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Identification of individuals and groups in a public goods experiment

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Abstract: Revealing the identities of contributors has been shown to increase cooperation in public goods games. In this paper we experimentally investigate whether this finding holds true when decisions are made by groups rather than individuals. We distinguish between groups in which members can discuss face-to-face to reach a decision and groups in which members communicate via computer chat. The results confirm the positive effect of identification on cooperation among individuals. For groups, however, we only find a small and temporary effect of identification, irrespective of the type of communication. The reason for this is that the sensitivity to others' opinions plays an important role for individual decisions but not for group decisions.

JEL classification: C72, C91, C92, H41

Keywords: public goods experiment; cooperation; group decisions; face-to-face communication; computer chat communication; identification; shame

1. Introduction

People often behave more socially oriented when their actions are observable by others. Making actions observable has significant positive effects in settings as diverse as blood donation, blackout prevention, support for national parks, or voting in small communities (Rand et al. 2014; Kraft-Todd et al., 2015). Cooperation in experimental public goods games increases when the players' identities and their actions are revealed to the other players (Andreoni and Petrie, 2004; Rege and Telle, 2004). Evidence suggests that the aversion to negative feelings such as shame or guilt is the main driver for the effect of identification. These negative feelings appear to be a much stronger motivation than the anticipation of positive feelings such as pride or prestige (Samek and Sheremeta, 2014). Shame and guilt are painful self-conscious feelings that often arise when selfish behavior is exposed and potentially disapproved by others (Smith et al., 2002). They can serve as self-inflicted punishment and help individuals to refrain from making choices that hurt the community and lead to social devaluation. The information threat theory of shame holds that shame serves as an adaptive function that has evolved to deter individuals from courses of action where the prospective cost of social devaluation exceeds the benefits. Empirical studies have found patterns of shame that support the information threat theory. They have shown that experienced shame supports prosocial behavior (de Hooge et al., 2008); that proneness to shame is greater when the social environment or own social resources make it difficult to form new relationships and thus increase the cost of social devaluation (Sznycer et al., 2012); and that the intensity of shame people feel regarding a given transgression closely tracks the social devaluation that is associated with that transgression (Sznycer et al., 2016).

Given people's aversion to feelings of shame or guilt, increasing transparency can be an effective way to regulate interpersonal relationships. But does this result also hold for group behavior? Are groups, like individuals, sensitive to the observance and potential disapproval by others? To the best of our knowledge, these questions have not been answered yet, although many important economic, financial, and political decisions are in fact made by groups rather than individuals. Examples include decisions by households, firms, governments, delegation teams, nongovernmental organizations, or unions. It has long been known in social psychology that groups behave differently than individuals. The concept of "deindividuation" describes how anonymity and diffusion of responsibility within groups lead to less restrained and more impulsive and aggressive behavior (Festinger et al., 1952; Zimbardo, 1969). The likelihood of a person to help in an emergency case is lower when there are other people around, a phenomenon that has become known as the "bystander effect" (Darley and Latané, 1968; Latané and Nida, 1981). Likewise, groups show more competitive behavior in social dilemma situations than individuals which has been labeled the "interindividual-intergroup discontinuity effect" (Insko and Schopler, 1998; Wildschut et al., 2003). A growing behavioral economics literature shows that groups learn more quickly, make more sophisticated and payoff-oriented decisions, and are less influenced by cognitive limitations, behavioral biases, and social considerations (for reviews see Charness and Sutter, 2012; Kugler et al., 2012).

Despite the growing interest in group behavior, little is known about the effects of identification on groups. Previous research has shown that, while identification of individuals intensifies

emotions and moral reactions towards them (Kogut and Ritov, 2005a; Small and Loewenstein, 2003, 2005), identification of groups does not have the same effects (Kogut and Ritov, 2005b). However, this research only shows how observers respond but not how groups themselves respond to their identification. Shepherd et al. (2013) show that members of a group feel less shame for a questionable group decision the more they identify with the group. This study, however, neither provides a comparison between individuals and groups nor a comparison between identified and unidentified actions.

In this paper, we investigate the effects of identification on cooperation among individuals and groups in a controlled experimental setting. This approach allows us to create clear counterfactual situations without identification and to compare the behavioral responses of individuals and groups. We first compare the willingness to cooperate of individuals and groups in a finitely repeated public goods game in which no identifiable information about players is displayed. The public goods game is played either by four individuals or by four groups consisting of four individuals each and acting as a unitary player. In half of the groups, members communicate face-to-face to reach a decision while in the other half of the groups, members communicate anonymously via computer chat. All groups are required to discuss the problem and make consensus decisions. We then increase the transparency in the game by revealing the players' identities and actions. Following the approach of Andreoni and Petrie (2004) and Samek and Sheremeta (2014, 2016), we use digital photos to identify individuals and teams. At the end of every round, photos of the individuals or teams are displayed along with their contributions to the public good. Subjects know about this procedure in advance and can adjust their contributions if they wish. The two types of communication among group members, face-to-face and computer chat, represent two different group decision processes. Face-to-face communication represents a process where members openly discuss the available strategies and jointly make a decision. The members of the group know each other and what each of them contributes to the final decision. Computer chat communication represents a process where the members of a group decide jointly but the individual members' input remains anonymous. Therefore, they do not have much more information than outsiders.

We predict that groups react less sensitively to the disclosure of identities than individuals do. As members of a group share the responsibility and accountability for a decision, they do not feel singled out for doing something inappropriate. They can support and convince each other that they have made an appropriate decision for which there is no need to feel shame or guilt. This opportunity does not exist for an individual decision maker. This difference should be particularly important for individuals who are sensitive to the observance and opinions of others. Furthermore, groups may expect less (unspoken) disapproval from other groups than individuals expect from other individuals. It is well known that individuals dislike being the "sucker" and that they get angry and frustrated when they have been exploited by others (Kurzban et al., 2001; Ahn et al., 2001). Individuals can thus be expected to strongly disapprove of free-riders. The feelings of frustration and anger may be less intense for groups because the members share the fate. A weaker and less emotional disapproval among groups may in turn lead to a lower intensity of shame or guilt.

Our experimental results confirm the prediction. Revealing identities significantly improves cooperation among individuals while the effect for groups is relatively small and does not last,

irrespective of the type of communication. Without identification, groups contribute more to the public good than individuals. In particular at the beginning of the game when it is unclear what the other players will do, groups are more willing to risk a high contribution. However, groups increase their contributions only slightly and temporarily when their identities are revealed to the other groups. Individuals, by contrast, make significantly higher contributions when their identities are revealed and the increase persists. This confirms that revealing identities and the mere suspicion that others may disapprove of one's behavior constitute strong incentives for individuals to behave more socially oriented. The novel insight is that this is not the case for groups.

Our data show furthermore that the effect of identification on individuals is moderated by their sensitivity to others' opinions. Prior to the experiment, every participant is asked how much they care about what other people think about them. When identities are kept private, there is no significant difference in behavior between individuals who care about others' opinions and those who do not care much. When identities are revealed, we find that individuals who care about others' opinions contribute significantly more than those who care little. We do not observe the same in groups. The difference between groups whose members care about others' opinions and groups whose members care only little is small, whether identities are revealed or not. Our study thereby provides new insights on an important driver of individual behavior and shows that concern about others' disapproval belongs in the model of individual behavior but not group behavior.

The remainder of the paper proceeds as follows: Section 2 provides the background for our study, summarizing previous findings from social psychology and behavioral economics. Section 3 explains the experimental design. Section 4 presents the results, Section 5 discusses the results and concludes.

2. Background

As background for our study, this section will summarize previous findings on the influence of identification, disapproval, and shame on social behavior and the differences between individuals and groups.

There is ample evidence showing that making actions observable improves cooperation in diverse settings from blood donations to support for national parks (for reviews, see e.g. Rand et al. 2014; Kraft-Todd et al., 2015). Experimental studies have shown that cooperation in public goods games improves significantly when the players have to convey their contributions to the other players after the game (Rege and Telle, 2004) or when a photo of them is shown along with their contributions (Andreoni and Petrie, 2004). The photos have a much smaller effect when they are published without the contribution decisions (a similar result was obtained by Brosig et al., 2003). Building on these findings, Samek and Sheremeta (2014) show that the positive effect remains when only the two lowest contributors are shown, but disappears when only the two highest contributors are shown, indicating that shame associated with having given less than others is a stronger motivation than prestige which can be gained by contributing more than others. Similarly, allowing subjects to communicate their disapproval increases pro-social behavior. Subjects behave more cooperatively when they can send disapproval points (Masclet

et al., 2003) or judgmental messages to each other after the game (López-Pérez and Vorsatz, 2010; Peeters and Vorsatz, 2013), even when the feedback has no direct effect on payoffs. The opportunity to give feedback also increases transfers in dictator games (Ellingsen and Johannesson, 2008; Andreoni and Rao, 2011). Studies that investigate the effects of shame directly show that subjects who imagined, recalled, or felt shame behaved more cooperatively in subsequent bargaining or dilemma games than subjects in the control treatment (Ketelaar and Au, 2003; de Hooge et al., 2008). Taken together, this research suggests that, given individuals' aversion to disapproval by others and feelings of shame, increasing transparency can be an effective way of regulating interpersonal relations. It is not yet clear, however, if this is also the case for groups.

Recent reviews of the experimental literature have concluded that group behavior tends to be closer to standard game theoretical predictions than individual behavior (Charness and Sutter, 2012; Kugler et al., 2012). For instance, groups have been shown to send less money in the trust game (Kugler et al., 2007), to make and accept smaller offers in the ultimatum game (Bornstein and Yaniv, 1998), and to give less in the dictator game (Luhan et al., 2009). Groups have also been shown to be less cooperative in prisoners' dilemma games (Insko and Schopler, 1998; Wildschut et al., 2003) or common-pool resource games (Gillet et al., 2009). The lower cooperativeness has been explained by the ability of groups to justify selfish decisions (social support of shared self-interest hypothesis), to create a shield of anonymity and diffuse responsibility (identifiability hypothesis), and to anticipate the selfishness of other groups (schema-based distrust hypothesis). But there are also some reasons to expect groups to be more cooperative than individuals. It is well known that the fear to be exploited by others is an important barrier for individuals to cooperate (Kurzban et al., 2001; Ahn et al., 2001). Many people are conditional cooperators, meaning that they are willing to cooperate only if others do so, too. Thus, when it is unclear how the other players will act, cooperation is a risky decision. Groups have been shown to be better at handling risk than individuals (Rockenbach et al., 2007) and so they may be more prepared to cooperate under strategic uncertainty. Also, as mentioned before, the feeling of being the "sucker" may be less disturbing for groups as it is shared among the members. Another possible reason why groups may be more cooperative than individuals is provided by the social comparison theory. According to this theory, people are motivated to present themselves in a more favorable way than they expect others to be (Cason and Mui, 1997). An individual who chooses to free ride when deciding alone may be reluctant to recommend this action when discussing within a group. Finally, groups might be better able to reason through the game, anticipate other players' behavior, and choose a strategy that gives a higher overall payoff. So far, only two studies compared individuals and groups in a public goods game. Auerswald et al. (2013) find that groups contribute more to the public good than individuals, whereas Huber et al. (2017) do not find a significant difference between individuals and groups. The difference between the two studies may be explained by the different group size (3 versus 2). Both studies find that groups punish less and earn higher payoffs when the game includes a punishment mechanism. In short, although most studies point to more self-interest in groups, many aspects of group behavior are still not fully understood. This is clearly the case for group behavior in public goods games where only little research has been done so far.

