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Does expressing disapproval influence future cooperation? An experimental study

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Abstract

We report on an experiment designed to explore whether a written expression of disapproval affects future levels of cooperation. In between two identical public goods games, participants play a mini dictator game that, depending on the treatment, either gives or does not give the recipient the opportunity to text the dictator. The recipients of an unfair offer contribute significantly less in the second public goods game. Yet, the contribution reductions are significantly smaller in the treatments allowing for recipient communication. To control for belief-based explanations of these findings, we run treatments where we elicit beliefs about the others' contributions. It turns out that the reductions in contributions, but not the reductions in beliefs, of the unfairly treated recipients are notably smaller when messaging is possible. This tends to suggest that allowing for communication opportunities helps to curtail selfishness.

Keywords: Public goods game; dictator minigame; emotions; cooperation

JEL classification: C72; C91; C92; D63

I. Introduction

The influence of symbolic, non-monetary punishment on behavior is 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 goods games (e.g., Gächter and Fehr, 1999; Masclet et al., 2003; Rege and Telle, 2004; Noussair and Tucker, 2005). The goal of this paper is to investigate, via an experiment, whether allowing the voicing of negative emotions affects future instead of current levels of cooperation.[1] Shedding light on this topic is important because if there are positive spillover effects from "having a voice", then the introduction of mechanisms designed to encourage the 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, a mini dictator game, and one more unannounced public goods game that is identical to the first one. Pairs are reshuffled only between the first public goods game and the mini dictator game. The latter 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 negative emotions and the desire to retaliate (e.g., Haidt, 2003; Nelissen and Zeelenberg, 2009; Clavien and Klein, 2010). We analyze the consequences of negative emotions on cooperation by comparing the first and second public goods game contributions of the recipients who receive the unfair offer.[2] We analyze the spillover effects

[1] We acknowledge that different negative emotions generate different behavioral predictions (see, e.g., Lerner and Keltner, 2000). However, determining which specific emotion (anger, resentment, irritation, or contempt) is experienced by our participants is beyond the scope of this study. Thus, we refer to negative emotions in general terms.

[2] Extreme care has been taken in terms of the design in order to ensure that the results are not driven by participants learning how to play the free riding equilibrium (in the sense

of expressing such negative emotions by comparing how contributions to the public good change in two different treatments: a treatment with a standard mini dictator game, and another treatment with a mini dictator game where the recipient, having learned of the dictator's allocation choice, is allowed to send him a text message.

Our main hypothesis is that, compared to recipients with no option of communication, recipients who can express themselves via symbolic gestures find it easier to contain their emotions and therefore reduce their contributions less in the subsequent public goods game. 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 calmer and in a good mood, they often become more generous in future interactions (Carlson et al., 1988; Isen, 2000; Kirchsteiger et al., 2006).[3]

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 recipients who receive the unfair offer in the mini dictator game tend to be less cooperative in the final game. However, and this is the original contribution of this work, when such recipients are given the chance to send a text message to the dictators, the observed reductions in subsequent contributions are significantly smaller.

Could these results be attributed to people being conditional cooperators (Fischbacher et al., 2001; Fischbacher and Gächter, 2010) and acting on beliefs about the other's type? If a player perceives a low transfer in the dictator game

of Andreoni, 1988).

[3]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).

as a sign of his partner's type, then he expects his partner to contribute little in the second public goods game and, to the extent that he is a conditional cooperator, he will reduce his own contribution. Yet, since an expression of disapproval—a form of symbolic punishment—may be expected to cause guilt, shame, or other emotional distress in a dictator that acted selfishly, a recipient may believe that a selfish dictator that has received an unfavorable message is likely to be more cooperative in the future.[4] If such a recipient were a conditional cooperator, he would reduce his contribution less in the presence than in the absence of messaging opportunities. To address these issues we conduct treatments where we elicit the subjects' beliefs about the contributions of their partners. We find that while conditional cooperation can account for the unfairly treated recipients' tendency to reduce contributions in the second public goods game, it cannot explain why the reductions in contributions are significantly smaller when we allow for text messaging.

The paper is organized as follows. Section II introduces the games that constitute the basis of our experimental design. Section III is devoted to the design itself: it describes our treatments, states our research questions, and provides details on the employed experimental procedures. Section IV reports our experimental results. Section V summarizes the main points of the study and offers concluding remarks.

II. The Games

Each of our experimental sessions consists of a succession of three games: the first and third games are identical linear public goods games; the second game is a mini dictator game. Each participant therefore plays the final public goods

[4]See, e.g., Ellingsen and Johannesson (2008) or Xiao and Houser (2009) for studies showing that negative verbal feedback can induce a feeling of guilt or shame in the message's receiver and prompt him to act cooperatively. 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). Gächter and Fehr (1999) provide several examples of how social disapproval can affect behavior in collective action problems.

game having acted as either a dictator or a recipient in the mini dictator game. We will refer to the participants as "dictators" or "recipients" depending on their role in the mini dictator game. We study how the differences in the recipients' contributions between the two public goods games vary across treatments in order to determine whether communication opportunities in the mini dictator game help to sustain cooperation.

