smaller in the case of the *M*-treatment ( $p = 0.04$ ; one-sided test). Thus, once the possibility of messaging is introduced (a) proportionally less of the resentful recipients reduce their contributions, and (b) those that reduce their contributions, reduce them to a smaller extent. We conclude that even Question 2 has an affirmative answer.

Figure 2 plots the kernel densities of the two samples. The *M*-treatment sample ranges from 0.50 to 8.00, producing a fairly smooth probability density function estimate. The standard deviation of the *C*-treatment sample is larger (4.46 in comparison to 2.34); approximately one third of its observations exceed

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<sup>18</sup>In comparison to their contributions in PGG 1, the grateful recipients' contributions in PGG 2 are significantly larger ( $p = 0.00$  for both *C* and *M* treatments; one-sided Wilcoxon signed rank test).

8.00. In fact, the estimate of its probability density function appears to have a second mode at 14 (as 7 out of the 44 participants in this group switched from the maximum to the minimum possible contribution).

[Figure 2 about here.]

It is interesting to investigate the intra-distributional dynamics of the two samples, that is to look at the way the characteristics of the individual members of the two groups change in response to receiving an unfair offer. For this purpose, we divide the permissible range of contributions into the intervals  $[0.0, 3.5)$ ,  $[3.5, 7.0)$ ,  $[7.0, 10.5)$ , and  $[10.5, 14.0]$ . Players with contributions falling within these intervals are labeled undoubtedly selfish (US), moderately selfish (MS), moderately cooperative (MC), and undoubtedly cooperative (UC), respectively. The transition matrices are given in Table 2. Each element  $t_{j,k}$  represents the probability of transitioning from state  $j$  in PGG 1 to state  $k$  in PGG 2 (the elements below the main diagonal are empty due to sample construction).

[Table 2 about here.]

In the  $C$ -treatment we have  $t_{1,1} = t_{2,2} = t_{3,3} = 0$ , i.e., the reductions in contributions were big enough so that none of the players remained in the same category. Most of the undoubtedly cooperative players became undoubtedly selfish, and the same applies to the moderately cooperative players. The  $M$ -treatment players did handle their anger better. None (just a minority) of the undoubtedly cooperative (moderately cooperative) players became undoubtedly selfish. In addition, some of the moderately cooperative players managed to avoid inefficient choices in PGG 2.

## 4.2 Selfish dictators

The proportion of selfish dictators that contributed more in PGG 2 than in PGG 1 is almost the same in treatments  $C$  and  $M$  (0.16 and 0.17, respectively).

Even if the size of the sample is insufficient to make any claims, it appears that contribution increases are larger in the message treatment (Figure 3A),<sup>19</sup> especially if we exclude certain outliers from the sample (Figure 3B).<sup>20</sup>

[Figure 3 about here.]

While it is tempting to attribute this difference to feelings of either guilt or shame that selfish dictators experience after getting negative feedback from their MDG partners, such a conclusion is not warranted by our analysis. It remains a fact that most of the selfish dictators that did get negative feedback (i.e., messages expressing envy, anger, shame, irritation, or contempt) either did not modify or reduced their contributions (54.5% and 29.5% of them, respectively).

### 4.3 Self-reported emotions

Table 3 presents the results of the post-experimental questionnaire: how the recipients described their own feelings upon learning the dictator's decisions. 69% of the recipients that were offered €2 reported a negative emotion. 73% of the recipients that were offered €11 reported a positive emotion. These results justify our choice of using the MDG in order to induce negative emotions in the participants of our experiment.

[Table 3 about here.]

### 4.4 The messages' content

We draw on Xiao and Houser (2009; 2005) in order to evaluate the emotional content of the messages that recipients sent to their respective dictators. Upon completing the experimental sessions, a research assistant (who was fully aware

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<sup>19</sup>When selfish dictators increase their contributions, they typically do so by €3 or less. The contributions of these participants in PGG 1 range from nothing to €8, that is they are not so large so as to preclude further increases (only two these participants, one in the *C* and the other in the *M* treatment, contribute the total of their endowment in PGG 2).

<sup>20</sup>We use Carling's (2000) median rule as method for outlier detection.



of the experiment) was asked to recruit six message evaluators from the undergraduate student body at the Friedrich-Schiller University in Jena. The undergraduates that he decided upon had no previous experience with dictator game experiments.

After being seated in the laboratory, the evaluators were supplied with the MDG instructions. Once all evaluators finished reading these instructions, they were given a randomly ordered list of all messages and they were asked to classify each message as showing “positive”, “negative” or “neutral” emotional content. While assessing the messages, the evaluators had no information about the allocation offered to the recipients that composed them.

Each evaluator was paid €10 conditional on classifying all messages. To increase the evaluators’ attentiveness, they were told that three messages would be randomly chosen at the end of the session, and if their evaluations agreed with the most common classification of these messages, then they would be paid an extra €5. The research assistant provided us with the most common classification of each message. The classification was unanimous in 103 cases. The remaining seven cases were determined by the research assistant.<sup>21</sup>

Table 4 classifies the messages written by the two types of recipients on the basis of their emotional content. One third of the messages written by recipients receiving €2 expressed negative emotions. Yet the majority of them, namely 59%, expressed neutral emotions. Here the recipient typically scolded the dictator for his choice, but also confessed that he would not have acted differently had the right of choice been given to him. The messages written by recipients receiving €11 were predominantly of positive content.

[Table 4 about here.]

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<sup>21</sup>We refrained from evaluating dubious cases ourselves in order to remain neutral with respect to the classification results.

## 5 Conclusions

Numerous psychological and economic experiments have shown that emotions play a part in decision-making. Laboratory research in economics and psychology has also documented that, within a given environment (usually a dictator, ultimatum, or public good game), symbolic non-monetary punishment serves as a deterrent to costly and inefficient actions. What is novel in the present paper is that we link the experiencing of negative emotions in one game to behavior in one other game, thereby allowing to test for spill-over effects.