Another relevant difference between individuals and groups pertains to how people perceive and react to their identification. Identified individuals generally evoke stronger emotions and moral reactions than non-identified individuals. This can lead to more generous behavior towards identified victims or more punitive behavior towards identified wrongdoers (Kogut and Ritov, 2005a; Small and Loewenstein, 2003, 2005). These effects of identification have not been found for groups (Kogut and Ritov, 2005b). These findings support the conjecture mentioned above that there may be weaker and less emotional disapproval among identified groups than among identified individuals.

To the best of our knowledge, there is no study that has looked into the effects of revealing the identities of unitary groups. A few studies have explored related questions. Using a prisoners' dilemma, Insko et al. (1987) show that groups behave more cooperatively when, prior to the game, all members from both groups meet and discuss than when only two representatives meet. Shame might play a role for this positive effect of social contact but it is impossible to distinguish it from the other aspects of social contact such as communication or familiarity. In a related study, Schopler et al. (1995) find that groups cooperate more when they can hear not only the names and decisions from the members of their own group but also from the members of the opposing group. The difference to our study is that, instead of revealing the identity of the whole group as a unitary decision maker, the identities and decisions of the individual members are revealed. Another difference is that identification is done through voice and not a picture. Hauge and Rogeberg (2015) show that representatives who act on behalf of groups contribute more to a public good when there is a chance that they would have to make their decision public. This effect is stronger for men than for women. The difference to our study is that individuals do not make a decision within a group but on behalf of a group. This is an important difference because these decisions are still individual decisions and not group decisions.

3. Experimental design

We consider an n-player linear public goods game. In each round of the game (there are finite repetitions), n symmetric players who are endowed with y tokens each may contribute to the production of a public good. Each player's contribution costs are assumed to depend only on the own contribution level while the benefits depend on the total provision of the public good. The payoff function for player i is given by

$$\pi_i = y - g_i + a\sum_{j=1}^{n} g_j \quad (1)$$

where g_i is i's contribution to the public good with $0 \leq g_i \leq y$ and a denotes the constant marginal per capita return from contributing to the public good with $0 < a < 1 < na$. The full cooperative public goods contribution level that maximizes social welfare is given by $g_i^{FC} = y \ \forall i$. However, under the standard economics assumption of rational payoff-maximizing agents, the only subgame perfect Nash equilibrium in the finitely repeated game is given by $g_i^{NC} = 0 \ \forall i$. The Nash equilibrium involves dominant strategies such that each player's choice does not depend on the contribution levels chosen by the remaining players.

In all of our experimental treatments, $n = 4$ players played the public goods game for ten rounds with $y = 100$ and $a = 0.4$. Depending on the treatment, a player was represented either by an individual or a unitary group of four persons. The experimental sessions were held in a computer lab (MaXLab) at the University of Magdeburg, Germany, using undergraduate students recruited from the general student population. The experiment was organized and recruited with the software hroot (Bock et al., 2014).

Table 1. Treatments

Treatment	Picture	Decision making	Communication within teams	Number of subjects	Number of observations
Indi-NoPic	No	Individual	-	40	10
Indi-Pic	Yes	Individual	-	40	10
F-Team-NoPic	No	Team	Face-to-face	160	10
F-Team-Pic	Yes	Team	Face-to-face	160	10
C-Team-NoPic	No	Team	Computer chat	160	10
C-Team-Pic	Yes	Team	Computer chat	160	10

Overall, 720 students participated in the experiment, whereby each student took part in one treatment only. We conducted six treatments which are summarized in Table 1: (1) a treatment in which players decided individually and no information about players was revealed (*Indi-NoPic*), (2) a treatment in which players decided individually and information about each individual's identity was revealed to all players (*Indi-Pic*), (3) a treatment in which players decided as a four-person team with face-to-face communication and no information about the teams was revealed (*F-Team-NoPic*), (4) a treatment in which players decided as a four-person team with face-to-face communication and information about each team was revealed to all players (*F-Team-Pic*), (5) a treatment in which players decided as a four-person team with computer chat communication and no information about the teams was revealed (*C-Team-NoPic*), (6) a treatment in which players decided as a four-person team with computer chat communication and information about each team was revealed to all players (*C-Team-Pic*).

Following the design of Andreoni and Petrie (2004) and Samek and Sheremeta (2014), we used digital photos to identify individuals and teams to one another. Digital photos show the appearance but do not allow for communication between players, which may confound the effects of identification alone. In addition to the photo, first names were included as part of the identification of players. Upon arriving at the lab, each subject got a printed name card with his or her first name and hold up the name card while the photo was taken. In the individual treatments and the team treatments with computer chat, we took a photo of each individual separately because players in the same group and members of the same team were not supposed to meet each other. Team members in the treatments with face-to-face communication, on the other hand, were supposed to meet each other, so in these cases we took a photo of the whole team. Care was taken that the faces displayed on all photos had about the same size, so it was not the case that the individual photos showed subjects more prominently than the team photos (see Appendix for samples).

Participants in the individual treatments were randomly assigned into groups of four players to play the game and they stayed together for the ten rounds of play. Similarly, in the team treatments, teams of four persons were formed randomly and then four teams were randomly assigned into a meta-group to play the public goods game. The four persons within a team and the four teams within the meta-group stayed together throughout the game. In all treatments, contribution decisions in each round were made simultaneously. After all players made their contribution decisions, the total amount of the public good was displayed as well as the contribution made by each player or team, sorted from the largest to the smallest amount. In the treatments *Indi-NoPic*, *F-Team-NoPic*, and *C-Team-NoPic*, no additional information about the players was revealed (not even an ID number). In the treatments *Indi-Pic*, *F-Team-Pic*, and *C-Team-Pic* the names and photos of every individual or team were displayed next to their contribution. This way, each individual or team was recognized and also ranked according to their contribution to the public good from the largest to the smallest amount. In *C-Team-Pic*, the four individual photos were shown next to each other, jointly forming a team photo.

During the game, earnings were presented in tokens. In the individual treatments, 100 tokens converted to €1. In the team treatments, 100 tokens converted to €4 and earnings were distributed equally among team members. In each session, subjects were seated at linked computers to play the game (software z-Tree; Fischbacher, 2007). In the team treatments with face-to-face communication, each team had its own room where the members could openly talk face-to-face. Importantly, each team member had his or her own computer. In the team treatments with computer chat, team members also had their own computer but they had no visible or other contact with each other, except of the anonymous computer chat which was open throughout the game.[1] In all team treatments, members of a team were asked to discuss the contribution decision in a civilized way (without using threats or insults) and make a decision within five minutes. In the team treatments with computer chat communication, members were also told that they must not identify themselves, and they adhered to this rule. To ensure consensus decisions during the game, each team member had to enter the same contribution for the computer to accept the team decision. If any one member deviated, the computer did not accept the decision and all team members had to start anew. Note that this feature makes our design particularly conservative. It ensures that teams made consensus decisions where each member had to agree. Allowing for majority voting where members can be overruled should increase the difference between teams and individuals because it further obscures responsibility among team members.

The experiment included two short questionnaires, one before subjects knew about the game and another one after they had played the game. In the ex-ante questionnaire, subjects were asked about their personal background and some attitudinal characteristics, including trust, risk aversion, and beliefs about others' selfishness. An important question was how much they care about what other people think about them which they could answer on a scale from 1 being "not at all" to 10 being "very much." After this questionnaire, a set of written instructions was handed out which explained the game and included several numerical examples and control

[1] In the computer chat, subjects were denoted by numbers which could not be linked with the photos. The chat was open in every stage of the game and closed between the stages. When a member of the team left the stage in order to proceed to the next stage, all remaining team members were informed that one member has left the stage.

questions (see Appendix for instructions). The control questions tested subjects' understanding of the payoff function given in (1) to ensure that they were aware of the payoff-maximizing strategy and the dilemma situation. The game only began after all subjects read the instructions and answered the control questions correctly. After the game, subjects were asked to complete a second questionnaire which asked about their motivations and emotions during the game. While the teams with face-to-face communication were allowed to talk during the game, they were requested to read the instructions and complete the control questions as well as the two questionnaires individually and in silence, which they did. After the final questionnaire was completed, the subjects were paid their earnings in cash. Care was taken that individuals and teams left the lab one by one so that they did not meet.

4. Results

4.1 Contributions to the public good

The left panel in Figure 1 shows the average contributions across rounds by treatment. The *Indi-NoPic* treatment shows by far the lowest contributions with 25.7 tokens on average. Individuals in the *Indi-Pic* treatment contributed more than twice as much, namely 53 tokens on average. A Mann-Whitney-Wilcoxon (MWW) test shows that the difference between the two treatments is statistically significant ($P = 0.0257$).[2] This result confirms the findings from the previous literature that revealing contributors' identities significantly increases cooperation among individuals (Andreoni and Petrie, 2004; Samek and Sheremeta, 2014).

Teams in the *F-Team-NoPic* treatment allocated on average 45.9 tokens to the public good and teams in *C-Team-NoPic* contributed 46.2 tokens on average. Compared to *Indi-NoPic* this is an increase of approximately 80 percent, and the differences are at least weakly significant ($P < 0.10$ each). Thus, irrespective of the type of communication, teams contribute more than individuals when identification is not possible which is in line with the finding by Auerswald et al. (2013).

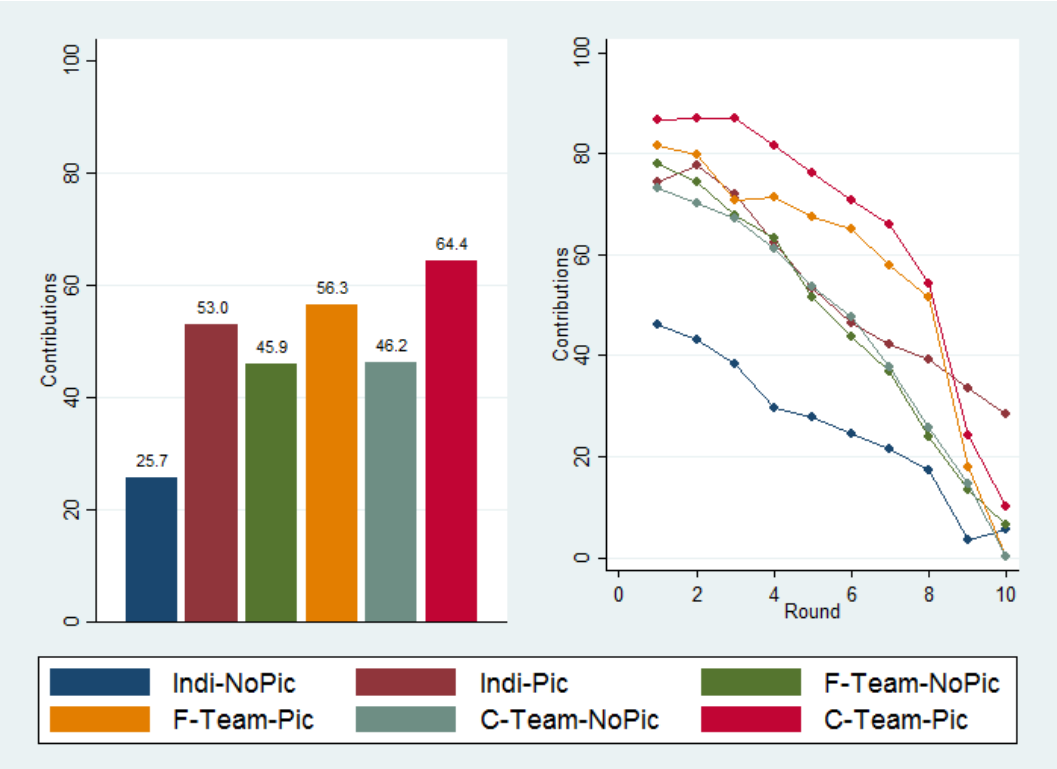
When identities were revealed, teams in *F-Team-Pic* contributed 56.3 tokens on average which is an increase of 23 percent compared to *F-Team-NoPic*. Teams in *C-Team-Pic* contributed 64.4 tokens on average, 39 percent more than the teams in *C-Team-NoPic*. The differences in average contributions due to the revelation of identities are much smaller for teams than for individuals (the increase for individuals is 106 percent) and they lack statistical significance ($P > 0.10$ each). This clearly confirms our hypothesis that individuals respond more sensitively to the revelation of identities than teams.