The Mini Dictator Game

At the beginning of the mini dictator game (henceforth MDG) the participants are paired at random. Then a random move determines which pair 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. The second allocation favors the recipient, albeit slightly; it gives €9 to the dictator and €11 to the recipient. 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 recipients supposedly experiencing negative emotions after having received just €2.[5]

The Two-Person Linear Public Goods Game

To study the effect of messaging on future levels of cooperation, we rely on two identical linear public goods games, one played before the MDG and another one played immediately after it. The first public goods game is the yardstick of the participants' cooperative attitudes.

In each public goods game (henceforth PGG), participants interact in pairs. Each pair member is endowed with €14 that he can either consume privately or contribute to the public good. Indicating a PGG by g, where $g = 1, 2$, and denoting the contribution of member i $(i = 1, 2)$ in g by c_i^g, where $0 \leq c_i^g \leq 14$,

[5] 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.

i's monetary payoff in each g is given by:

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

Since the marginal per capita return is less than unity, the dominant strategy for a monetary payoff maximizer is to contribute nothing. If both pair members free rided, then each one of them would earn €14. On the other hand, the socially efficient outcome is to contribute everything. If both pair members made the socially efficient choice, then each one of them would earn €21.

III. The Experimental Design

Treatments and Research Questions

The design manipulates two factors in a complete factorial design. The first factor refers to whether or not the recipient in the MDG—after being informed of his payoff—has the opportunity to send a written message to the dictator he is paired with. The second factor refers to whether or not beliefs about the other's contribution are elicited in the two PGGs. The characteristics of our treatments are summarized in Table 1. Each treatment is labeled with a sequence of letters. The first letter indicates whether or not the MDG allows for communication opportunities (C stands for "control" and M for "message"). The remaining letter(s) indicate whether or not beliefs are elicited in the PGGs (nB stands for "no beliefs" and B for "beliefs")

In the MDG of each treatment, the dictator chooses, as explained in Section II, between two alternative allocations of €20. In the treatments with messaging opportunities (i.e., MnB and MB), each recipient may text the dictator he was paired with; in the control treatments (i.e., CnB and CB), the recipient has no such possibility. These treatments are designed to shed light on the following questions:

Table 1. *Summary of experimental design*

Treatment	Recipients may send a message	Elicitation of beliefs in PGGs
CnB	NO	NO
MnB	YES	NO
CB	NO	YES
MB	YES	YES

Question 1 *Do recipients that receive €2 in the MDG contribute less in the second than in the first PGG?*

Question 2 *Are the reductions (if any) in contributions smaller when the recipients of the unfair offer are allowed to send the dictators a message than when they have no option of communication?*

We address Question 1 by comparing, in all treatments, the second PGG contributions of the recipients getting €2 to their first PGG contributions. More formally, we compare, in all treatments, c_i^2 to c_i^1, where i is restricted to the sample of recipients getting €2. We address Question 2 by comparing the differences in contributions between the first and the second PGG in each control treatment to the same differences in the corresponding message treatment. That is, we compare $c_i^1 - c_i^2$ in CnB (CB) to $c_i^1 - c_i^2$ in MnB (MB), where i is restricted to the sample of unfairly treated recipients that reduce their contributions. The positive differences in contributions between the first and the second PGG, i.e., $c_i^1 - c_i^2 > 0$, will be referred to as "contribution cuts".

As mentioned in Section II, in both PGGs of each treatment, each pair member needs to decide how many out of €14 he wishes to contribute to the public good. In the treatments with belief elicitation (i.e., CB and MB), each pair member has one more task to perform: he must report what he expects his partner to contribute. We gave participants a financial incentive to report beliefs accurately. We paid them €3 for a belief that turned out to be correct,

€2 for a belief that differed no more than one unit from the other's actual contribution, and nothing in all other cases.