Specifically, our experiment is designed to address two research questions. First, could resentment toward an unfair dictator impair the prospects of cooperation with him in a different setting (in the present case a public goods game)? Second, does the expression of emotions via a text message diminish the tendency toward uncooperativeness that follows the experience of negative emotions? Our analysis indicates a positive answer to both questions. The recipients' self-reported emotional states and the classification of the content of their messages support the view that most of them experience negative emotions when they receive an unfair allocation. Having no way to deal with these emotions, 83% of the resentful recipients that are classified as undoubtedly cooperative in the first public goods game become undoubtedly selfish in the public goods game that follows. That is negative emotions have a lasting effect on behavior as they undermine future cooperation. In contrast with the above recipients, the resentful recipients that could convey their feelings to their respective dictators handle their anger better: they reduce their contributions in the second public goods game, but they do so to a significantly less extent. In other words, the possibility to communicate negative emotions suffices to curtail selfish decisions.

While we focus on the behavior of the recipients that experience negative emotions, selfish dictators that receive disapproving messages could be expected

to feel guilty and accordingly increase their contributions in the second public goods game. Such a conjecture is not supported by our data: most of the selfish dictators that received messages of negative content did not increase their contributions. It should be noted that, in line with the findings of Ellingsen and Johannesson (2008) and Xiao and Houser (2009), there are fewer selfish allocations in the treatment where messaging is allowed for.

Further research is needed to understand why and how feelings affect future behavior. Yet, the practical implications of our study are worth pointing out. Policy makers should facilitate and encourage channels of communication that allow dissatisfied citizens to constructively release their anger. And in a work setting, managers that want to sustain the cooperation of their employees should be willing to hear out those of them that feel that they have been wronged.

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Table 1: Descriptive statistics of the participants' contributions in the two PGGs.

	Control treatment					Message treatment				
	no. of players	PGG 1		PGG 2		no. of players	PGG 1		PGG 2	
		mean	median	mean	median		mean	median	mean	median
All participants	222	5.95	6.00	4.71	4.00	220	6.19	6.00	6.28	5.00
▷ Recipients	111	6.35	6.00	4.32	3.00	110	6.20	6.00	6.24	5.00
¬ Resentful	82	6.31	6.00	3.06	1.00	64	5.79	5.00	4.45	2.25
– with $c_i^{2,T} < c_i^{1,T}$	44	7.76	7.00	1.26	0.00	26	6.10	6.00	2.00	1.50
– with $c_i^{1,T} = c_i^{2,T}$	31	4.53	3.00	4.53	3.00	32	5.50	2.05	5.50	2.05
– with $c_i^{2,T} > c_i^{1,T}$	7	5.10	5.00	7.87	6.00	6	5.92	4.75	9.50	10.50
¬ Grateful	29	6.46	6.00	7.88	8.00	46	6.77	7.00	8.73	10.00
▷ Dictators	111	5.55	5.00	5.10	5.00	110	6.19	6.00	6.31	6.00
¬ Selfish	82	4.62	4.00	3.88	3.00	64	4.84	4.00	4.63	4.00
– with $c_i^{2,T} < c_i^{1,T}$	27	6.33	6.00	3.02	3.00	19	5.50	5.00	2.91	3.00
– with $c_i^{1,T} = c_i^{2,T}$	42	3.62	1.00	3.62	1.00	34	4.85	4.00	4.85	4.00
– with $c_i^{2,T} > c_i^{1,T}$	13	4.28	4.00	6.54	6.00	11	3.68	4.00	6.95	7.00
¬ Generous	29	8.17	7.00	8.53	8.00	46	8.07	8.75	8.65	9.00



Table 2: Transition probabilities from PGG 1 to PGG 2 characteristics.

	Control treatment				Message treatment			
	UC	MC	MS	US	UC	MC	MS	US
UC	0.00	0.08	0.08	0.83	0.00	0.00	1.00	0.00
MC		0.00	0.33	0.67		0.00	0.56	0.44
MS			0.00	1.00			0.18	0.82
US				1.00				1.00

Notes: There are 12 (2) UC, 15 (9) MC, 7 (11) MS, and 10 (4) US players in the first PGG of the control (message) treatment.

Table 3: Relative frequencies of the recipients' self-reported emotions.

Content	Emotion	Recipients	
		receiving €2	receiving €11
Negative	Anger	0.14	0.00
	Irritation	0.33	0.00
	Contempt	0.08	0.00
	Envy	0.14	0.00
Neutral	Shame	0.00	0.02
	Surprise	0.05	0.17
	None	0.20	0.07
Positive	Happiness	0.02	0.17
	Gratitude	0.00	0.43
	Admiration	0.05	0.09
	Pride	0.00	0.04

Table 4: Classification of the messages sent by the recipients.

	negative	neutral	positive
Recipients receiving €2	0.33	0.59	0.06
Recipients receiving €11	0.02	0.00	0.98

Notes: 64 recipients received €2 and 46 recipient received €11. Only one of the former did not sent any message.

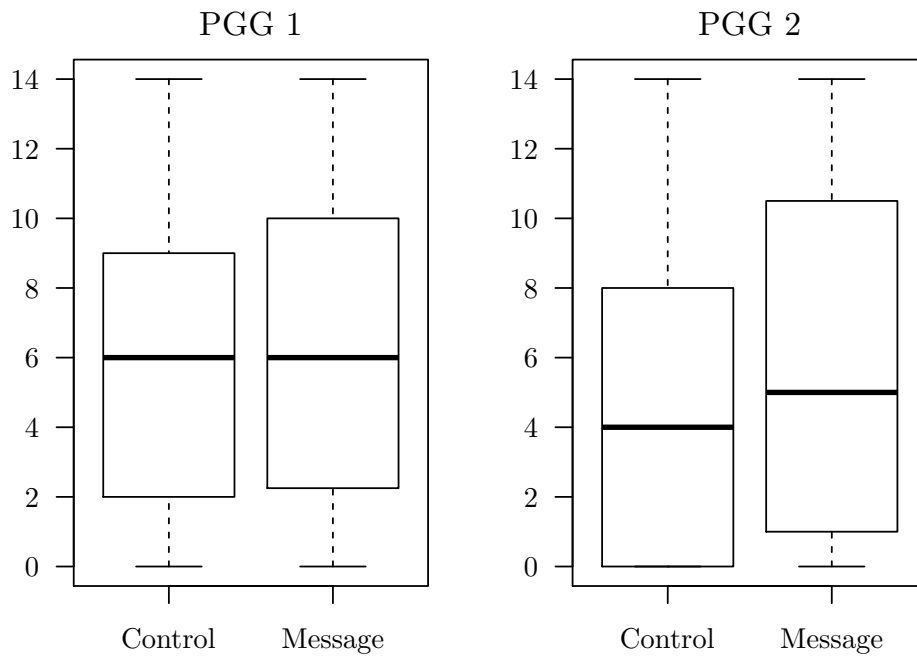


Figure 1: Boxplots of  $c_i^{g,T} \forall i, g, T$ .