Lastly, we find no significant differences between the teams with face-to-face communication and the teams with computer chat communication, neither when identities are kept private nor when identities are revealed ($P > 0.10$ each). Thus, whether the discussion takes place face-to-face or via computer chat appears to matter little for cooperation. This result is in contrast to Kocher and Sutter (2007) who found more generous behavior with face-to-face communication

[2] Unless stated otherwise, we use the meta-group as unit of observation in all statistical tests. That means, four individuals constitute an observation in *Indi-NoPic* and *Indi-Pic* and four teams (16 individuals) constitute an observation in *F-Team-NoPic*, *F-Team-Pic, C-Team-NoPic*, and *C-Team-Pic*.

than with communication through the computer, but in their experiment the computer communication was not only anonymous but also restricted to proposals and votes.

Figure 1. Average contributions across rounds and over time by treatment



The right panel in Figure 1 shows how average contributions in the different treatments develop over time. As has been observed in many other public goods experiments, average contributions decrease over time in all four treatments. However, the initial contribution level and the steepness of the downward trend differ. The first round is interesting because players have to choose their contributions without any information about what the other players might do. Subjects in *Indi-NoPic* started the game carefully with relatively low contribution level in the first round (46.1 tokens on average), arguably to avoid the risk of being exploited by others. Subjects in *Indi-Pic*, by contrast, started the game at a much higher contribution level (74.3 tokens). The difference between the two treatments remains relatively stable until the end of the game. Interestingly, *Indi-Pic* is the only treatment in which subjects managed to stay well above zero contributions in the last round (28.4 tokens). Thus, the disclosure of identities has an immediate and lasting effect on individual contribution decisions.

Without identification, teams contributed more than individuals, especially at the beginning of the game. In the first round, teams in *F-Team-NoPic* contributed 77.9 tokens and teams in *C-Team-NoPic* contributed 73.3 tokens on average. They appeared much more willing to risk a high contribution at the start of the game when the contributions by the other players were not yet known. However, the difference between teams and individuals decreases over time and vanishes by the end. In the last round, teams in *F-Team-NoPic* contributed 6.3 tokens on

average and the teams in *C-Team-NoPic* contributed almost zero. Teams in *F-Team-Pic* and *C-Team-Pic* also started at a high level (81.5 tokens and 86.6 tokens, respectively). In the beginning and especially in the middle part of the game, contributions in *F-Team-Pic* and *C-Team-Pic* exceed the contributions in their counterparts without picture, but then drop sharply in the last three rounds. In the last round, the differences are very small and contributions in *F-Team-Pic* are even lower than in *F-Team-NoPic*. Hence, for teams, the disclosure of identities only has a relatively small and temporary effect.

It is also interesting to look at the extreme decisions, that is, contributing either all or nothing to the public good. Table 2 shows the proportions of zero contributions and full contributions for the first round, the last round, and all rounds together. It shows that, in the first round of *Indi-NoPic*, 22.5 percent of individuals contributed the full amount to the public good. The share of full contributions is substantially higher in the other five treatments (45 – 70 percent). This confirms that individuals in *Indi-NoPic* started the game rather carefully and tried to avoid the risk of being exploited by others. This concern appears to be less important in the other treatments. This is especially remarkable for *F-Team-NoPic* and *C-Team-NoPic* in which identities were kept private. For *F-Team-NoPic*, one could argue that the shame associated with selfish behavior is triggered *within* the team and so leads to higher contributions. But this argument cannot explain the high contributions in *C-Team-NoPic* where the members of a team remained anonymous. Thus, being in a team alone appears to reduce the fear of being exploited by others and increase the willingness to risk a high contribution in the first round. However, teams were unable to keep cooperation up and experienced a sharp reduction in contributions towards the end of the game.

Turning to the other extreme, *Indi-NoPic* has a much higher percentage of zero contributions in the first round (22.5 percent) than the other treatments. The share of zero contributions is very low in *Indi-Pic* (2.5 percent), arguably because individuals did not want to be identified as a free-rider. Zero contributions in the first round are also rare in the team treatments (0 – 5 percent). A plausible reason for this is that group members who would free ride when deciding alone might be reluctant to push this selfish strategy in the group discussion, even when identities are private. Another possible explanation is that groups are better at anticipating the negative effects that such a strategy may have on the other players and overall payoffs. One point becomes clear when we compare the individual and the team treatments: Teams did not just average over what the members would have done individually. If they did we would observe a similar average contribution level and fewer extreme decisions at both ends, that is fewer zero contributions and fewer full contributions. This is not the case.

Let's now look at the extreme decisions in the last round. Here, the *Indi-Pic* treatment turns out to be the outlier. In *Indi-Pic* there are more full contributions (22.5 percent) than in the other treatments (0 – 7.5 percent). Likewise, there are fewer zero contributions (55 percent) than in the other treatments (82.5 – 97.5 percent). This confirms that the effect of the identification on individual behavior is still at play in the last round, whereas the differences for teams are much smaller.

In summary, deciding as a group rather than individually changes cooperation at the beginning of the game but the difference decreases over time and vanishes by the last round. Disclosure

of identities has a sizable and lasting effect on individuals but only a relatively small and temporary effect on groups. In the next two sections we will investigate the effects of identification in greater detail.

Table 2. Percentage of zero and full contributions by treatment

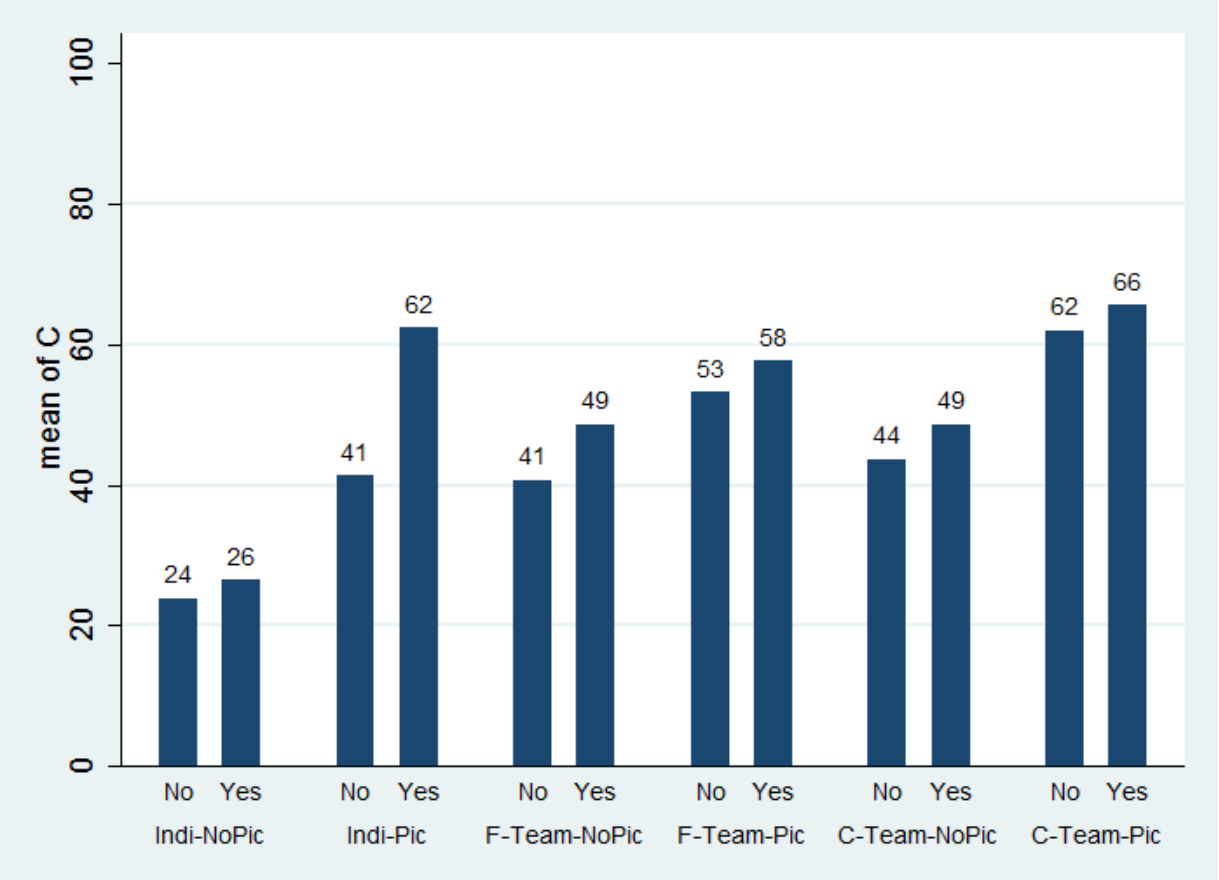
	First round		Last round		All rounds	
	Zero	Full	Zero	Full	Zero	Full
Indi-NoPic	22.5	22.5	90.0	5.0	49.3	10.3
Indi-Pic	2.5	45.0	55.0	22.5	25.8	36.5
F-Team-NoPic	5.0	47.5	85.0	5.0	39.5	24.5
F-Team-Pic	2.5	60.0	85.0	0.0	26.5	45.3
C-Team-NoPic	5.0	47.5	97.5	0.0	29.3	19
C-Team-Pic	0.0	70.0	82.5	7.5	20.8	48.8

4.2 Importance of others' opinions

In our ex ante questionnaire, we asked participants to state how much they care about what other people think about them on a scale from 1 being "not at all" to 10 being "very much." Figure 2 compares the average contributions of shame-prone subjects who care about others' opinions ("Yes," answer categories 6-10) and non-shame-prone subjects who do not care much about others' opinions ("No," answer categories 1-5). For the team treatments, we consider the average answer to this question to distinguish between shame-prone teams ("Yes," average answer is 6 or higher) and non-shame-prone team ("No," average answer is below 6). In all treatments, individuals and teams who care about others' opinions contribute more to the public good than those who do not care (difference between "Yes" and "No" within treatments). Remarkably, the by far largest difference can be found in the *Indi-Pic* treatment; individuals who care about others' opinions contribute about 50 percent more than those who do not care. In the other treatments, this difference is less than 20 percent.