Treatments CB and MB let us control for belief-based explanations of the answers to Questions 1 and 2, and examine the extent to which conditional cooperation (Fischbacher et al., 2001; Fischbacher and Gächter, 2010) motivates our recipients. Lower contributions in the second PGG compared to the first one (namely an affirmative answer to Question 1) may indeed result from recipients being treated unfairly and experiencing negative feelings towards their partner as well as from them being conditional cooperators and taking the dictator's action as a signal of selfishness. By the same token, the reductions in the unfairly treated recipients' contributions could be smaller when messaging is permitted (namely Question 2 could be answered in a positive way) not only if messaging helped recipients to contain negative emotions, but also if it acted to reset their beliefs about the other's contribution. We run treatments with and without belief elicitation in the two PGGs as there is evidence of interaction effects between belief elicitation and contribution decisions.[6]

The treatments with belief elicitation allow us to answer the following two questions:

Question 3 *Does an act of selfishness on the part of dictators serve as a signal of uncooperativeness so that recipients who get €2 in the MDG expect their second PGG partner to contribute less than their first PGG partner and, consequently, lower their own contributions?*

Question 4 *Do recipients, acting in the belief that their message will induce dictators to cooperate more, reduce their expectations of their partners' contributions less when they can send a message in comparison to when they are not allowed to do so?*

[6]In fact the literature findings are mixed. Croson (2000) finds that when incentivized beliefs are elicited, the subjects' actions are closer to the dominant strategy Nash prediction of zero contributions. On the other hand, Gächter and Renner (2010) find that incentivized beliefs lead to higher contributions than either nonincentivized beliefs or no beliefs at all.

We address Question 3 by (a) comparing, for the recipients who get €2, their beliefs in the first PGG to their beliefs in the second PGG and (b) testing whether the observed changes in beliefs are associated with analogous changes in contributions. We address Question 4 by comparing how the recipients who get €2 change their beliefs from the first to the second PGG in treatments CB and MB; more formally, denoting i's belief in game g by b_i^g (where $i = 1, 2$ and $g = 1, 2$), we compare $b_i^1 - b_i^2$ in CB to $b_i^1 - b_i^2$ in MB. If there is no correlation between reductions in beliefs and reductions in contributions, or if—notwithstanding the existence of such a correlation—the reductions in beliefs do not differ between treatments (Question 4 has a negative answer) but the reductions in contributions are smaller in MB than in CB (Question 2 has a positive answer), then the effectiveness of a text message would be more likely attributable to the existence of communication opportunities than to any change in the recipients' beliefs.

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 participants, 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.

Each of the three games was presented separately at a different stage of the experiment. Each participant learned about the content of each stage only after having completed the previous one. All games were run one-shot. We implemented a stranger matching protocol between the first PGG and the MDG, and a partner matching protocol between the MDG and the second PGG.

The full sequence of events unfolded as follows. First, the instructions for

the first PGG were distributed and read aloud.[7] Then, the participants were randomly paired up. Before starting the game, they had to answer three sets of control questions testing their comprehension of the rules. Additionally, they had to go through three practice periods.[8] Once all participants made their contribution decisions, and in treatments CB and MB specified as well their beliefs about their partner's contribution, the instructions for the MDG were handed out and read aloud.[9] Pairs were reshuffled (subjects were aware that they were playing with a new partner), each pair member was randomly assigned one of the two roles, dictator or recipient, and the dictators were asked to submit their allocation choices.

In treatments MnB and MB, after becoming aware of the dictator's choice, each recipient could use a text box to type in a message. Each recipient was given four minutes to compose his 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 the PGG, this time with their MDG partner. We took two measures to shorten the span of time between the possible feeling of emotions at the end of the MDG and the contribution decisions in the second PGG: (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 the PGG at its own pace (i.e., without having to wait for the decisions of the other participants).

Finally, in all four treatments, we had recipients report the emotion, if any, they experienced when they found out the dictator's decision. Recipients had to

[7] The supplement contains a translation of the instructions (originally in German) for the MB treatment.

[8] The practice periods did not involve any interaction (the other's contribution was selected at random by the computer). Their sole aim was to familiarize the participants with the game and its incentives (no payments were associated with the practice periods).

[9] We framed the game as neutrally as possible, avoiding suggestive terms like dictator (he is named player X in the instructions).

select one among the following eleven emotions: pride, envy, anger, happiness, shame, irritation, gratitude, surprise, contempt, admiration, or none.[10]

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 the other's contribution and their own payoff in the first PGG only after having completed the second PGG. Then one of the three games 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 ran seven sessions for each treatment without belief elicitation (CnB and MnB), five sessions for CB, and four sessions for MB. Each experimental session lasted about an hour. Averaging over all four treatments, mean earnings amounted to €17.85 (inclusive of a €2.5 show-up fee).

IV. Experimental Results

Figure 1 draws, separately for each treatment, boxplots of all subjects' contribution choices in the two PGGs (PGG 1 refers to the first public goods game and PGG 2 to the second; the figure consists of four distinct blocks, one block per treatment). With unbiased recruitment, it should not be possible to reject the null hypothesis that the PGG 1 contributions in treatments CnB and MnB, as well as in treatments CB and MB, have identical distributions. Wilcoxon rank sum tests (two-sided) indicate that this is indeed the case (p-value = 0.62 for CnB vs. MnB, 0.27 for CB vs. MB).[11] We can therefore conclude that randomization worked (i.e., the participants were sufficiently similar across the different sessions).