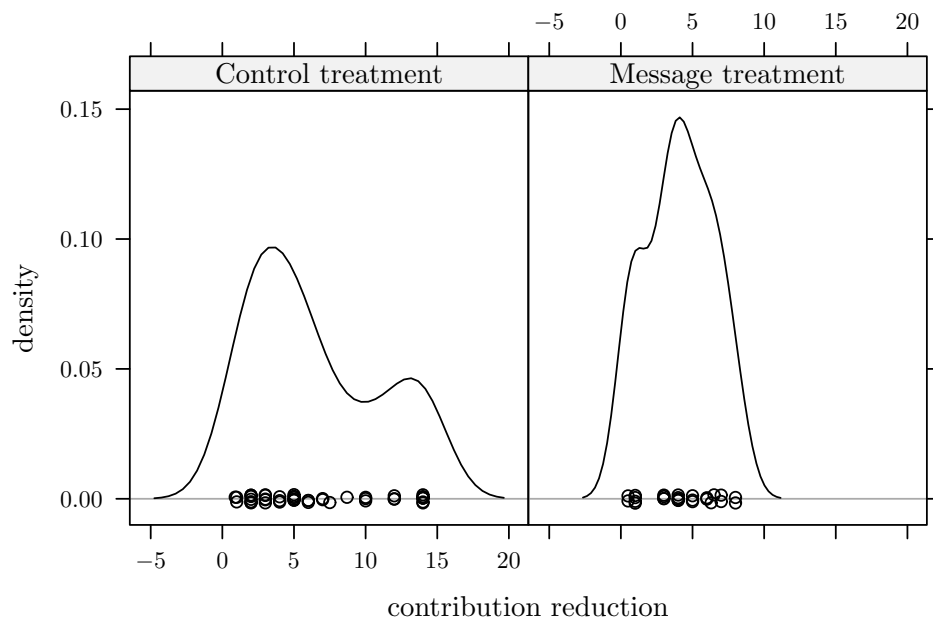


Figure 2: Kernel density plots of  $c_i^{1,T} - c_i^{2,T}$  such that  $i$  represents only resentful recipients and  $c_i^{1,T} - c_i^{2,T} > 0$ .

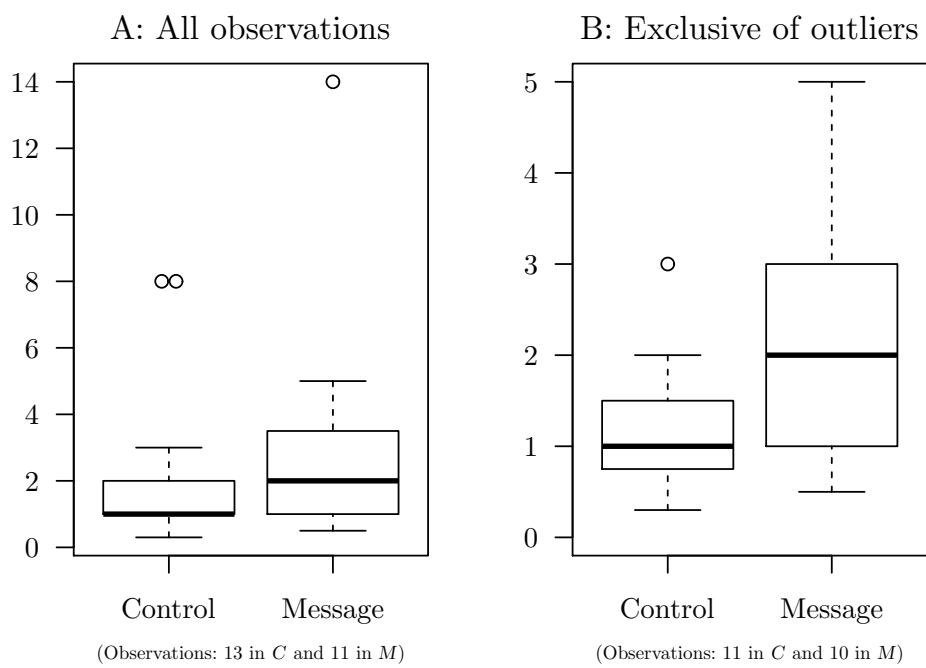


Figure 3: Boxplots of  $c_i^{2,T} - c_i^{1,T}$  such that  $i$  represents only selfish dictators and  $c_i^{2,T} - c_i^{1,T} > 0$ .

## GENERAL INFORMATION

Welcome! You are about to participate in an experiment funded by the Max Planck Institute of Economics. Please switch off your mobile and remain silent. It is strictly forbidden to talk to the other participants. Raise your hand whenever you have a question and one of the experimenters will come to your aid.

The experiment consists of three parts. You may find the instructions for the first part on the following pages. You will get the instructions for the second part on completion of the first part. Similarly, you will get the instructions for the third part on completion of the second part.

You will receive €2.50 for showing up on time. In each individual part of the experiment you will have the opportunity to earn more money. Your final payoff will be determined by your earnings in only one of these three parts, but you do not know in advance which part will be used.

At the end of the experiment (i.e., after part 3 is over), one experimenter will select one participant by drawing one card from a deck that contains as many cards as the number of participants. This participant will in his/her turn select one part of the experiment by drawing a ball from an urn that contains three balls labeled 1, 2 and 3. Only the earnings that correspond to this particular part will be paid out in cash (along with the show-up fee).

Payments will be carried out privately, i.e., the others will not be aware of your earnings.

## Instructions on the first part of the experiment

### Group formation

You are randomly matched with one other participant. We will refer to this participant as the *other*.

### Decisions

You (as well as the *other*) get €14. You will have to decide **how much of the 14 euros that you were given you want to contribute to a project**. You will face this decision just once.

The euros that you contribute yield income for you as well as for the *other* (you will learn more about the “income from the project” below). The euros that you do not contribute you keep (they are your own and yield income just for you).