Furthermore, we see that the introduction of the photo increases contributions by both shame-prone players (difference between "Yes" with and without picture) and non-shame-prone players (difference between "No" with and without picture). However, the introduction of the photo has by far the largest impact on shame-prone individuals; their contributions are substantially higher in *Indi-Pic* than in *Indi-NoPic* (138 percent). This difference is much larger than for the non-shame-prone individuals (71 percent) and any type of team (18-41 percent).

Figure 2. Average contributions conditional on sensitivity to others' opinions



To investigate this relation in greater detail we employ a series of random effects regression models. To this end, we pool the data from each pair of associated treatments, so that each regression includes observations from 80 players (individuals or teams) over all but the first round. The results for each of the three pairs of treatments (Indi, F-Team, C-Team) are shown in Table 3. The dependent variable is the contribution per round. In the first regression (column (1)), the number of the current round, the lagged contributions by the other players, and a dummy variable indicating whether or not players' identities were revealed serve as explanatory variable. The variable *Round* accounts for the downward trend of contributions over the course of the game. As expected, the coefficient is negative and significant in all conditions. The aggregate contribution by the other players in the previous round has a positive and significant effect in all conditions. Revealing players' identities, measured by the dummy variable *Picture*, has a significantly positive effect on individuals, no significant effect on the F-Teams, and a positive, but only weakly significant, effect on the C-Teams.

In the second regression (column (2)), we additionally include a number of attitudinal variables. Binary measures of the trust, risk aversion, and beliefs about others' selfishness serve as control variables and are not shown in the table. They were all elicited prior to the game. For the teams, we took the average response across all team members in order to measure the attitude at the team level. The variable *Others opinions* is a dummy indicating whether individuals or teams

care about other people's opinions.[3] For individuals, the dummy takes the value one if an individual's answer to the question about the importance of others' opinions is 6 or higher (on a scale from 1 to 10) and zero otherwise. For teams, the dummy is one if team members answer this question with 6 or higher on average and zero otherwise. The variable *Others opinions*Picture* is an interaction dummy of *Others opinions* and *Picture*; thus, it is one if subjects care about others' opinions and their identity was revealed, and zero otherwise. We see that the inclusion of the attitudinal variables clearly moderates the effect of the pictures. For the individuals, the variable *Picture* no longer has a significant effect while the interaction dummy *Others opinions*Picture* has a significantly positive effect on contributions. All else being equal, individuals who care about others' opinions and whose identity was revealed contributed on average 12.3 tokens more than individuals who also care about others' opinions but whose identity was kept private. Likewise, they contributed on average 12.3 tokens more than individuals whose identities were revealed but who do not care about others' opinions. This indicates that shame proneness only has a positive effect on contributions in combination with the disclosure of identities. For the teams, neither the variable *Picture* nor *Others opinions* nor the interaction dummy have a significant effect on contributions.

Of course, the influence of shame proneness is diluted in teams simply because highly sensitive subjects are often matched with less sensitive subjects. Nevertheless, if shame proneness had an effect, we should observe a difference between teams with a low degree of shame proneness and teams with a high degree, as long as there is enough variation among teams. Note also that, even when the differences in average shame proneness among teams are relatively small, they are based on more subjects. A 1-point difference means that *four* subjects in a team gave an answer that was one category higher on average than *four* subjects in another team. The average reported values range from 4 (the team with the lowest degree of shame proneness) to 8.5 (the team with highest degree) and yet there is no significant difference between teams with a low degree of shame proneness and teams with a high degree. We provide additional regression analyses in the Appendix where we use the minimum or maximum value of the team, instead of the average, in order to measure the importance of others' opinions at the team level (Table A1). These regressions examine if the member of the team who cares the most or the least about others' opinions has a significant effect on contributions. None of the regressions shows a significant effect. Taken together, these findings suggest that, even when the members of a team care about other people's opinions, this concern only has a relatively weak effect on the contribution decisions, if any, because the members do not decide individually but in a team. In particular, being in a team that communicates face-to-face appears to help shame-prone subjects to overcome their concerns about others' opinions about them.

[3] The underlying scale (from 1 to 10) provides only an ordinal measure. Following Wooldridge (2002; p.223) we coded the variable as a dummy because we cannot be sure that the successive categories are perceived as equally spaced across the full scale. For instance, it is not clear that respondents perceived the difference between categories 2 and 3 the same as the difference between categories 7 and 8, or that they interpreted the category 8 as twice as much as 4.

Table 3. Panel regression results on contributions

	Indi-NoPic & *Indi-Pic*		*F-Team-NoPic* & *F-Team-Pic*		*C-Team-NoPic* & *C-Team-Pic*	
	(1)	(2)	(1)	(2)	(1)	(2)
Round	-1.750***	-1.815***	-2.868***	-2.786***	-3.440***	-3.492***
	(0.477)	(0.459)	(0.732)	(0.732)	(0.638)	(0.632)
Others lagged contribution	0.232***	0.228***	0.275***	0.278***	0.269***	0.267***
	(0.0199)	(0.0168)	(0.0103)	(0.0111)	(0.0157)	(0.0155)
Picture (d)	7.875**	-1.465	1.085	3.440	3.306*	1.054
	(3.641)	(4.542)	(2.456)	(5.241)	(1.865)	(2.722)
Others opinions (d)		-1.423		2.445		-0.382
		(2.597)		(3.318)		(3.353)
Others opinions*Picture (d)		13.76**		-3.054		3.245
		(6.609)		(5.191)		(4.117)
Constant	14.50***	8.655	18.12***	13.65*	22.37***	20.12***
	(4.953)	(5.303)	(5.253)	(7.190)	(5.678)	(5.889)
Controls	No	Yes	No	Yes	No	Yes
Observations	720	720	720	720	720	720

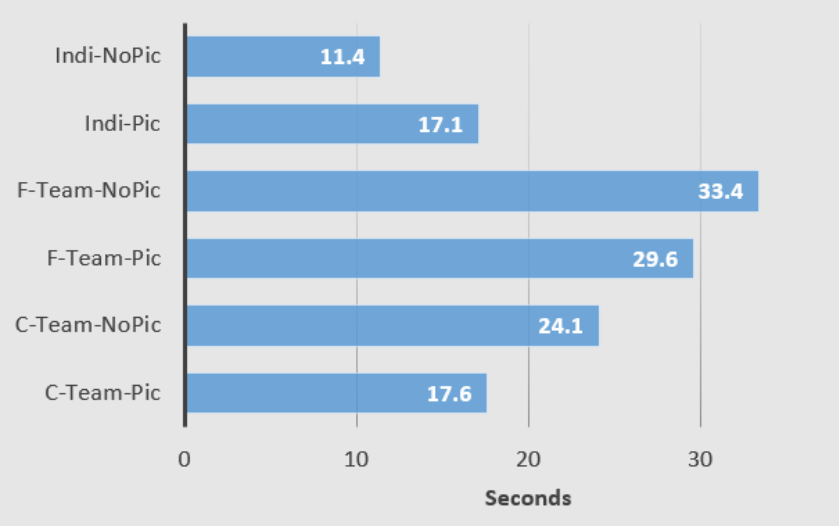
Random effects panel regression with clustering of standard errors at the meta-group level. Numbers are marginal effects; standard errors in parentheses; significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Depended variable is an individual's (team's) contribution per round. (d) indicates dummy variable. Definition of variables: *Round* = number of round; *Others lagged contribution* = aggregate contribution of the other three players/teams in the previous round; *Picture* = 1 if identities are revealed, 0 otherwise; *Others opinions* = 1 if individual (or team on average) cares about others' opinions, 0 otherwise; *Others opinions*Picture* = Interaction dummy of *Others opinion* and *Picture*; Control variables: *Trust* = 1 if individual (or team on average) considers others as trustworthy, 0 otherwise; *Others helpfulness* = 1 if individual (or team on average) considers others as helpful and not only pursuing their own interest, 0 otherwise; *Risk aversion* = 1 if individual (or team on average) is risk averse, 0 otherwise.

4.3 Expectations

The subjects in the team treatments not only made decisions within a team, they also played with teams. Therefore, apart from feeling safer within a team, these subjects might also have different expectations about the other players than individuals. It is possible, for example, that the subjects in the team treatments expect the other teams to pay only little attention to the pictures. Asking subjects directly about their expectations prior to the game is likely to bias the behavior in the game. Asking after the game does not work either because this would elicit experience rather than expectations. For this reason we decided to use a subtle way to measure subjects' expectations prior to the game. After the participants learned about the details of the game but before they started to play, they were asked to estimate how long the other players (individuals or teams) would look at the contributions. They knew that the game would be played over ten rounds and that, after each round, the players' contributions would be displayed on the computer screen. Depending on the treatment contributions were shown with or without pictures. The task was to estimate the average inspection time of the other players across all rounds. Importantly, every participant estimated the inspection time for the own treatment only (and not for the other treatments of which they were not aware). Correct guesses, meaning the

actual average of the other players plus or minus 2 seconds, were rewarded with €3.[4] Remember that participants in all treatments had their own computer and so could decide individually how long they would like to inspect the outcome after each round. The game continued to the next round only if and when every person, whether in a team or not, pressed a continue button. We were thus able to measure the time every person spent looking at the outcome screen before pressing the continue button and calculate the rewards for correct guesses. Figure 3 shows the expected inspection time for each treatment. It shows that individuals expected a longer inspection of outcomes when identities were revealed than when they were not revealed (MWW test, P = 0.0875).[5] In contrast, subjects in the team treatments had lower expectations when identities were revealed than when identities were not revealed, but the differences are not significant (P > 0.10 each). Of course, it is harder to guess the inspection time for teams because they may discuss the outcome which is why this finding should be interpreted with care. Nevertheless, it is consistent with the finding that the identification of individuals elicits greater emotional reactions than the identification of groups (Kogut and Ritov, 2005b).

Figure 3. Difference in expectations when pictures are shown



4.4 Acquaintances in the treatments with revelation of identities

In the ex-post questionnaire we asked subjects in all treatments in which identities were revealed if they knew another player or a person in another team. Two persons (5 percent) in *Indi-Pic*, 36 persons (22.5 percent) in *F-Team-Pic*, and 40 persons (25 percent) in *C-Team-Pic* answered this question positively. The difference between individuals and teams is simply caused by the fact that the subjects in the team treatments got to see 12 persons in the other

[4] In the team treatments, guesses were only made about the other teams and not the members of the own team. The inspection time of the own team members could have been influenced through communication. Also, we were mainly interested in the expectations about the players with whom they had to solve the cooperation problem.
[5] Since estimations were elicited before the game started, we use the individual as the unit of observation for the individual treatments and the team for the team treatments. Hence, we have 40 observations for each treatment.

three teams while the individuals only saw three other persons.[6] At the meta-group level, we do not find any significant effects of knowing other persons on contributions. Regression analysis (see Table A2 in the Appendix) shows that knowing another player or someone in the other teams had no significant effect in *Indi-Pic* and *C-Team-Pic* while it had a small positive effect in *F-Team-Pic*. If anything, however, this makes our result only stronger since removal of those teams would lower contributions in *F-Team-Pic* and move it even closer to the *F-Team-NoPic* treatment.