Within-treatment comparisons reveal that in the control treatments, namely

[10] The overwhelming majority of recipients who got €2 did select a negative emotion. The list contains both negative and positive emotions for two reasons: (i) we did not want to push participants in a particular direction; (ii) we expected recipients getting €11 to report a positive emotion.

[11] Except for the tests evaluating randomization of subjects to treatments, all other tests reported in the paper are, in line with our research questions, one-sided.

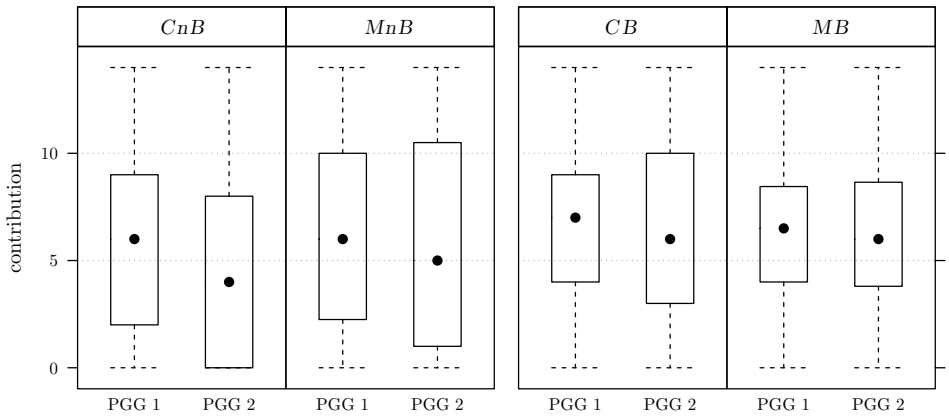

Fig 1. Boxplots of contributions in the first and the second public goods game (PGG 1 and PGG 2, respectively) per treatment

CnB and CB, contributions in the second PGG are significantly smaller than contributions in the first PGG (p-value ≤ 0.02 for both comparisons, one-sided Wilcoxon signed rank tests). Conversely, in the treatments allowing for text-messaging, namely MnB and MB, the differences in contributions between the two PGGs are either marginally significant (p-value = 0.09 for MB) or clearly non-significant (p-value = 0.53 for MnB). Looking then at the PGG 2 contributions across treatments we find that such contributions are significantly smaller in the control than in the message treatment when subjects are not required to report their beliefs (on average, 4.71 euros in CnB vs. 6.28 euros in MnB; p-value = 0.00 according to a one-sided Wilcoxon rank sum test), while this is not true when subjects are required to report their beliefs about their partner's contribution (on average, 6.32 euros in CB vs. 6.15 euros in MB; p-value = 0.62).

These findings should be treated with some caution as they depend on the composition of the sample. Table 2 categorizes our subjects according to their role and earnings in the MDG and reports the average contribution of each category in each of the two PGGs.

We start by considering the contributions of the recipients who get €2, the

Table 2. *Average contribution in the two PGGs, separately for each type of participant and each treatment*

	CnB treatment			MnB treatment			CB treatment			MB treatment		
	N[a]	PGG 1	PGG 2	N	PGG 1	PGG 2	N	PGG 1	PGG 2	N	PGG 1	PGG 2
All participants	222	5.95	4.71	220	6.19	6.28	154	6.92	6.32	120	6.55	6.15
▷ Recipients	111	6.35	4.32	110	6.20	6.24	77	6.58	5.99	60	6.79	6.11
¬ Getting €2	82	6.31	3.06	64	5.79	4.45	47	7.21	5.48	42	7.03	5.30
– with $c_i^2 < c_i^1$	44	7.76	1.26	26	6.10	2.00	25	7.62	3.37	27	6.27	3.23
– with $c_i^1 = c_i^2$	31	4.53	4.53	32	5.50	5.50	16	7.34	7.34	12	8.79	8.79
– with $c_i^2 > c_i^1$	7	5.10	7.87	6	5.92	9.50	6	5.15	9.30	3	6.83	10.00
¬ Getting €11	29	6.46	7.88	46	6.77	8.73	30	5.59	6.79	18	6.23	7.99
▷ Dictators	111	5.55	5.10	110	6.19	6.31	77	7.27	6.66	60	6.30	6.18
¬ Keeping €18	82	4.62	3.88	64	4.84	4.63	47	7.11	6.09	42	5.53	5.08
– with $c_i^2 < c_i^1$	27	6.33	3.02	19	5.50	2.91	22	7.37	3.63	13	7.60	4.25
– with $c_i^1 = c_i^2$	42	3.62	3.62	34	4.85	4.85	15	8.00	8.00	18	4.22	4.22
– with $c_i^2 > c_i^1$	13	4.28	6.54	11	3.68	6.95	10	5.18	8.62	11	5.24	7.46
¬ Keeping €9	29	8.17	8.53	46	8.07	8.65	30	7.52	7.55	18	8.11	8.77