### Earnings

Your earnings consist of two parts:

- a) “Income from the project” =  $0.75 \times (\text{your contribution} + \text{the } other\text{'s contribution})$ . In words, the income from the project equals the sum of the contributions of the pair you belong to multiplied by 0.75.
- b) “Euros that you keep” =  $14 - \text{your contribution to the project}$ .

Thus, your earnings summarized in a formula are as follows:

$\begin{aligned} \text{Your earnings} = & \quad \text{Income from the project} \quad + \quad \text{Euros that you keep} \\ & (0.75 \times \text{sum of pair's contributions}) \quad + \quad (14 - \text{your contribution}) \end{aligned}$
--

*Example:*

Suppose that you and the *other* contribute 5 euros each. Then both you and the *other* receive an “income from the project” of 7.5 ( $= 0.75 \times 10$ ) euros. The “euros that you keep” are 9 ( $= 14 - 5$ ). Hence, your earnings are  $7.5 + 9 = 16.5$  euros.

### Interaction with your pair member

You as well as the *other* decide simultaneously and privately on the number of euros that you want to contribute to the project.

### The information you receive

You will be informed about

1. the number of euros contributed by the *other*,



2. the income from the project, and
3. your earnings

at the end of the experiment, i.e., on completion of part 3.

Next, you will have to answer some control questions to verify your understanding of the rules of this part of the experiment. Once everybody has answered all questions correctly, three practice rounds will help you familiarize yourself with the dynamics of part 1. In these rounds the computer will choose the *other's* decisions from a set of randomly generated values. The result of these rounds will not be relevant to your final payoff.

*You should remain quietly seated throughout the experiment. Please raise your hand now if you have questions. Click "OK" (on your computer screen) when you are finished with the instructions for this part of the experiment.*

## Instructions on the second part of the experiment

You are paired with a participant different from the participant you were paired with in the first part.

Each member of each pair is randomly assigned one of two roles: either  $X$  or  $Y$ . You will be informed of your role once you have started the second part of the experiment.

### $X$ 's task

$X$  is given €20 and has to decide only once how to divide this money between him/herself and  $Y$ . In particular,  $X$  has the following options:

**Division 1:**  $X$  keeps €18 and gives the remaining €2 to  $Y$ ;

**Division 2:**  $X$  keeps €9 and gives the remaining €11 to  $Y$ .

### $Y$ 's task

$Y$  is given nothing and has no option but to accept  $X$ 's decision. However, after being informed of  $X$ 's decision,  $Y$  has the opportunity to send a message to  $X$  expressing his/her approval or disapproval of the way the €20 were distributed.

The message sender is not allowed to identify him/herself. Thus,  $Y$  cannot reveal his/her real name, nickname, or any other identifying feature such as gender, hair color, or seat number.

$Y$  has 4 minutes to write his/her message, but (s)he is free to send it ahead of time. A clock will inform  $Y$  of the remaining time.

### Earnings

The earnings of  $X$  and  $Y$  are as follows:

	$X$ earns	$Y$ earns
$X$ chooses division 1	€18	€2
$X$ chooses division 2	€9	€11

*Please click "OK" if you have finished reading the instructions for the present part of the experiment and have no further questions.*

**INSTRUCTIONS ON THE THIRD PART OF THE EXPERIMENT**

Here you replicate the first part of the experiment. As a reminder,  
you will be given €14 and you will have to decide how much you want to contribute to a project;  
your earnings equal:

Income from the project	+	Euro that you keep
$(0.75 \times \text{sum of pair's contributions})$	+	$(14 - \text{your contribution})$

**You will be paired with the SAME PERSON you were paired with in the second part.**

Press OK when you have finished reading these instructions and are ready to make your decision.

OK

Table 5: Control treatment data.

session	subject	PGG 1		MDG		PGG 2		questionnaire	
		group	contribution	group	role	profit	group		contribution
1	1	1	0.00	1	D	18	1	0.00	
1	2	1	14.00	2	R	2	2	2.00	9
1	3	2	5.00	2	D	18	2	7.00	
1	4	2	0.00	3	R	2	3	0.00	2
1	5	3	0.00	3	D	18	3	0.00	
1	6	3	0.00	4	R	2	4	0.00	6
1	7	4	6.00	4	D	18	4	8.00	
1	8	4	3.00	5	R	2	5	3.00	6
1	9	5	5.00	5	D	18	5	4.00	
1	10	5	0.00	6	R	2	6	0.00	2
1	11	6	0.00	6	D	18	6	0.00	
1	12	6	8.70	7	R	2	7	0.00	6
1	13	7	2.00	7	D	18	7	2.00	
1	14	7	6.00	8	R	2	8	2.00	11
1	15	8	0.00	8	D	18	8	0.00	
1	16	8	0.00	9	R	2	9	0.00	6
1	17	9	4.00	9	D	18	9	2.00	
1	18	9	0.00	10	R	2	10	0.00	6
1	19	10	10.00	10	D	18	10	0.00	
1	20	10	0.00	11	R	2	11	0.00	6
1	21	11	6.00	11	D	18	11	4.00	
1	22	11	7.00	12	R	2	12	2.00	6
1	23	12	0.00	12	D	18	12	0.00	
1	24	12	7.00	13	R	2	13	1.00	9
1	25	13	0.00	13	D	18	13	0.00	
1	26	13	12.00	14	R	2	14	7.00	11
1	27	14	7.00	14	D	18	14	7.00	
1	28	14	10.00	15	R	2	15	5.00	9
1	29	15	4.00	15	D	18	15	4.00	
1	30	15	1.00	16	R	2	16	0.00	6
1	31	16	4.00	16	D	18	16	5.00	
1	32	16	12.00	1	R	2	1	0.00	6