We also asked a number of other questions in the ex post questionnaire in order to elicit subjects' perceptions after having played the game. The results are shown in the Appendix. They show, for example, that the participants in the team treatments were generally satisfied with their team, they felt involved in the decision making process and agreed with the final decision. The most interesting finding is the difference between individuals and teams with respect to their appreciation of the pictures. The individuals in *Indi-Pic* appear to perceive the pictures as more useful and influential than the teams in *F-Team-Pic* and *C-Team-Pic* which is consistent with actual behavior. However, when the participants in the anonymous treatments were asked whether they would have preferred to play the game with pictures, high contributing teams in *F-Team-NoPic* and *C-Team-NoPic* supported the idea of removing anonymity much more than low contributing teams, while the support among high contributors and low contributors in *Indi-NoPic* was equally low. This raises interesting questions about the willingness of individuals and teams to employ naming and shaming, which go beyond the scope of this study.

5. Discussion and conclusion

Increasing transparency, and thereby exploiting the human tendency to behave more socially oriented under supervision, has been suggested as an effective way to regulate interpersonal relations (Rand et al. 2014; Kraft-Todd et al., 2015). This can even have positive side effects beyond the interpersonal relations, for example, when a change of personal eating or commuting habits due to social pressure has positive effects on the global climate (Nyborg et al., 2016). Our results indeed confirm previous findings that the mere suspicion of others' disapproval is an incentive for individuals to behave more cooperatively (Anderoni and Petrie 2004; Samek and Sheremeta 2014; Rege and Telle 2004). The effect of revealing individuals' identities on cooperation is immediate, sizable, and permanent. A more detailed analysis shows that in particular shame-prone individuals who care about other people's opinions make higher contributions to the public good when identities are revealed. When identities are kept private, there is no significant difference between individuals who care about others' opinions and those who care only little. In addition, when identities are revealed, individuals expect the other players to inspect the outcome of the game more carefully than when identities are kept private.

[6] This question referred only to acquaintances in the other teams and not to acquaintances in the own team. In *C-Team-Pic*, we also asked about acquaintances in the own team and nine persons (5.6 percent) answered this question positively. Regression analysis shows that knowing someone in the own team had no significant effect on contributions.

However, the results also confirm our hypothesis that "naming and shaming" does not work for groups as it works for individuals. The disclosure of identities only has a small and temporary effect on cooperation among groups. We do not find a significant difference between teams in which members care about others' opinions and teams in which members do not care much, regardless of whether identities are revealed or not. Thus, being in a team appears to help subjects to overcome their concerns about other people's opinions. This happens not only because highly sensitive subjects are matched with less sensitive subjects but also because sensitive subjects *become* less sensitive when they are part of a team. Feelings of shame *within* teams also seem to matter little. If they mattered, we would expect higher contributions in *F-Team-NoPic* where identities are known than in *C-Team-NoPic* where identities are private. But this is not the case. Furthermore, we find that the disclosure of the pictures does not make a difference for the expected inspection time among groups. One might speculate that groups focus more on the outcome itself rather than who caused it. This may be a fruitful area for future research to further improve our understanding of group decision making. In conclusion, concern about others' disapproval appears to belong to models of individual behavior but not group behavior. Decision makers who want to use "naming and shaming" to improve social outcomes, as for example fundraisers, should try to target individuals rather than groups as increasing transparency among groups may not change their behavior. Group interactions seem to require stronger regulations at least when responsibility for decisions is diffused and members can hide within the group. We believe that this is the case for most group decisions. The recent automobile emission scandal serves as a good example for diffusion of responsibility within groups.[7]

Finally, our study adds to the relatively small literature on the differences between individuals and groups in the anonymous public goods game. We find that, irrespective of the type of communication, groups contribute more than individuals which is in line with Auerswald et al. (2013). Especially at the beginning of the game when it is not yet clear what the other players will do, groups appear to be more willing to risk a high contribution. They are also less likely than individuals to start the game with contributing nothing, perhaps because groups are better able to anticipate the negative effect this strategy may have on the other players' willingness to cooperate. Indeed, the analysis of the chat protocols (see Appendix) suggests that maximizing payoffs and keeping the others' contribution level up were the most important motivations for the groups, whereas fairness or concerns to be exploited are mentioned only rarely. These motivations can also help to explain why groups' contributions decrease quickly over time and come close to zero by the end of the game. It is important to note that, while the potential for the pictures to make a difference is limited at the beginning of the game when groups contribute a lot anyway, there is great potential at the end of the game when contributions are very low. But, unlike in the case of the individuals, the potential is not used.

It would be interesting to test if our results hold under different group decision making rules, for instance, when a majority rule is used or when one member decides as a group representative. As a majority rule further obscures responsibility and accountability within groups we would not expect a greater effect of identification under this rule. The decision by a

[7] On the issue of responsibility in the Volkswagen scandal, see for example https://www.nytimes.com/2017/05/17/business/volkswagen-muller-diesel-emissions.html?mcubz=0.

group representative would be more interesting as it combines elements of both individual and group decision making (Hauge and Rogeberg, 2015). Likewise, revealing the input of each single member, rather than the final decision only, may lead to different results as this would make responsibility more transparent (Schopler et al., 1995). By forming groups according to certain preferences instead of random formation, for example by subjects' sensitivity to others' opinions, one could further investigate if subjects indeed become less sensitive in groups or if the matching of heterogeneous subjects is the more important factor.

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Appendix

1. Samples of the pictures

The pictures below show how the pictures used in the experiment looked like. The people on the pictures did not take part in the experiment. They were informed, and they agreed, that the pictures would be used for research purposes. The participants in the experiment were informed that the pictures would be used only during the experiment and deleted afterwards.

F-Team-Pic

C-Team-Pic

Indi-Pic

2. Experimental Instructions

(The instructions below are for the *F-Team-Pic* treatment, translated from German. The instructions for the other treatments are similar.)

Welcome to this experiment!

1. *General information*

You can earn money in this experiment. How much you earn depends on the game play, or more precisely, on the decisions you and your fellow co-players will make. Please remain at your seat for the entire experiment. We will inform you when the experiment is finished and you are allowed to leave your seat.

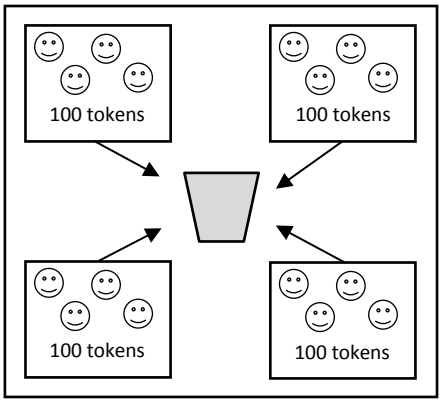
Now, read the following rules of the game carefully. Subsequently, answer the control questions below. All participants should read the instructions and answer the control questions independently from each other. Therefore, please do not talk with each other during this phase. In case you have a question, give us a hand signal. We will come to you and answer the question.

2. *Game rules*

There are four teams participating in this game, meaning your team and three other teams. Each team consists of four persons. So, in total, 16 persons participate in the game. Every team is confronted with the same decision task.

Each team receives 100 tokens. The teams decide if they keep their tokens or contribute them to a common project. The tokens that a team keeps benefit only the team. The tokens that a team contributes to the common project benefit all teams. The tokens that are contributed to the common project will be multiplied by 1.6 and then divided equally among the four teams. So, every team benefits from tokens contributed to the common project regardless of how much it contributed itself. The team's profit is the sum of the tokens kept and the tokens that it receives from the common project.

Example: If all four teams keep their tokens and do not contribute to the common project, every team receives 100 tokens (= 100 + 1.6*0 / 4). If every team contributes 100 tokens to the common project, each team receives 160 tokens (= 0 + 1.6 * 400 / 4). If three teams contribute 80 tokens each to the common project and one team contributes nothing, the former teams receive 116 tokens each (= 20 + 1.6*240 / 4) and the latter team receives 196 tokens (= 100 + 1.6*240 / 4).



All teams decide simultaneously how much they contribute to the common project. Any amount between 0 and 100 tokens is possible. Every team is supposed to discuss the decision about the contribution and to make the decision within 5 minutes. The discussion is to be held civilized (no threats, insults etc.). When the team has agreed on a contribution, all members have to enter the decision into the computer. Only then the decision is valid.

After all teams have chosen their contributions to the common project, the contributions of all teams will be shown on the screen. The computer will sort the contributions from the highest to the lowest. Next to the contribution, the photo of the respective team will be shown. Note that the photos will not be published outside of the experiment and not be passed to third parties. After the experiment, all photos will be deleted.

The game will be played for 10 identical rounds. The four teams will remain the same for all rounds. Each team will receive 100 tokens in every round which can be kept or contributed to the common project. After every round, contributions and the respective photos will be shown. The profit of a team is the sum of all tokens from all 10 rounds. Each token is converted into 0.04 Euros (25 tokens = 1 Euro). That means, for example, if a team earns 1500 tokens in the 10 rounds, it receives 60 Euros (= 0.04 * 1500). The profit of a team is equally distributed among the four members. In the example above, every team member would receive 15 Euros.

Before and after the game, you will be asked a few questions. All participants are supposed to answer these questions independently from each other and in silence. This applies also to the following control questions.

3. Control questions

a. Right or wrong? Four teams participate in the game and every team consists of four members.

O Right O Wrong

b. Right or wrong? The game will be played for 10 identical rounds. The teams remain the same for all rounds.

O Right O Wrong

c. Assume that all teams have contributed a total of 120 tokens to the common project. Your team has contributed 30 tokens. What is the profit of your team in this round (in tokens)?

O 68 O 84 O 118 O 136 O 148 O 196

d. Assume that all teams have contributed a total of 120 tokens to the common project. Your team has contributed 0 tokens. What is the profit of your team in this round (in tokens)?

O 68 O 84 O 118 O 136 O 148 O 196

e. Assume that all teams have contributed a total 240 tokens to the common project. Your team has contributed 60 tokens. What is the profit of your team in this round (in tokens)?

O 68 O 84 O 118 O 136 O 148 O 196

f. Assume that all teams have contributed a total of 240 tokens to the common project. Your team has contributed 0 tokens. What is the profit of your team in this round (in tokens)?

O 68 O 84 O 118 O 136 O 148 O 196

When you have answered all control questions, give us a hand signal. We will come to you and check the answers. When we have checked the answers of all participants and there are no more questions, the game will start. Good luck!