[a] N stands for the number of subjects in each category.

main object of our analysis. A visual inspection of Table 2 reveals two noteworthy features. First, the contributions to the first public good of the recipients that get €2 are not very different neither between the nB nor between the B treatments; no significant difference is indeed detected between CnB and MnB (p-value = 0.53; two-sided Wilcoxon rank sum test) or between CB and MB (p-value = 0.67). Hence, these recipients are sufficiently homogeneous in terms of cooperative attitudes across comparable treatments. Second, whatever treatment we consider, the recipients getting €2 contribute significantly less in the second than in the first PGG. In all treatments, the difference in contributions between the first and the second game is statistically significant at the 1% level (one-sided Wilcoxon signed rank test). The last result provides an affirmative answer to Question 1. Noticing that the recipients who get €11 contribute significantly more in the second than in the first PGG (p-value = 0.00 for all treatments; one-sided Wilcoxon signed rank test), it is clear that the subsequent lower contributions of the unfairly treated recipients cannot be attributed to learning how to play the free riding equilibrium (see also the simulation exercise reported in Appendix A).

Are the changes in the contributions of the recipients that get €2 affected by the possibility of sending a message? Table 2 suggests that the unfairly treated recipients that reduce their contributions (i.e., with $c_i^2 < c_i^1$) do so to a smaller extent in the communication-allowing treatments than in the control treatments both when beliefs are not elicited ($c_i^1 - c_i^2$ equals, on average, 6.50 in CnB and 4.10 in MnB) and when beliefs are elicited ($c_i^1 - c_i^2$ equals, on average, 4.25 in CB and 3.04 in MB). Actually, while in treatments CnB and CB there are some individual recipients who, after receiving the unfair offer, reduce their contributions by more than 8 euros,[12] in treatments MnB and MB the contribution cuts of the unfairly treated recipients do not exceed (with

[12]In treatment CnB, about 20% of the unfairly treated recipients with $c_i^2 < c_i^1$ switched from the maximum possible contribution in PGG 1 to the minimum possible contribution in PGG 2.

the exception of a clear outlier in MB) 8 euros. One-sided Wilcoxon signed rank tests comparing the contribution cuts of the recipients getting €2 in each control treatment (CnB and CB) to their contribution cuts in the corresponding message treatment (MnB and MB, respectively) confirm that cuts in the message treatments are significantly smaller, although weakly so when beliefs are elicited (p-value = 0.04 for CnB vs. MnB, 0.08 for CB vs. MB).[13] We conclude that even Question 2 has an affirmative answer.

Turning to the analysis of beliefs, in both treatments with belief elicitation the recipients that receive €2 expect from their partners significantly smaller contributions in the second PGG than in the first one (p-value = 0.00 for both CB and MB; one-sided Wilcoxon signed rank test). In addition, the null hypothesis that, in the second PGG, the stated beliefs of the recipients getting €2 are significantly lower than those of the recipients getting €11 cannot be rejected (p-value = 0.02 for both CB and MB; one-sided Wilcoxon rank sum test). Consequently, players do take a selfish action in the MDG as a sign that their partners will be uncooperative in the future. It can be also shown that they adjust their contributions accordingly: the unfairly treated recipients' reductions in the amount they expect their partners to contribute are positively and significantly correlated with their own contribution cuts ($\tau = 0.36$ with p-value = 0.00 for CB and $\tau = 0.62$ with p-value = 0.00 for MB; Kendall's rank correlation coefficient). These results indicate that we can answer Question 3 affirmatively.

As to Question 4, a one-sided Wilcoxon rank sum test comparing $b_i^1 - b_i^2$ in CB to $b_i^1 - b_i^2$ in MB does not confirm that when recipients getting €2 are given the opportunity to communicate with their partners they reduce their contribution expectations to a smaller extent (p-value = 0.60). The same holds if we restrict our attention to the unfairly treated recipients with decreasing contributions (p-value = 0.72). It appears that these players reduce substantially

[13] The p-value of the test comparing CB and MB drops to 0.07 once the two series are cleared of outliers (one observation per series).

their contribution cuts in the presence of messaging opportunities (Question 2 could be answered in the affirmative) even if they do not believe that the selfish type of player they are paired with will become more cooperative in response to their message.