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session	subject	PGG 1			MDG		PGG 2		questionnaire
		group	contribution	group	role	profit	group	contribution	
2	1	1	8.00	1	D	9	1	8.00	
2	2	1	2.00	2	R	2	2	2.00	6
2	3	2	14.00	2	D	18	2	5.00	
2	4	2	4.00	3	R	2	3	4.00	11
2	5	3	0.00	3	D	18	3	0.00	
2	6	3	0.00	4	R	2	4	0.00	6
2	7	4	9.00	4	D	18	4	0.00	
2	8	4	10.00	5	R	2	5	0.00	11
2	9	5	0.00	5	D	18	5	0.00	
2	10	5	7.00	6	R	2	6	5.00	11
2	11	6	4.00	6	D	18	6	4.00	
2	12	6	14.00	7	R	2	7	0.00	6
2	13	7	4.00	7	D	18	7	0.00	
2	14	7	3.00	8	R	2	8	1.00	6
2	15	8	1.00	8	D	18	8	1.00	
2	16	8	14.00	9	R	2	9	0.00	1
2	17	9	0.00	9	D	18	9	0.00	
2	18	9	3.00	10	R	2	10	0.00	3
2	19	10	7.00	10	D	18	10	5.00	
2	20	10	1.50	11	R	2	11	0.50	11
2	21	11	14.00	11	D	18	11	14.00	
2	22	11	8.90	12	R	2	12	9.10	6
2	23	12	0.00	12	D	18	12	0.00	
2	24	12	10.00	13	R	2	13	0.00	3
2	25	13	14.00	13	D	18	13	14.00	
2	26	13	10.00	14	R	2	14	10.00	11
2	27	14	4.00	14	D	18	14	2.00	
2	28	14	14.00	15	R	2	15	0.00	9
2	29	15	4.00	15	D	18	15	4.00	
2	30	15	3.00	16	R	2	16	0.00	6
2	31	16	7.00	16	D	18	16	5.00	
2	32	16	3.00	1	R	11	1	8.00	7

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session	subject	PGG 1			MDG		PGG 2		questionnaire
		group	contribution	group	role	profit	group	contribution	
3	1	1	5.00	1	D	9	1	5.00	
3	2	1	6.00	2	R	2	2	6.00	2
3	3	2	10.00	2	D	18	2	8.00	
3	4	2	4.00	3	R	2	3	0.00	6
3	5	3	0.00	3	D	18	3	0.00	
3	6	3	0.00	4	R	2	4	0.00	9
3	7	4	0.00	4	D	18	4	0.00	
3	8	4	7.00	5	R	2	5	0.00	11
3	9	5	0.00	5	D	18	5	0.00	
3	10	5	5.00	6	R	2	6	0.00	9
3	11	6	0.00	6	D	18	6	0.00	
3	12	6	2.00	7	R	2	7	0.00	6
3	13	7	1.50	7	D	18	7	2.00	
3	14	7	6.00	8	R	11	8	10.00	8
3	15	8	10.00	8	D	9	8	11.00	
3	16	8	3.50	9	R	11	9	7.00	8
3	17	9	14.00	9	D	9	9	14.00	
3	18	9	1.00	10	R	2	10	1.00	4
3	19	10	10.00	10	D	18	10	3.00	
3	20	10	2.90	11	R	2	11	2.00	6
3	21	11	0.00	11	D	18	11	0.00	
3	22	11	14.00	12	R	2	12	0.00	6
3	23	12	5.00	12	D	18	12	6.00	
3	24	12	0.00	13	R	2	13	0.00	2
3	25	13	14.00	13	D	18	13	14.00	
3	26	13	14.00	14	R	2	14	2.00	5
3	27	14	7.00	14	D	18	14	4.00	
3	28	14	0.00	15	R	2	15	0.00	11
3	29	15	2.50	15	D	18	15	2.00	
3	30	15	2.00	16	R	2	16	0.00	6
3	31	16	10.00	16	D	18	16	10.00	
3	32	16	3.00	1	R	11	1	4.00	7

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session	subject	PGG 1			MDG		PGG 2		questionnaire
		group	contribution	group	role	profit	group	contribution	
4	1	1	9.00	1	D	18	1	8.50	
4	2	1	4.00	2	R	2	2	0.00	6
4	3	2	0.00	2	D	18	2	0.00	
4	4	2	0.00	3	R	2	3	0.00	6
4	5	3	2.00	3	D	18	3	0.00	
4	6	3	7.00	4	R	2	4	13.00	6
4	7	4	5.00	4	D	18	4	4.00	
4	8	4	8.00	5	R	2	5	8.00	6
4	9	5	1.00	5	D	18	5	1.00	
4	10	5	4.00	6	R	2	6	1.00	6
4	11	6	8.00	6	D	18	6	9.00	
4	12	6	7.00	7	R	2	7	7.00	2
4	13	7	0.00	7	D	18	7	0.00	
4	14	7	14.00	8	R	2	8	14.00	11
4	15	8	9.00	8	D	18	8	9.00	
4	16	8	6.00	9	R	11	9	9.00	8
4	17	9	14.00	9	D	9	9	3.00	
4	18	9	10.00	10	R	11	10	10.00	4
4	19	10	10.00	10	D	9	10	10.00	
4	20	10	8.00	11	R	11	11	8.00	7
4	21	11	7.00	11	D	9	11	7.00	
4	22	11	8.00	12	R	2	12	5.00	6
4	23	12	4.00	12	D	18	12	12.00	
4	24	12	9.00	13	R	2	13	3.00	6
4	25	13	7.00	13	D	18	13	6.00	
4	26	13	7.00	14	R	2	14	2.00	11
4	27	14	0.00	14	D	18	14	0.00	
4	28	14	0.80	15	R	2	15	3.00	11
4	29	15	4.00	15	D	18	15	0.00	
4	30	15	14.00	16	R	11	16	14.00	8
4	31	16	9.00	16	D	9	16	9.00	
4	32	16	12.00	1	R	2	1	5.00	9