3. Supplementary regression analyses

Table A1. Panel regression results on contributions using minimum or maximum values to measure the importance of others' opinions at the team level

	F-Team-NoPic & *F-Team-Pic*	*C-Team-NoPic* & *C-Team-Pic*	*F-Team-NoPic* & *F-Team-Pic*	*C-Team-NoPic* & *C-Team-Pic*
Round	-2.730***	-3.500***	-2.768***	-3.504***
	(0.748)	(0.636)	(0.742)	(0.632)
Others lagged contribution	0.281***	0.266***	0.279***	0.266***
	(0.0106)	(0.0159)	(0.00977)	(0.0157)
Picture (d)	1.262	2.312	0.862	3.757*
	(4.099)	(2.548)	(3.643)	(2.052)
Minimum others opinions (d)	-2.224	0.136		
	(4.129)	(2.687)		
Minimum others opinions*Picture (d)	0.0901	1.430		
	(4.710)	(3.385)		
Maximum others opinions (d)			-3.818	-0.261
			(3.346)	(3.484)
Maximum others opinions*Picture (d)			1.184	-1.598
			(4.775)	(4.062)
Constant	15.21**	19.92***	16.36**	19.56***
	(6.644)	(5.900)	(6.972)	(5.812)
Controls	Yes	Yes	Yes	Yes
Observations	720	720	720	720

Random effects panel regression with clustering of standard errors at the meta-group level. Numbers are marginal effects, standard errors in parentheses; significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Depended variable is an individual's (team's) contribution per round. (d) indicates dummy variable. Definition of variables: *Round* = number of round; *Others lagged contribution* = aggregate contribution of the other three players/teams in the previous round; *Picture* = 1 if identities are revealed, 0 otherwise; *Minimum others opinions* = 1 if lowest value of a team member on a scale from 1 to 10 is above the median of 3, 0 otherwise; *Minimum others opinions*Picture* = Interaction dummy of *Minimum others opinions* and *Picture*; *Maximum others opinions* = 1 if highest value of a team member on a scale from 1 to 10 is above the median of 8, 0 otherwise; *Maximum others opinions*Picture* = Interaction dummy of *Maximum others opinions* and *Picture*; Control variables: *Trust* = 1 if individual (or team on average) considers others as trustworthy, 0 otherwise; *Others helpfulness* = 1 if individual (or team on average) considers others as helpful and not only pursuing their own interest, 0 otherwise; *Risk aversion* = 1 if individual (or team on average) is risk averse, 0 otherwise.

Table A2. Panel regression results on contributions in the treatments with disclosure of identities when acquaintance is included as an explanatory variable

	Indi-Pic	*F-Team-Pic*	*F-Team-Pic*	*C-Team-Pic*	*C-Team-Pic*
Round	-2.060***	-3.340***	-3.369***	-3.706***	-3.705***
	(0.587)	(1.006)	(1.008)	(1.090)	(1.106)
Others lagged contribution	0.232***	0.292***	0.291***	0.282***	0.282***
	(0.0248)	(0.00983)	(0.0101)	(0.0231)	(0.0243)
Others opinions (d)	12.98*	1.309	1.193	3.635***	3.110**
	(6.857)	(3.980)	(4.532)	(1.331)	(1.428)
Acquaintance (d)	-6.799	4.322**		-2.352	
	(7.425)	(1.962)		(3.040)	
Number acquaintances			1.505		-0.331
			(2.073)		(1.726)
Constant	4.536	12.54	14.52	19.60**	18.71*
	(6.701)	(8.243)	(9.367)	(8.939)	(9.590)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	360	360	360	360	360

Random effects panel regression with clustering of standard errors at the meta-group level. Numbers are marginal effects, standard errors in parentheses; significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Depended variable is an individual's (team's) contribution per round. Definition of variables: *Round* = number of round; *Others lagged contribution* = aggregate contribution of the other three players/teams in the previous round; *Others opinions* = 1 if individual (or team on average) cares about others' opinions, 0 otherwise; *Acquaintance* = 1 if individual (or at least one team member) knows another player (a person in another team), 0 otherwise; *Number acquaintances* = Number of team members who know a person in another team. Control variables: *Trust* = 1 if individual (or team on average) considers others as trustworthy, 0 otherwise; *Others helpfulness* = 1 if individual (or team on average) considers others as helpful and not only pursuing their own interest, 0 otherwise; *Risk aversion* = 1 if individual (or team on average) is risk averse, 0 otherwise.

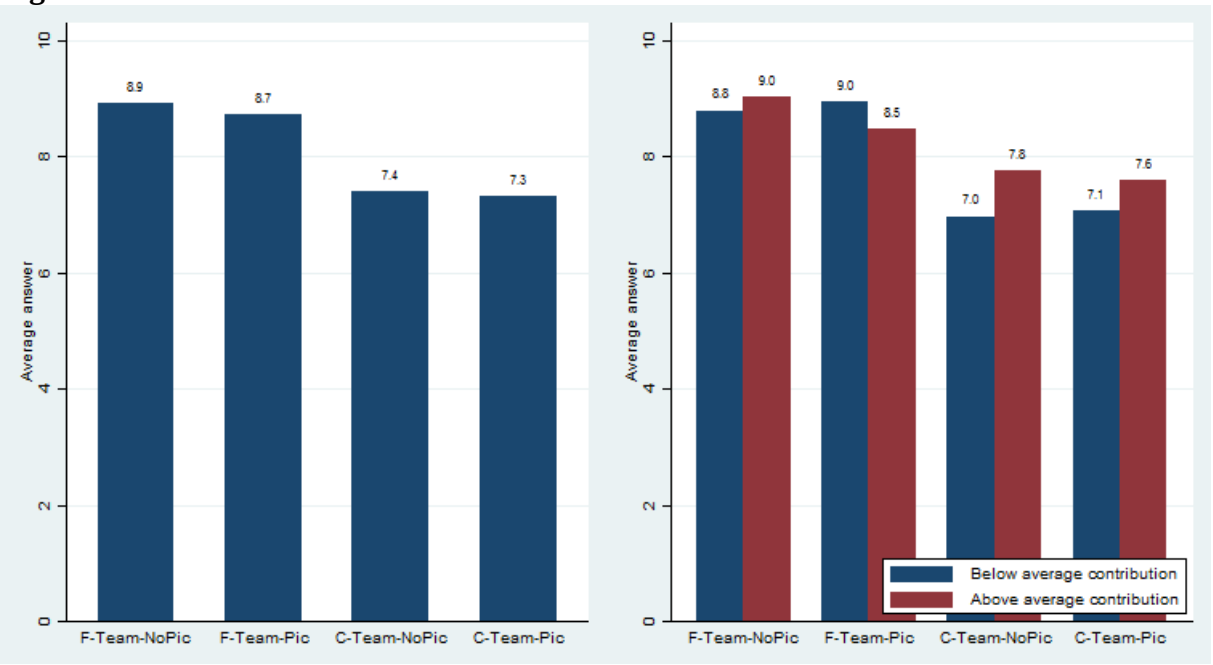
4. Results from the ex post questionnaire

In our ex post questionnaire, we asked subjects about their emotions and motivations during the game. In particular, we wanted to know if the team decisions were consensus decisions and if members were satisfied with their team and the final decisions. The answers show that members on average were satisfied with their team, they felt involved in the team decision making process and agreed with the final decisions (Figures A1 and A2). The majority of subjects stated that they would have made the same decision if they had decided alone (Figure A3). Not surprisingly, subjects felt more obliged towards the own team than towards the other teams (Figures A4 and A5).

In another set of questions, we wanted to know if subjects were satisfied with the version of the game they had played. Participants in the treatments with pictures were asked in how far they found the disclosure of the photos along with the contributions helpful and if the photos influenced their decisions. The individuals appear to perceive the pictures as more useful and influential than the teams (Figures A6 and A7). We also asked if the participants would have preferred to play the game without disclosure of the photos. The support for the anonymous game was limited as can be seen in Figure A8.

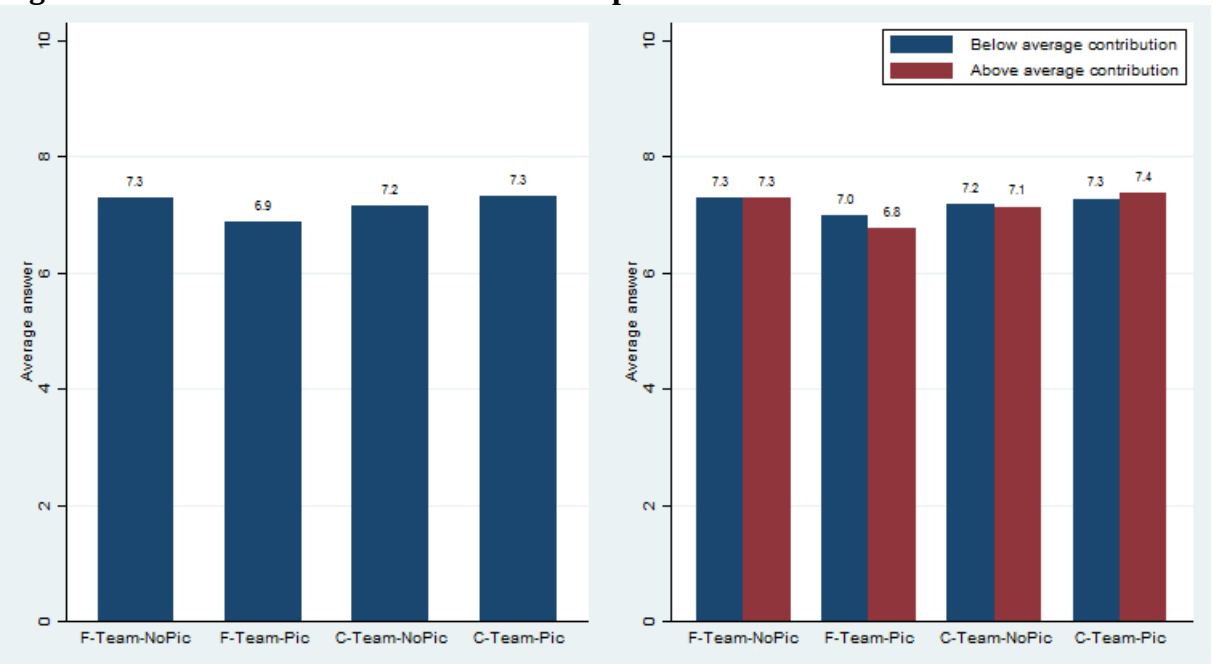
Likewise, we asked participants in the anonymous treatments if they would have preferred to play the game with the disclosure of photos. The alternative version of the game received only limited support on average (Figure A9). It received more support from high contributing teams than from low contributing teams while there is no difference between high contributors and low contributors among the individuals. This lack of support for the disclosure of identities in *Indi-NoPic* is surprising since they had experienced a very low level of cooperation in the anonymous game. This raises an interesting question for future research: How would subjects with no experience choose between the two versions of the game, with or without disclosure of identities, if they had the choice?