Before discussing the participants' self-reported emotions and the messages' content, we briefly report on the dictators' behavior. In the treatments without belief elicitation, there are fewer selfish allocations when text-messaging is permitted than when the recipient has no option of communication (73.87% in CnB vs. 58.18% in MnB).[14] This does not hold for the treatments with belief elicitation where the percentage of selfish allocations is higher in the presence of ex post recipient communication (61.04% in CB vs. 70.00% in MB). In the latter treatments, however, the presence of a message leads selfish dictators, i.e., those who keep €18 for themselves, to increase their contributions in the second PGG ($c_i^2 > c_i^1$ for 26.2% of the selfish dictators in MB, and for 21.3% of the selfish dictators in CB). While it is tempting to attribute these findings to feelings of either guilt or shame that selfish dictators experience after receiving a message, such a conclusion is not warranted by our analysis. In both MnB and MB treatments, most of the selfish dictators either did not modify or reduced their contributions.

Self-Reported Emotions and the Messages' Content

Table 3 presents, separately for recipients who received €2 and recipients who received €11, the results of the post-experimental questionnaire, i.e., how recipients described their own feelings upon learning the dictator's decision. In the four individual treatments, the overwhelming majority of the recipients that were offered €2 reported a negative emotion (between 64.3% and 72.3%).[15] Some (between 14.9% and 26.2%) claimed not to have felt any emotion. Very

[14] This is in line with the findings of Ellingsen and Johannesson (2008) and Xiao and Houser (2009).

[15] Similarly, between 69.0% and 88.9% of the recipients that were offered €11 reported a positive emotion.

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

Emotion	recipients getting €2				recipients getting €11			
	CnB	MnB	CB	MB	CnB	MnB	CB	MB
Anger	0.08	0.14	0.04	0.00	0.00	0.00	0.00	0.00
Irritation	0.44	0.33	0.51	0.52	0.00	0.00	0.00	0.00
Contempt	0.12	0.08	0.11	0.02	0.00	0.00	0.00	0.00
Envy	0.07	0.14	0.06	0.10	0.00	0.00	0.00	0.00
Shame	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Surprise	0.01	0.05	0.11	0.10	0.28	0.17	0.20	0.11
None	0.24	0.20	0.15	0.26	0.03	0.07	0.00	0.00
Happiness	0.01	0.01	0.02	0.00	0.10	0.17	0.37	0.06
Gratitude	0.00	0.00	0.00	0.00	0.41	0.43	0.20	0.44
Admiration	0.00	0.05	0.00	0.00	0.14	0.09	0.20	0.28
Pride	0.02	0.00	0.00	0.00	0.03	0.04	0.03	0.11

Note The first (last) four emotions are negative (positive), the remaining three are neutral.

few (3 out of 82 in CnB, 4 out of 64 in MnB, and 1 out of 47 in CB) reported a positive emotion. Overall, 73 out of the 235 recipients getting €2 did not report a negative emotion. We note that the results presented above for the whole sample do not qualitatively change if we exclude these 73 recipients from the analysis.

Table 4 classifies the messages written by both types of recipients on the basis of their emotional content (the methodological details are given in Appendix B). In both treatments with messaging opportunities, all recipients except one sent a message to their dictators. In treatment MnB, 63 messages were written by recipients receiving the unfair offer; 35% of them were classified as expressing negative emotions and the majority (namely 59%) as expressing neutral emotions. In all but a few neutral messages, the recipient did rebuke the dictator for his choice, but also confessed that he would not have acted differently had the right of choice been given to him. For example, one such

Table 4. *Message classification in the two communication-allowing treatments*

		Negative	Neutral	Positive
Treatment MnB	recipients getting €2	0.35	0.59	0.06
	recipients getting €11	0.02	0.00	0.98
Treatment MB	recipients getting €2	0.52	0.43	0.05
	recipients getting €11	0.00	0.11	0.89

Note In MnB (MB), 64 (42) recipients received €2 and 46 (18) recipients received €11. In each treatment, one recipient with €2 did not send any message.

message refers to the dictator's choice as stupid: "I cannot do anything else but accept your choice. I find it stupid that you did not give me more, but I would have acted the same way". And another message says: "Hi Mr./Mrs. Unknown, I pity you for your choice, but probably I would have done the same." The frequency of this kind of neutral message is lower in treatment MB, where 52% of the 41 messages written by recipients getting €2 express negative emotions. Only 4 (2) recipients getting €2 in MnB (MB) sent a message that was classified as showing positive emotional content.

As to the messages written by recipients getting €11, the overwhelming majority of them was classified as having positive content (45 out of 46 in MnB and 16 out of 18 in MB).

V. 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 an ultimatum or a public goods 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 and the presence of communication opportunities in one game to behavior in a subsequent game.

Practically speaking, we test for spillover effects.