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session	subject	PGG 1		MDG		PGG 2		questionnaire	
		group	contribution	group	role	profit	group		contribution
5	1	1	0.00	1	D	18	1	1.00	
5	2	1	6.00	2	R	11	2	8.00	7
5	3	2	3.00	2	D	9	2	11.00	
5	4	2	0.00	3	R	11	3	0.00	8
5	5	3	8.50	3	D	9	3	8.00	
5	6	3	9.90	4	R	11	4	14.00	10
5	7	4	14.00	4	D	9	4	14.00	
5	8	4	7.00	5	R	2	5	5.00	6
5	9	5	7.00	5	D	18	5	10.00	
5	10	5	4.00	6	R	11	6	3.00	7
5	11	6	8.50	6	D	9	6	7.50	
5	12	6	14.00	7	R	11	7	14.00	1
5	13	7	7.00	7	D	9	7	7.00	
5	14	7	14.00	8	R	2	8	14.00	11
5	15	8	4.00	8	D	18	8	4.00	
5	16	8	6.00	9	R	11	9	8.00	7
5	17	9	7.00	9	D	9	9	5.00	
5	18	9	8.00	10	R	11	10	11.00	4
5	19	10	12.00	10	D	9	10	12.00	
5	20	10	6.00	11	R	11	11	7.00	7
5	21	11	7.00	11	D	9	11	2.00	
5	22	11	10.00	12	R	2	12	0.00	9
5	23	12	5.00	12	D	18	12	1.00	
5	24	12	4.50	13	R	2	13	4.50	11
5	25	13	5.00	13	D	18	13	5.00	
5	26	13	8.50	14	R	2	14	1.00	6
5	27	14	7.50	14	D	18	14	7.00	
5	28	14	1.00	15	R	11	15	3.00	7
5	29	15	4.00	15	D	9	15	1.00	
5	30	15	0.00	1	R	2	1	0.00	2

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session	subject	PGG 1			MDG		PGG 2		questionnaire
		group	contribution	group	role	profit	group	contribution	
6	1	1	1.00	1	D	9	1	5.80	
6	2	1	6.00	2	R	2	2	6.00	9
6	3	2	2.50	2	D	18	2	3.00	
6	4	2	7.00	3	R	2	3	4.00	6
6	5	3	0.00	3	D	18	3	0.00	
6	6	3	10.00	4	R	2	4	10.00	9
6	7	4	1.00	4	D	18	4	1.00	
6	8	4	3.00	5	R	11	5	4.00	7
6	9	5	14.00	5	D	9	5	14.00	
6	10	5	14.00	6	R	11	6	14.00	7
6	11	6	11.00	6	D	9	6	14.00	
6	12	6	10.00	7	R	2	7	10.00	11
6	13	7	5.00	7	D	18	7	5.00	
6	14	7	8.00	8	R	11	8	8.00	7
6	15	8	7.00	8	D	9	8	7.00	
6	16	8	4.00	9	R	2	9	4.00	11
6	17	9	2.70	9	D	18	9	3.00	
6	18	9	14.00	10	R	2	10	0.00	6
6	19	10	6.00	10	D	18	10	3.00	
6	20	10	0.00	11	R	2	11	0.00	11
6	21	11	2.00	11	D	18	11	0.00	
6	22	11	2.00	12	R	2	12	0.00	6
6	23	12	12.00	12	D	18	12	12.00	
6	24	12	2.00	13	R	2	13	0.00	1
6	25	13	8.00	13	D	18	13	8.00	
6	26	13	4.00	14	R	11	14	6.00	8
6	27	14	6.00	14	D	9	14	6.00	
6	28	14	0.00	15	R	11	15	0.00	7
6	29	15	7.00	15	D	9	15	5.00	
6	30	15	14.00	16	R	2	16	0.00	3
6	31	16	12.00	16	D	18	16	12.00	
6	32	16	14.00	1	R	11	1	14.00	10

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session	subject	PGG 1			MDG		PGG 2		questionnaire
		group	contribution	group	role	profit	group	contribution	
7	1	1	0.00	1	D	9	1	14.00	
7	2	1	4.00	2	R	11	2	6.50	11
7	3	2	14.00	2	D	9	2	14.00	
7	4	2	7.00	3	R	2	3	14.00	3
7	5	3	5.00	3	D	18	3	5.00	
7	6	3	6.00	4	R	11	4	8.00	4
7	7	4	7.00	4	D	9	4	8.00	
7	8	4	14.00	5	R	11	5	14.00	10
7	9	5	7.00	5	D	9	5	9.00	
7	10	5	6.00	6	R	2	6	0.00	3
7	11	6	4.00	6	D	18	6	3.00	
7	12	6	9.00	7	R	2	7	9.00	8
7	13	7	0.00	7	D	18	7	0.00	
7	14	7	4.00	8	R	2	8	5.00	11
7	15	8	6.00	8	D	18	8	14.00	
7	16	8	5.00	9	R	2	9	0.00	6
7	17	9	4.00	9	D	18	9	3.00	
7	18	9	0.00	10	R	11	10	0.00	8
7	19	10	6.00	10	D	9	10	7.00	
7	20	10	14.00	11	R	2	11	14.00	11
7	21	11	10.00	11	D	18	11	0.00	
7	22	11	7.00	12	R	11	12	11.00	10
7	23	12	9.00	12	D	9	12	9.00	
7	24	12	14.00	13	R	2	13	0.00	6
7	25	13	7.00	13	D	18	13	7.00	
7	26	13	14.00	14	R	2	14	14.00	6
7	27	14	9.00	14	D	18	14	9.00	
7	28	14	3.00	15	R	2	15	5.00	6
7	29	15	6.00	15	D	18	15	2.00	
7	30	15	5.00	16	R	2	16	6.00	11
7	31	16	4.00	16	D	18	16	5.00	
7	32	16	5.00	1	R	11	1	5.00	8

Table 6: Message treatment data.

session	subject	PGG 1		MDG		PGG 2		questionnaire	
		group	contribution	group	role	profit	group		contribution
1	1	1	6.00	1	D	18	1	6.00	
1	2	1	2.50	2	R	11	2	2.50	11
1	3	2	14.00	2	D	9	2	14.00	
1	4	2	4.00	3	R	11	3	7.00	8
1	5	3	4.00	3	D	9	3	4.00	
1	6	3	10.00	4	R	2	4	10.00	11
1	7	4	6.00	4	D	18	4	8.00	
1	8	4	6.00	5	R	2	5	0.00	11
1	9	5	14.00	5	D	18	5	14.00	
1	10	5	14.00	6	R	2	6	14.00	3
1	11	6	1.00	6	D	18	6	1.00	
1	12	6	0.00	7	R	2	7	0.00	11
1	13	7	3.00	7	D	18	7	3.50	
1	14	7	4.00	8	R	2	8	0.00	3
1	15	8	8.00	8	D	18	8	6.50	
1	16	8	13.00	9	R	11	9	14.00	4
1	17	9	5.00	9	D	9	9	7.00	
1	18	9	4.00	10	R	11	10	4.00	8
1	19	10	14.00	10	D	9	10	14.00	
1	20	10	9.00	11	R	2	11	5.00	3
1	21	11	0.00	11	D	18	11	0.00	
1	22	11	0.50	12	R	2	12	0.00	3
1	23	12	3.00	12	D	18	12	2.00	
1	24	12	2.00	13	R	11	13	14.00	4
1	25	13	11.50	13	D	9	13	14.00	
1	26	13	14.00	14	R	2	14	14.00	3
1	27	14	14.00	14	D	18	14	14.00	
1	28	14	0.00	15	R	2	15	0.00	11
1	29	15	0.00	15	D	18	15	0.00	
1	30	15	7.00	16	R	2	16	7.00	11
1	31	16	0.00	16	D	18	16	0.00	
1	32	16	10.00	1	R	2	1	10.00	3