Figure A1. Satisfaction with the own team



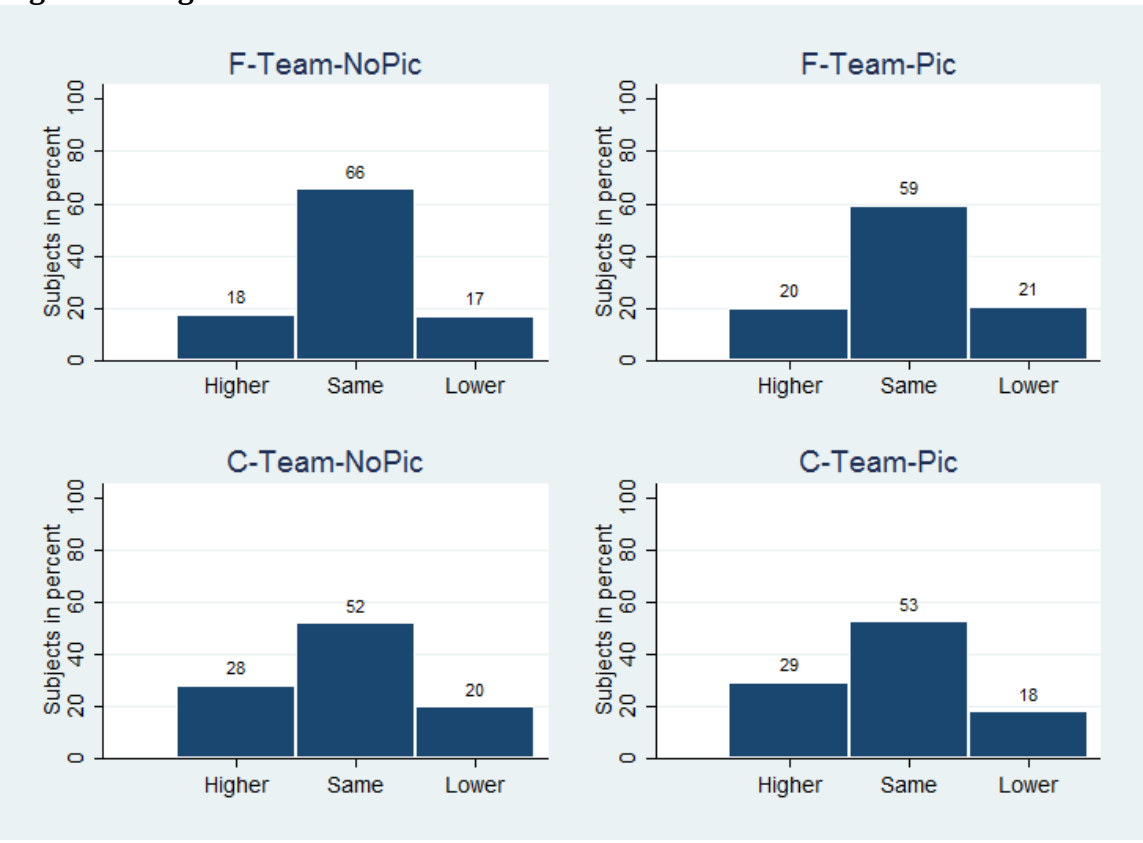
Average answers to the question: "Were you generally satisfied with the behavior of the other team members in your team? Mark a number on a scale from 1 (not at all) to 10 (very much)." "Below average contribution" in the right panel indicates that the team's average contribution across all ten rounds is below or equal to the average contribution of all four teams. "Above average contribution" indicates that the team's average contribution across all ten rounds is above the average of all four teams.

Figure A2. Involvement in the team decision process



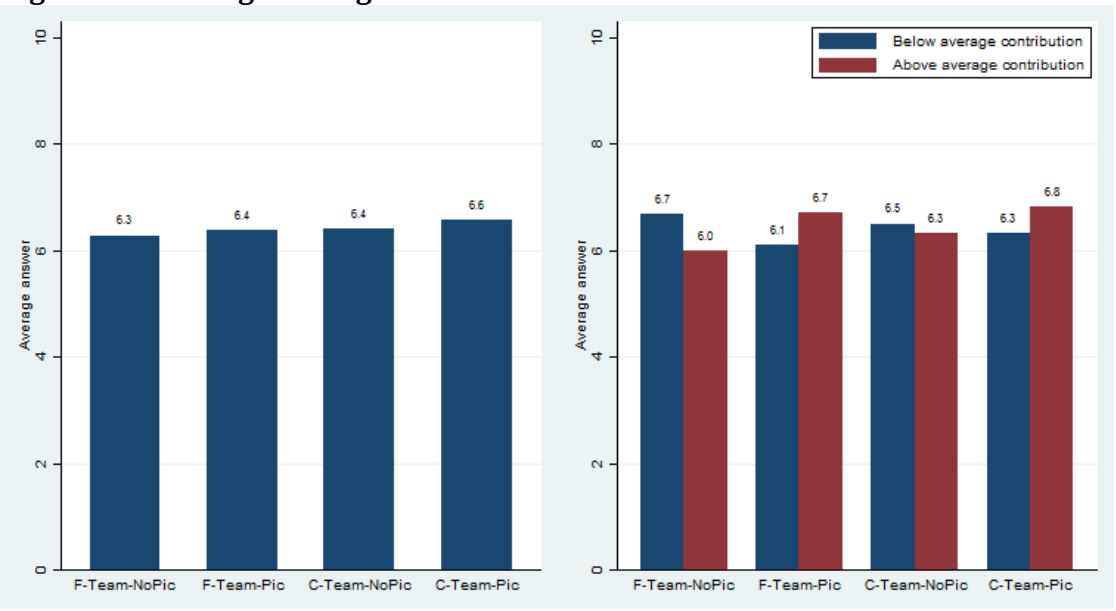
Average answers to the question: "How strongly were you involved in your team's decisions? Mark a number on a scale from 1 (not at all) to 10 (very much)." "Below average contribution" in the right panel indicates that the team's average contribution across all ten rounds is below or equal to the average contribution of all four teams. "Above average contribution" indicates that the team's average contribution across all ten rounds is above the average of all four teams.

Figure A3. Agreement with the team decisions



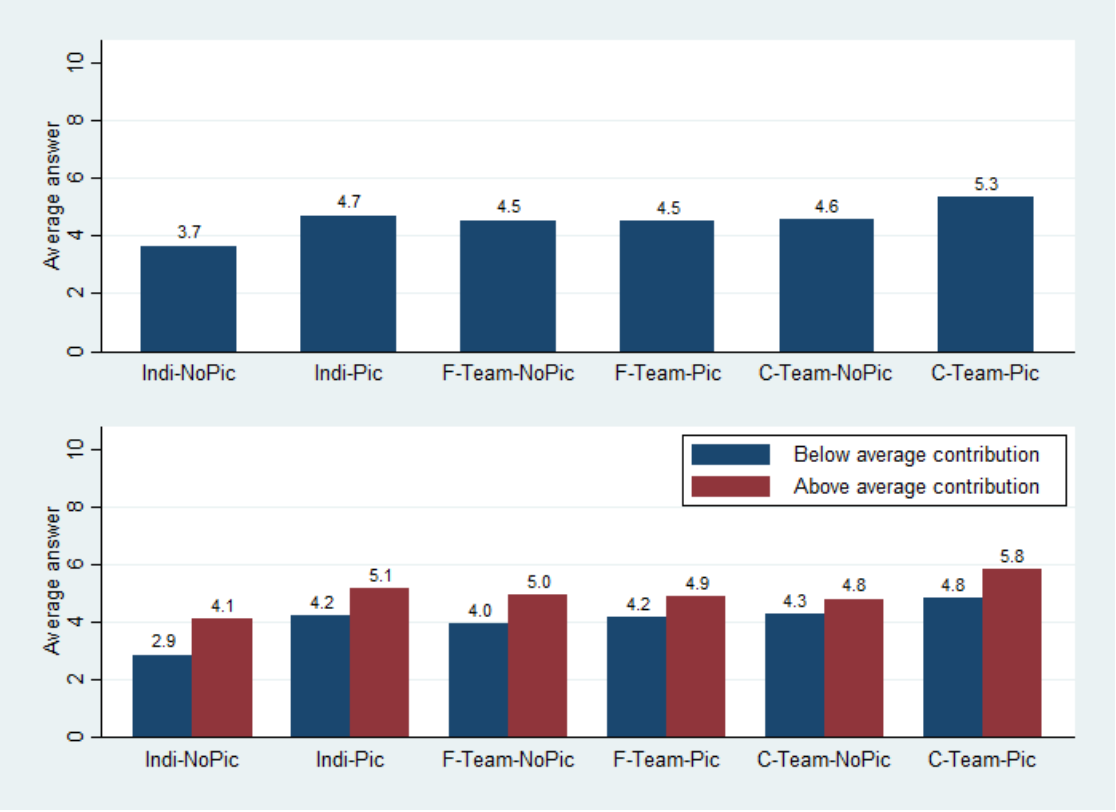
Answers to the question: "If you could have made the decisions alone, would you have chosen higher contributions, the same contributions, or lower contributions than your team?"

Figure A4. Feeling an obligation to the own team



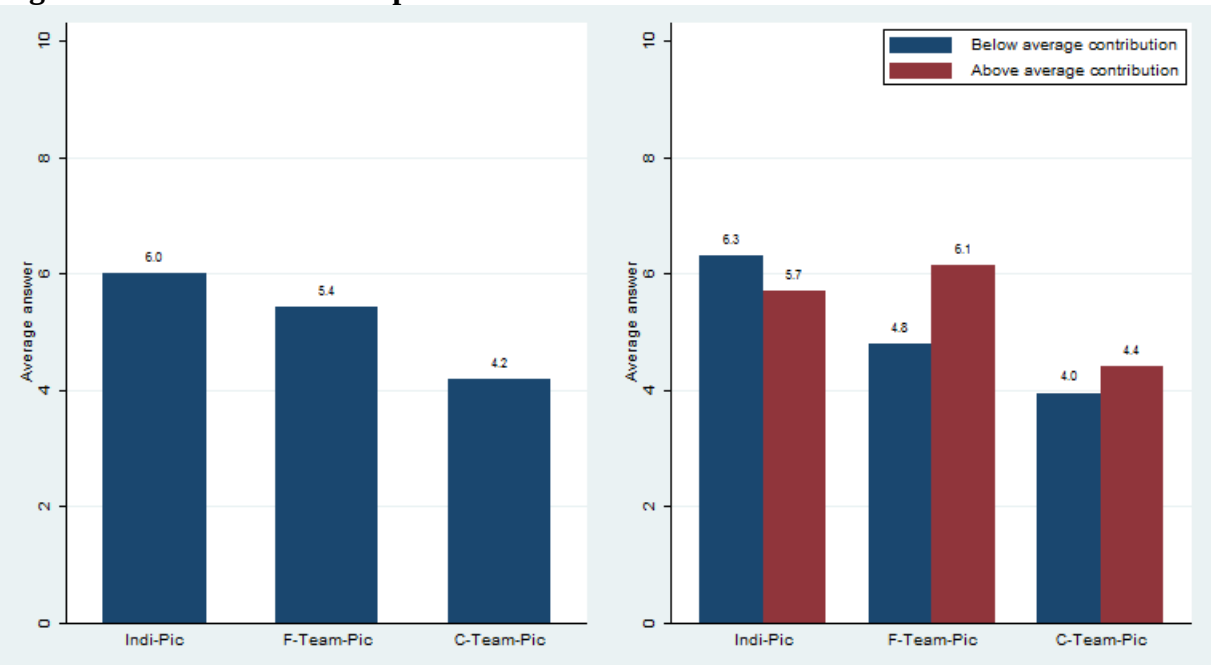
Average answers to the question: "Did you feel an obligation to your team in the game? Mark a number on a scale from 1 (not at all) to 10 (very much)." "Below average contribution" in the right panel indicates that the team's average contribution across all ten rounds is below or equal to the average contribution of all four teams. "Above average contribution" indicates that the team's average contribution across all ten rounds is above the average of all four teams.