Contribution rates in our second public goods game show clear signs of dropping off both in the presence and in the absence of communication opportunities. Although we showed that this cannot be attributed to learning,[16] it could be explained in terms of conditional cooperation as the reductions in contributions are found to be positively correlated with the reductions in stated beliefs. More specifically, a player who receives a small transfer in the dictator game lowers his beliefs about the other's contribution and also becomes less cooperative in the future.

Yet, compared to recipients with no communication option, recipients who, after being treated unfairly, could text-message their dictators reduce their subsequent contributions significantly less. These smaller reductions in contributions are observed even if such recipients do not expect that their partners will cooperate more after receiving their message. Having formed a negative perception of the partner, the unfairly treated recipients are left with no faith on a written message as corrective action. The finding that the reductions in contributions, but not in beliefs, are smaller in the communication-allowing treatments than in the control treatments indicates that communication opportunities (and the possibility to express one's own feelings) *per se* suffice to curtail future selfish decisions, though the content of the messages was not always classified as conveying negative emotions.

Further research is needed to understand why and how feelings affect future behavior. Yet, the experimental evidence garnered from this study points at the importance of channels of communication that may allow dissatisfied people to release their feelings constructively.

[16] If players had a better understanding of the dominant strategy while they played the second public goods game, the decrease in contributions should be universal and involve everyone. We observed, instead, that the recipients getting €11 contribute, on average, more in the second public goods game than in the first one.

Appendix A. Change in Contributions and Learning

We performed the following exercise in order to demonstrate that the observed difference between c_i^1 and c_i^2 in CnB cannot be attributed to learning.[17] We removed successively an increasingly larger number of recipients that receive €2 from our CnB dataset, and re-estimated for each reduced-size sample the value of $R = \text{mean}(c_i^2)/\text{mean}(c_i^1)$. In what follows, we show that the smaller the relative frequency of recipients getting €2, the closer R is to unity.

Starting with $j = 1$, where j represents the number of unfairly treated recipients excluded from the sample (these recipients are excluded along with their respective partners in the two PGGs), we formed ${}_{82}C_1 = \binom{82}{82-1}$ samples of unfairly treated recipients by eliminating one out of the 82 of them at a time.[18] Then, each one of these samples was merged with the 29 grateful recipients and their partners to calculate our measure of relative contribution. We followed the same procedure for $j = 2$ (where R was estimated ${}_{82}C_2$ times, each time removing one combination of two unfairly treated recipients from the dataset), and then for $j = 3, 4, 5$. The resulting distributions of R for $j = 1, \ldots, 5$ are depicted in Figure 2a (the ends of the whiskers represent the minimum and maximum values of the respective series). We observe that the medians of the distributions increase with j monotonically. The same holds for their means (Figure 2b).

As it was pointed out in Section IV, anyone arguing for learning would have to justify why contributions decrease for the recipients getting €2, but not for those getting €11. Furthermore, we just showed that the difference between c_i^1 and c_i^2 in CnB would probably have been smaller had fewer dictators opted for the unfair allocation.

[17] Although the exercise is done for treatment CnB, the result that will emerge holds for each one of the other three treatments.

[18] ${}_{82}C_j$ represents the binomial coefficient $\binom{82}{82-j} = \frac{82!}{j!(82-j)!}$.

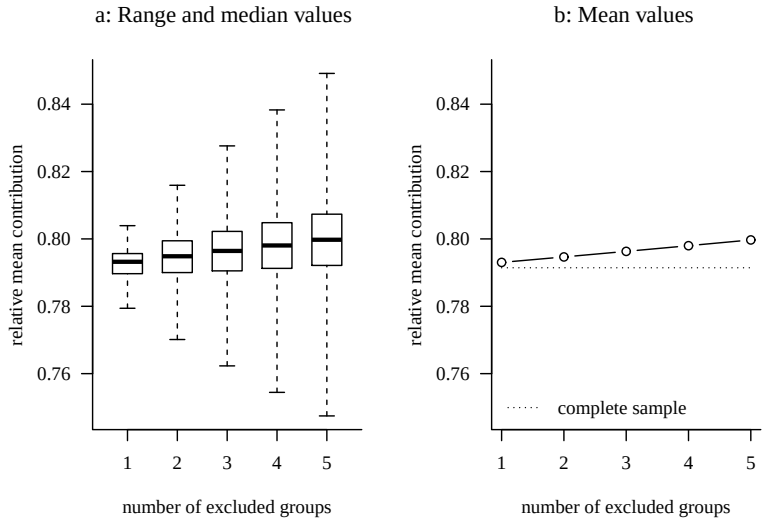

Fig 2. Relative frequency of unfairly treated recipients and mean contribution in PGG 2 as a share of mean contribution in PGG 1 (treatment CnB)

Appendix B. Classification Methodology

We draw on Xiao and Houser (2005; 2009) 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 of the experiment) was asked to recruit six message evaluators from the undergraduate student body at the Friedrich-Schiller University in Jena. These evaluators 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 about 94% of the cases. The remaining cases were determined by the research assistant.[19]

[19] We refrained from evaluating dubious cases ourselves in order to remain neutral with respect to the classification results.