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session	subject	PGG 1			MDG		PGG 2		questionnaire
		group	contribution	group	role	profit	group	contribution	
2	1	1	6.00	1	D	18	1	5.00	
2	2	1	12.00	2	R	2	2	14.00	11
2	3	2	10.00	2	D	18	2	10.00	
2	4	2	0.00	3	R	2	3	0.00	2
2	5	3	6.00	3	D	18	3	7.00	
2	6	3	0.00	4	R	2	4	0.00	6
2	7	4	7.00	4	D	18	4	7.00	
2	8	4	0.00	5	R	2	5	0.00	11
2	9	5	7.00	5	D	18	5	7.00	
2	10	5	8.00	6	R	2	6	2.00	6
2	11	6	4.00	6	D	18	6	1.00	
2	12	6	0.00	7	R	2	7	0.00	2
2	13	7	5.00	7	D	18	7	7.00	
2	14	7	14.00	8	R	2	8	14.00	6
2	15	8	5.00	8	D	18	8	9.00	
2	16	8	0.00	9	R	2	9	0.00	11
2	17	9	7.00	9	D	18	9	7.00	
2	18	9	6.00	10	R	2	10	1.00	6
2	19	10	0.00	10	D	18	10	0.00	
2	20	10	0.00	11	R	2	11	0.00	2
2	21	11	7.00	11	D	18	11	7.00	
2	22	11	0.00	12	R	2	12	0.00	6
2	23	12	4.00	12	D	18	12	4.00	
2	24	12	0.00	13	R	11	13	0.00	7
2	25	13	10.00	13	D	9	13	12.00	
2	26	13	4.00	14	R	2	14	0.00	6
2	27	14	6.00	14	D	18	14	5.00	
2	28	14	3.50	15	R	2	15	2.50	2
2	29	15	4.00	15	D	18	15	4.00	
2	30	15	3.00	16	R	2	16	0.00	3
2	31	16	2.00	16	D	18	16	1.00	
2	32	16	0.00	1	R	2	1	0.00	6

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session	subject	PGG 1		MDG		PGG 2		questionnaire	
		group	contribution	group	role	profit	group		contribution
3	1	1	0.00	1	D	18	1	0.00	
3	2	1	12.00	2	R	11	2	13.00	7
3	3	2	10.00	2	D	9	2	14.00	
3	4	2	9.00	3	R	2	3	2.00	2
3	5	3	3.50	3	D	18	3	4.00	
3	6	3	14.00	4	R	2	4	14.00	11
3	7	4	2.00	4	D	18	4	0.00	
3	8	4	14.00	5	R	11	5	14.00	8
3	9	5	9.00	5	D	9	5	9.00	
3	10	5	10.50	6	R	2	6	4.00	6
3	11	6	0.00	6	D	18	6	0.00	
3	12	6	10.00	7	R	11	7	11.00	7
3	13	7	5.00	7	D	9	7	5.00	
3	14	7	4.00	8	R	2	8	0.00	6
3	15	8	0.00	8	D	18	8	0.00	
3	16	8	0.00	9	R	11	9	2.50	10
3	17	9	7.00	9	D	9	9	5.00	
3	18	9	9.00	10	R	11	10	14.00	7
3	19	10	0.00	10	D	9	10	14.00	
3	20	10	14.00	11	R	2	11	14.00	4
3	21	11	6.00	11	D	18	11	3.00	
3	22	11	7.00	12	R	2	12	4.00	6
3	23	12	4.00	12	D	18	12	4.00	
3	24	12	2.00	13	R	11	13	0.00	11
3	25	13	8.50	13	D	9	13	6.50	
3	26	13	10.00	14	R	2	14	10.00	11
3	27	14	7.00	14	D	18	14	4.00	
3	28	14	0.00	15	R	11	15	5.00	7
3	29	15	0.00	15	D	9	15	0.00	
3	30	15	0.00	1	R	2	1	0.00	9

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session	subject	PGG 1		MDG		PGG 2		questionnaire	
		group	contribution	group	role	profit	group		contribution
4	1	1	0.00	1	D	18	1	0.00	
4	2	1	9.00	2	R	2	2	1.00	6
4	3	2	11.00	2	D	18	2	7.00	
4	4	2	0.00	3	R	11	3	14.00	8
4	5	3	10.00	3	D	9	3	11.00	
4	6	3	6.00	4	R	11	4	6.00	7
4	7	4	10.00	4	D	9	4	14.00	
4	8	4	9.00	5	R	2	5	9.00	3
4	9	5	6.00	5	D	18	5	6.00	
4	10	5	14.00	6	R	11	6	14.00	4
4	11	6	14.00	6	D	9	6	14.00	
4	12	6	5.00	7	R	11	7	9.00	7
4	13	7	4.00	7	D	9	7	10.00	
4	14	7	14.00	8	R	11	8	14.00	7
4	15	8	9.00	8	D	9	8	9.00	
4	16	8	0.00	9	R	2	9	0.00	6
4	17	9	4.00	9	D	18	9	5.00	
4	18	9	0.10	10	R	2	10	0.10	6
4	19	10	4.00	10	D	18	10	4.00	
4	20	10	8.00	11	R	2	11	5.00	2
4	21	11	4.00	11	D	18	11	4.00	
4	22	11	14.00	12	R	11	12	14.00	7
4	23	12	7.00	12	D	9	12	6.50	
4	24	12	0.00	13	R	11	13	14.00	10
4	25	13	14.00	13	D	9	13	14.00	
4	26	13	6.00	14	R	11	14	8.00	7
4	27	14	13.00	14	D	9	14	13.00	
4	28	14	14.00	15	R	2	15	14.00	3
4	29	15	0.00	15	D	18	15	5.00	
4	30	15	12.00	1	R	2	1	4.00	9