Figure A5. Feeling an obligation to the other players / other teams



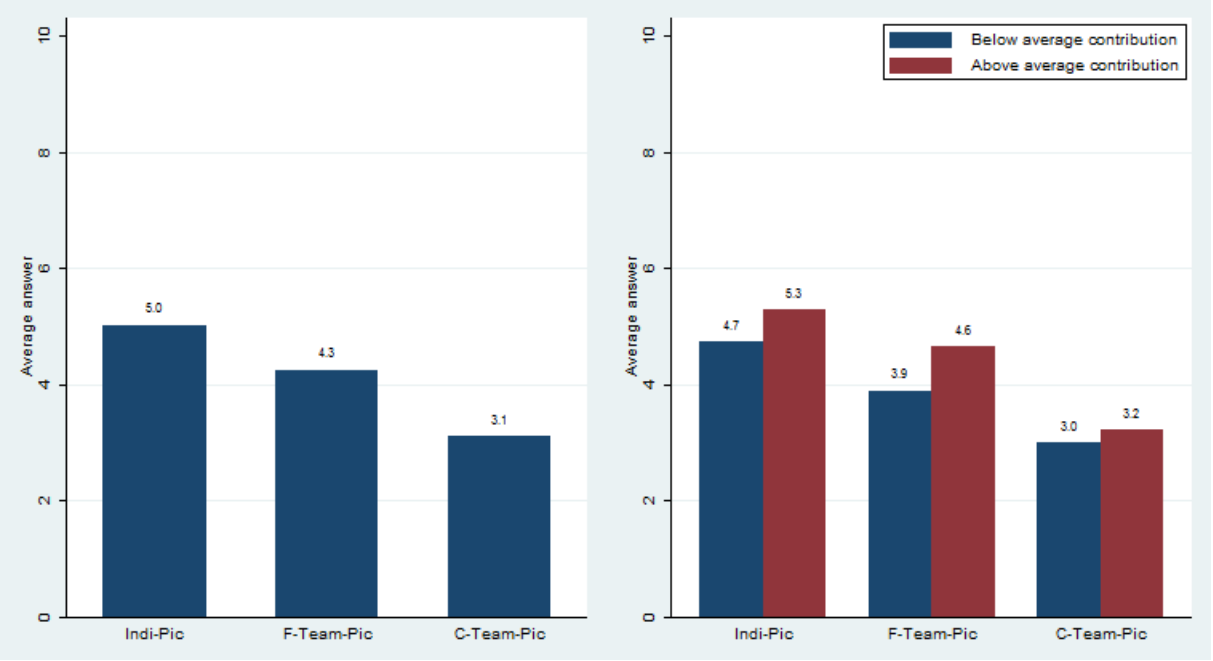
Average answers to the question: "Did you feel an obligation to the other players (to the other teams)? Mark a number on a scale from 1 (not at all) to 10 (very much)." "Below average contribution" in the lower panel indicates that the individual's (team's) average contribution across all ten rounds is below or equal to the average contribution of all four players (teams). "Above average contribution" indicates that the individual's (team's) average contribution across all ten rounds is above the average of all four players (teams).

Figure A6. Usefulness of the photos



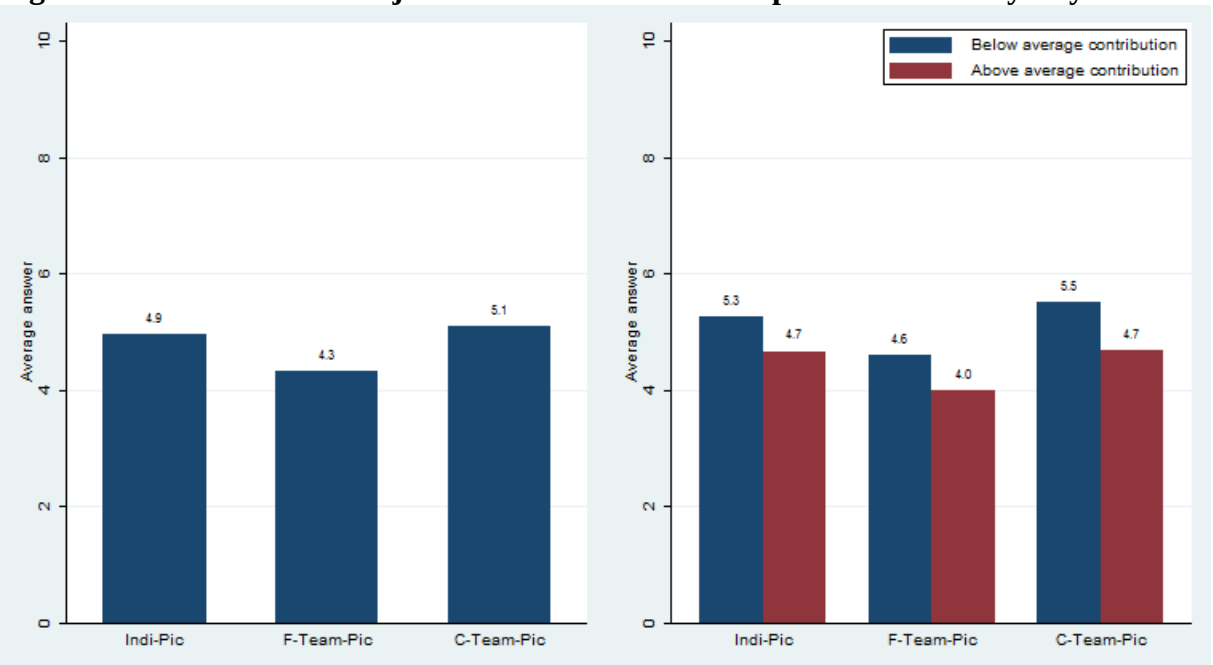
Average answers to the question: "Do you agree with the statement that the display of the photos along with the contributions was helpful? Mark a number on a scale from 1 (not at all) to 10 (very much)." "Below average contribution" in the right panel indicates that the individual's (team's) average contribution across all ten rounds is below or equal to the average contribution of all four players (teams). "Above average contribution" indicates that the individual's (team's) average contribution across all ten rounds is above the average of all four players (teams).

Figure A7. Influence of the photos



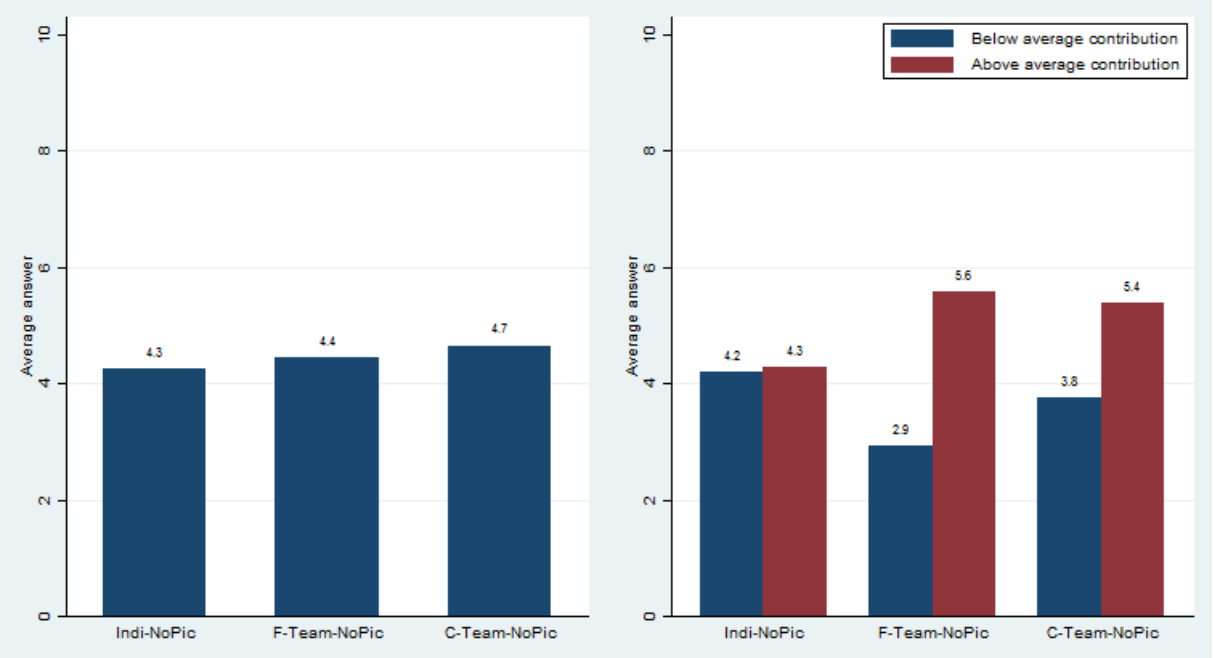
Average answers to the question: "Did the fact that the photos were displayed along with the contributions influence your decision (the decision of your team)? Mark a number on a scale from 1 (not at all) to 10 (very much)." "Below average contribution" in the right panel indicates that the individual's (team's) average contribution across all ten rounds is below or equal to the average contribution of all four players (teams). "Above average contribution" indicates that the individual's (team's) average contribution across all ten rounds is above the average of all four players (teams).

Figure A8. Preference of subjects in the treatments with pictures for anonymity



Average answers to the question: "In another version of the game, contributions of the players (teams) were shown anonymously without photos. Would you have preferred this anonymous version to the version you played? Mark a number on a scale from 1 (not at all) to 10 (very much)." "Below average contribution" in the right panel indicates that the individual's (team's) average contribution across all ten rounds is below or equal to the average contribution of all four players (teams). "Above average contribution" indicates that the individual's (team's) average contribution across all ten rounds is above the average of all four players (teams).

Figure A9. Preference of subjects in the treatments without pictures for removal of anonymity



Average answers to the question: "In another version of the game, contributions were shown along with photos of the players (teams). Would you have preferred this version with photos to the anonymous version you played? Mark a number on a scale from 1 (not at all) to 10 (very much)." "Below average contribution" in the right panel indicates that the individual's (team's) average contribution across all ten rounds is below or equal to the average contribution of all four players (teams). "Above average contribution" indicates that the individual's (team's) average contribution across all ten rounds is above the average of all four players (teams).

5. Analysis of the chats

In the two treatments with computer chat communication, *C-Team-NoPic* and *C-Team-Pic*, we were able to analyze how the teams discussed the problem and reached a decision on how much to contribute to the public good. Most decisions (56%) were made unanimously without much disagreement or discussion among the members. In 34% of all cases the decision was a compromise of the initial proposals of the team members. Around 5% of all contributions were determined by majority voting. In around 4% of cases one player could persuade all others to accept his or her proposal. These proportions were almost identical between the two chat treatments.

In total, subjects in these two treatments made 755 comments regarding their motivations. These comments convey the aim to earn as much money as possible (37%), to motivate the other teams to contribute more (25%), to treat the other teams fairly (25%), or not to be exploited by the other teams (12%). Again, these proportions were very similar in the two treatments, except that the concern to be exploited by others was expressed more often in *C-Team-NoPic* than in *C-Team-Pic*.

A lot comments expressed dissatisfaction or satisfaction with the behavior of the other teams and, in both treatments, subjects expressed more often dissatisfaction (459) than satisfaction (288).

Interestingly, the photos were not discussed much in *C-Team-Pic*. Only 23 comments concerned the photos. Most of them speculated about the effect that the photos may have on the contributions.