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S1 Experimental Instructions

This supplement reports the instructions (originally in German) that we used for the MB treatment. The instructions for the other treatments were adapted accordingly and are available upon request.

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 will 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 × (your contribution + the *other*'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 − your contribution to the project.

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

Your earnings =	**Income from the project**	+	**Euros that you keep**
	(0.75 × sum of pair's contributions)	+	(14 − your contribution)

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.

Your guess about the other's contribution

Besides making your contribution decision, you have to guess the contribution of the *other*. You will be paid for the accuracy of your guesses as follows:

- If your guess is equal to the amount contributed by the *other*, you will earn €3.
- If your guess deviates up to 1 unit from the amount contributed by the *other*, you will earn €2.
- If your guess deviates by more than 1 unit, you will earn nothing.

Suppose, for example, that the *other* contributes 4 euros. If your guess is 4, then you earn €3. If your guess is between 3 and 5 (i.e., 3, 3.1, 3.2, ... 4.8, 4.9, 5), then you earn €2. If your guess is lower than 3 or more than 5, then you earn €0.

The information you receive

You will be informed about i) the number of euros contributed by the *other*, ii) the income from the project, and iii) your earnings from both your contribution and your guess 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 <u>not</u> 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

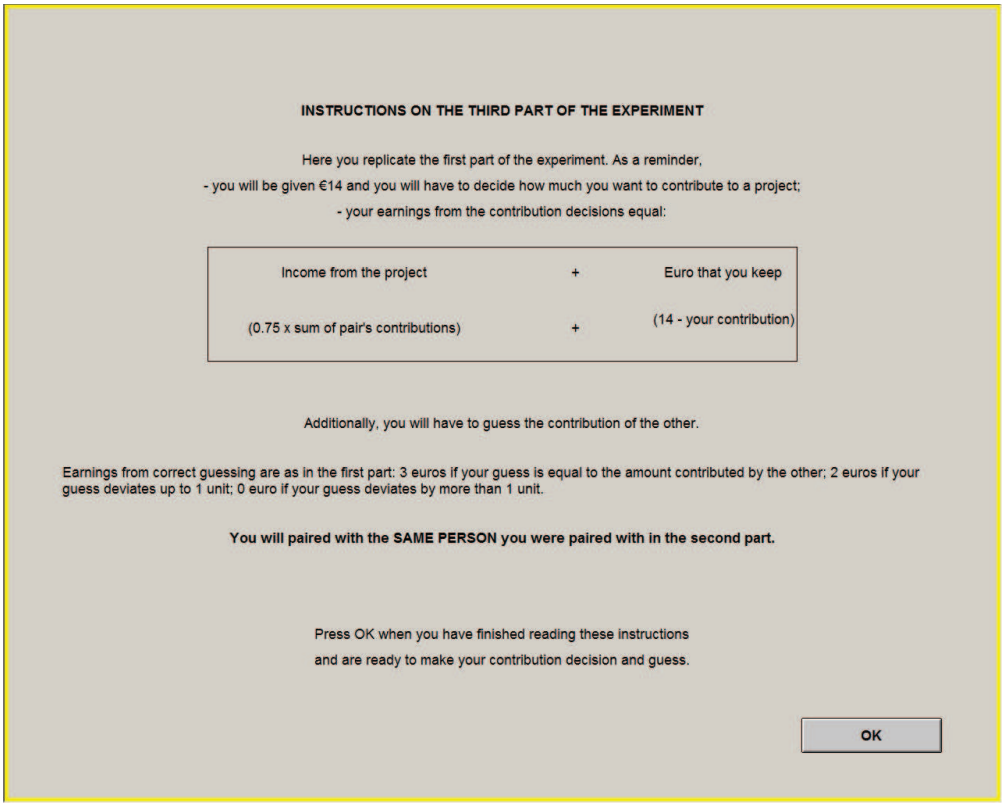
Y has no option but to accept X's decision. However, after being informed of X's decision, Y has the opportunity to send a message to X expressing his/her approval or disapproval of the way the €20 were distributed. The message sender is not allowed to identify him/herself (that is, Y cannot reveal his/her 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 from the contribution decisions equal:
Income from the project + Euro that you keep
(0.75 x sum of pair's contributions) + (14 - your contribution)
Additionally, you will have to guess the contribution of the other.
Earnings from correct guessing are as in the first part: 3 euros if your guess is equal to the amount contributed by the other; 2 euros if your guess deviates up to 1 unit; 0 euro if your guess deviates by more than 1 unit.
You will 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 contribution decision and guess.
OK