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session	subject	PGG 1		MDG		PGG 2		questionnaire	
		group	contribution	group	role	profit	group		contribution
5	1	1	1.00	1	D	18	1	4.00	
5	2	1	6.00	2	R	2	2	6.00	2
5	3	2	14.00	2	D	18	2	14.00	
5	4	2	4.00	3	R	11	3	4.00	7
5	5	3	14.00	3	D	9	3	14.00	
5	6	3	0.00	4	R	2	4	0.00	2
5	7	4	3.00	4	D	18	4	0.00	
5	8	4	1.00	5	R	11	5	2.00	4
5	9	5	2.00	5	D	9	5	2.00	
5	10	5	14.00	6	R	2	6	14.00	6
5	11	6	4.00	6	D	18	6	3.00	
5	12	6	4.00	7	R	11	7	5.00	4
5	13	7	14.00	7	D	9	7	14.00	
5	14	7	5.00	8	R	2	8	14.00	10
5	15	8	3.00	8	D	18	8	1.00	
5	16	8	0.00	9	R	2	9	0.00	6
5	17	9	14.00	9	D	18	9	14.00	
5	18	9	7.00	10	R	11	10	10.00	10
5	19	10	10.00	10	D	9	10	10.00	
5	20	10	9.00	11	R	11	11	9.00	7
5	21	11	4.00	11	D	9	11	4.00	
5	22	11	12.00	12	R	11	12	13.00	7
5	23	12	3.00	12	D	9	12	7.00	
5	24	12	10.00	13	R	11	13	10.00	7
5	25	13	10.00	13	D	9	13	10.00	
5	26	13	7.80	14	R	2	14	6.80	10
5	27	14	13.90	14	D	18	14	13.90	
5	28	14	2.00	15	R	2	15	3.00	6
5	29	15	4.00	15	D	18	15	0.00	
5	30	15	6.40	16	R	2	16	0.10	9
5	31	16	4.00	16	D	18	16	4.00	
5	32	16	5.00	1	R	2	1	4.50	8

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session	subject	PGG 1			MDG		PGG 2		questionnaire
		group	contribution	group	role	profit	group	contribution	
6	1	1	5.00	1	D	9	1	7.00	
6	2	1	10.00	2	R	2	2	14.00	11
6	3	2	0.00	2	D	18	2	0.00	
6	4	2	9.00	3	R	11	3	9.00	4
6	5	3	14.00	3	D	9	3	0.00	
6	6	3	14.00	4	R	11	4	10.00	7
6	7	4	4.00	4	D	9	4	5.00	
6	8	4	2.00	5	R	2	5	7.00	8
6	9	5	0.00	5	D	18	5	0.00	
6	10	5	4.00	6	R	11	6	12.00	8
6	11	6	8.00	6	D	9	6	6.00	
6	12	6	9.00	7	R	11	7	12.00	8
6	13	7	8.00	7	D	9	7	8.00	
6	14	7	5.00	8	R	2	8	0.00	6
6	15	8	6.00	8	D	18	8	1.00	
6	16	8	8.00	9	R	11	9	10.00	4
6	17	9	0.00	9	D	9	9	0.00	
6	18	9	8.00	10	R	2	10	4.00	8
6	19	10	6.00	10	D	18	10	6.00	
6	20	10	0.00	11	R	11	11	0.00	7
6	21	11	5.00	11	D	9	11	8.00	
6	22	11	7.00	12	R	2	12	0.00	9
6	23	12	0.00	12	D	18	12	0.00	
6	24	12	12.00	13	R	2	13	12.00	11
6	25	13	5.00	13	D	18	13	4.70	
6	26	13	10.50	14	R	11	14	13.30	7
6	27	14	7.00	14	D	9	14	7.00	
6	28	14	5.00	15	R	2	15	4.00	6
6	29	15	0.00	15	D	18	15	0.00	
6	30	15	11.00	16	R	11	16	14.00	8
6	31	16	6.00	16	D	9	16	10.00	
6	32	16	5.00	1	R	11	1	4.00	7

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session	subject	PGG 1			MDG		PGG 2		questionnaire
		group	contribution	group	role	profit	group	contribution	
7	1	1	9.00	1	D	9	1	9.00	
7	2	1	7.00	2	R	11	2	11.00	7
7	3	2	14.00	2	D	9	2	14.00	
7	4	2	10.00	3	R	11	3	14.00	11
7	5	3	9.00	3	D	9	3	12.00	
7	6	3	5.00	4	R	2	4	0.00	6
7	7	4	0.00	4	D	18	4	0.00	
7	8	4	4.50	5	R	2	5	5.00	9
7	9	5	2.00	5	D	18	5	0.00	
7	10	5	8.00	6	R	11	6	8.00	4
7	11	6	6.50	6	D	9	6	6.50	
7	12	6	10.00	7	R	2	7	10.00	11
7	13	7	7.00	7	D	18	7	10.00	
7	14	7	0.00	8	R	11	8	0.00	7
7	15	8	5.00	8	D	9	8	5.00	
7	16	8	0.00	9	R	2	9	0.00	6
7	17	9	14.00	9	D	18	9	14.00	
7	18	9	2.00	10	R	11	10	2.00	5
7	19	10	9.00	10	D	9	10	0.00	
7	20	10	3.00	11	R	2	11	0.00	2
7	21	11	8.50	11	D	18	11	7.00	
7	22	11	9.00	12	R	11	12	3.00	10
7	23	12	10.00	12	D	9	12	14.00	
7	24	12	8.00	13	R	11	13	12.00	1
7	25	13	14.00	13	D	9	13	14.00	
7	26	13	3.00	14	R	2	14	2.00	10
7	27	14	14.00	14	D	18	14	4.00	
7	28	14	4.00	15	R	2	15	4.00	6
7	29	15	0.00	15	D	18	15	14.00	
7	30	15	4.50	16	R	11	16	6.50	8
7	31	16	1.50	16	D	9	16	1.50	
7	32	16	14.00	1	R	11	1	14.00	1